MONTGOMERY CREEK WATERSHED TMDL
Clearfield County

Prepared for:

Pennsylvania Department of Environmental Protection

March 1, 2003

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TMDL[1]
Montgomery Creek Watershed
Clearfield County, Pennsylvania

INTRODUCTION

This Total Maximum Daily Load (TMDL) calculation has been prepared for segments in the Montgomery Creek Watershed (Attachment A). It was done to address the impairments noted on the 1996, 1998 and draft 2002 Pennsylvania 303(d) lists required under the Clean Water Act. The TMDL covers three segments on these lists (Table 1). High levels of metals, and in some areas depressed pH, caused these impairments. All impairments resulted from acid drainage from abandoned coal mines. The TMDL addresses the three primary metals (iron, manganese, and aluminum) associated with acid mine drainage (AMD) and pH.

Table 1. Montgomery Creek Watershed Segments Addressed

State Water Plan (SWP) Subbasin: 08-B West Branch Susquehanna River								
Year	***Miles***	***Segment ID***	***PA. DEP Stream Code***	***Stream Name***	***Designated Use***	***Data Source***	***Source***	***EPA 305(b) Cause Code***
1996	2.6	7183	26623	Montgomery Creek	HQ-CWF: Source to Clearfield Reservoir	305(b) Report	RE	Metals
1998	1.35	7183	26623	Montgomery Creek	HQ-CWF: Source to Clearfield Reservoir	SWMP	AMD	Metals
2002	6.8	990504-1230-JLR	26623	Montgomery Creek	HQ-CWF: Source to Clearfield Reservoir	SWAP	AMD	Metals, pH
1996	This segment not on 1996 303(d) list			Montgomery Creek, Unt				
1998	This segment not on 1998 303(d) list			Montgomery Creek, Unt				
2000	0.78	990504-1230-JLR	26624	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	UP	AMD	Metals, pH
1996	1.7		26626	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	305(b) Report	RE	Metals, pH

[1] Pennsylvania's 1996 and 1998 Section 303(d) lists were approved by the U.S. Environmental Protection Agency (EPA). The 2000 Section 303(d) list was not required by EPA. The 1996 Section 303(d) list provides the basis for measuring progress under the 1996 lawsuit settlement of *American Littoral Society and Public Interest Group of Pennsylvania v. EPA.*

State Water Plan (SWP) Subbasin: 08-B West Branch Susquehanna River								
Year	**Miles**	**Segment ID**	**PA. DEP Stream Code**	**Stream Name**	**Designated Use**	**Data Source**	**Source**	**EPA 305(b) Cause Code**
1998	NA	Not included in GIS.	26626	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	NA	NA	NA
2002	6.8	990504-1230-JLR	26626	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	SWAP	AMD	Metals, pH
1996	This segment not on 1996 303(d) list			Montgomery Creek, Unt				
1998	This segment not on 1998 303(d) list			Montgomery Creek, Unt				
2002	6.8	990504-1230-JLR	26627	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	SWAP	AMD	Metals, pH
1996	This segment not on 1996 303(d) list			Montgomery Creek, Unt				
1008	This segment not on 1998 303(d) list			Montgomery Creek, Unt				
2002	6.8	990504-1230-JLR	26628	Montgomery Creek, Unt	CWF: Clearfield Reservoir to Mouth	SWAP	AMD	Metals, pH

Attachment B includes a justification of differences between the 1996, 1998, and draft 2002 303(d) lists.

RE = Resource Extraction
SWMP = Surface Water Monitoring Program
SWAP = Surface Water Assessment Program
HQ = High Quality Water
CWF = Cold Water Fishes
AMD = Abandoned Mine Drainage

LOCATION

Montgomery Creek Watershed is located in Clearfield County about 2 miles southwest of Clearfield, Pennsylvania. The village of Hyde is located at the mouth of the watershed. Montgomery Creek Watershed lies largely within the Moshannon State Forest. Montgomery Creek can be accessed by traveling on State Highway 879 southwest from Clearfield, Pennsylvania.

SEGMENTS ADDRESSED IN THIS TMDL

The Montgomery Creek Watershed is affected by pollution from AMD. This pollution has caused high levels of metals and low pH in the mainstem of Montgomery Creek and in its unnamed tributaries. From a site visit to the watershed it was determined that a large portion of

the AMD degradation in the watershed is due to abandoned deep mines in the lower one third of the watershed. All impacts from AMD occur downstream from the Clearfield Reservoir.

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 U.S. Environmental Protection Agency's (EPA) implementing regulations (40 CFR 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 have not developed many TMDLs since 1972. 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, many 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 1996 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 (Pa. DEP) for evaluating waters changed between the publication of the 1996 and 1998 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. Pa. PA. DEP is now using the Unassessed Waters Protocol (UWP), a modification of the EPA Rapid Bioassessment Protocol II (RPB-II), as the primary mechanism to assess Pennsylvania's waters. The UWP 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 stream segment can vary between sites. All the biological surveys include kick-screen sampling of benthic macroinvertebrates, habitat surveys, and measurements of pH, temperature, conductivity, dissolved oxygen, and alkalinity. 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 the performance of the segment using a series of biological metrics. 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 303(d) list with the documented source and cause. A TMDL must be developed for the stream segment. A TMDL is for only one pollutant. If a stream segment is impaired by two pollutants, two TMDLs must be developed for that stream segment. 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. Calculate TMDL for the waterbody using EPA approved methods and computer models;
3. Allocate pollutant loads to various sources;
4. Determine critical and seasonal conditions;
5. Submit draft report for public review and comments; and

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

6. EPA approval of the TMDL.

This document will present the information used to develop the Montgomery Creek Watershed TMDL.

WATERSHED BACKGROUND

Montgomery Creek is located in the main bituminous coal field where coal is generally found in flattened horizontal layers. Coal mining and timber production were the primary land uses throughout the early half of the 20th century. Some timber production still occurs in the watershed. Forested land now makes up approximately 70 percent of the watershed. Disturbed land (abandoned coal mines, quarries, etc.) make up approximately 15 percent of the watershed. The upper part of the watershed is part of the Moshannon State Forest and is generally uninhabited except for seasonal camps. In the lower one-third of the watershed is the Clearfield Reservoir. This reservoir is used as the primary source for public water supply by the town of Clearfield and its surrounding communities. It is managed by the Clearfield Municipal Authority and serves approximately 15,000 customers. In addition to the primary source of the reservoir, the Authority has two secondary groundwater sources. Below the Clearfield Reservoir, the watershed is a mixture of forested land, mined land, and residential land. The town of Hyde is located near the mouth Montgomery Creek.

Historical data show water pollution due to abandoned mining in the watershed was occurring as early as the mid-1950's. It is probable that much of the deep mining conducted in the watershed occurred during a similar timeframe as the rest of Pennsylvania, during or before the early part of the 20th century. Records indicate that some of the deep mining in the area was done for local use (country bank deep mines). Surface mining became important in the watershed in the 1960's, with large sections of hilltops on both sides of the Montgomery Creek valley being strip and/or auger mined. Many of the more recent mining permits (1980's and following) were issued for remining of pre-Act abandoned surface mines. Much of the surface mining in the area mined the Lower and Middle Kittanning coals, a small amount of Upper Kittanning coal, and some underclays. Groundwater contamination is a problem in the watershed. Many private wells have been impacted by AMD and have had to be replaced or alternate sources found. Groundwater recharge to Montgomery Creek and its tributaries is also a way AMD is introduced into the stream. During a field investigation in June 2002, a spring, which fed directly into the Montgomery Creek mainstem, was observed to be polluted by AMD. This situation likely occurs in other areas of the Montgomery Creek Watershed.

There have been various studies conducted within the watershed to assess the biological community and water quality of Montgomery Creek (Bisko 1994, Pennsylvania Fish Commission 1970). Montgomery Creek had been stocked with fingerling brook trout from 1932 through 1957 by the Pennsylvania Fish Commission. Stocking had been discontinued in 1957 due to pollution from AMD. A stream survey by the Pennsylvania Fish Commission in 1970, at the request of the Lawrence Township Supervisors to stock the stream again, found it still to be severely impacted by AMD. Four taxa of macroinvertebrates and one fish taxon were collected from a station on Montgomery Creek three miles from its confluence with the West Branch Susquehanna River; even fewer macroinvertebrate taxa were collected at the mouth of the

stream. An Unassessed Waters survey conducted by the Susquehanna River Basin Commission for the Pa. DEP during 1998 and 1999 showed that the mainstem of Montgomery Creek from below the Clearfield Reservoir to the mouth and many of its unnamed tributaries were not meeting their designated uses for aquatic life due to pollution from AMD. Montgomery Creek Watershed from its source to Clearfield Reservoir is classified by the Pa. Code, Title 25 Chapter 93 Water Quality Standards as high quality cold water fishes (HQ-CWF). The watershed downstream from the Clearfield Reservoir is classified as cold water fishes (CWF).

Currently, treatment of AMD entering into Montgomery Creek and its unnamed tributaries is by the Sky Haven Coal Company at two sites, with an additional treatment system installed by Benjamin Coal Co. in lieu of penalties. Sky Haven took over permits of the SRP Coal Company in the watershed, including the McPherson #2 and Reed #1 jobs (MP# 17850145 and 17803108). Both the McPherson and Reed permits contain a pre-Act discharge that SRP impacted during remining of the area previous to the passage of the Subchapter F protection for remining. A limestone drain system treats discharge from a pre-Act deep mine discharge on the McPherson permit (PA0596710), while the pre-Act discharge on the Reed permit is treated by lime and limestone addition to treatment ponds (PA0127906). A watershed group is forming in the Montgomery Creek Watershed to aid in addressing the pollution from abandoned mines using passive treatment techniques.

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 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 of the nature of the pollution sources in the watershed, the TMDLs component makeup will be mostly load allocations that are specified above a point in the stream segment. There are two permitted discharges in the watershed: SRP1 from the S.R.P. McPherson#2 permit (mining permit 17850145, NPDES permit PA05966710) and SRP2 from the S.R.P. Reed#1 permit (mining permit 17803108, NPDES permit PA0127906). Wasteload allocations will be given to the two NPDES-permitted discharges and are specified at the discharge points. All load allocations will be specified as long-term average daily concentrations. These long-term average daily concentrations are expected to meet water quality criteria 99 percent of the time. Pennsylvania Title 25 Chapter 96.3(c) specifies that the water quality standards must be met 99 percent of the time. The iron TMDLs are expressed at total recoverable as the iron data used for this analysis was reported as total recoverable. 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 0.30	30-Day Average Total Recoverable Dissolved
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)

A TMDL equation consists of a wasteload allocation, load allocation, and a margin of safety. The wasteload allocation is the portion of the load assigned to point sources. The load allocation is the portion of the load assigned to nonpoint 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).

TMDL ALLOCATIONS SUMMARY

Methodology for dealing with metal and pH impairments is discussed in Attachment D. An example calculation from the Swatara Creek TMDL, including detailed tabular summaries of the Monte Carlo results, is presented for the Lorberry Creek TMDL in Attachment E. Information for the TMDL analysis using the methodology described above is contained in the TMDLs by segment section in Attachment F.

This TMDL will focus remediation efforts on the identified numerical reduction targets for each watershed. As changes occur in the watershed, the TMDL may be reevaluated to reflect current conditions. Table 3 presents the estimated reductions identified for all points in the watershed. Attachment F gives detailed TMDLs by segment analysis for each allocation point.

Table 3. Summary Table–Montgomery Creek Watershed

Station	Parameter	Measured Sample Data		Allowable		Reduction Identified
		Conc. (mg/l)	Load (lb/day)	LTA Conc. (mg/l)	Load (lb/day)	Percent
MC1	Montgomery Creek near mouth					
	Fe	0.30	55.5	0.30	54.7	0*
	Mn	5.44	1007.2	0.22	40.2	0*
	Al	2.23	412.9	0.18	32.8	0*
	Acidity	41.33	7652.2	0.41	75.9	0*
	Alkalinity	6.07	1123.8			
MC2	Montgomery Creek upstream of confluence with MT1 tributary					

Station	Parameter	Measured Sample Data		Allowable		Reduction Identified
		Conc. (mg/l)	Load (lb/day)	LTA Conc. (mg/l)	Load (lb/day)	Percent
	Fe	1.26	213.5	0.39	66.1	41*
	Mn	9.47	1604.9	0.19	32.2	96*
	Al	3.68	623.6	0.18	30.5	91*
	Acidity	55.14	9344.5	1.10	186.4	96*
	Alkalinity	5.43	920.2			
MC3	Montgomery Creek downstream of confluence with MT3 tributary					
	Fe	0.76	120.7	0.31	49.3	0*
	Mn	5.01	796.0	0.15	23.8	89*
	Al	2.02	320.9	0.14	22.2	79*
	Acidity	33.00	5242.9	0.99	157.3	65*
	Alkalinity	4.80	762.6			
MC4	Montgomery Creek upstream of confluence with MT3 tributary					
	Fe	0.17	24.9	0.17	24.9	0*
	Mn	1.98	289.5	0.20	29.2	88*
	Al	0.98	143.3	0.18	26.3	67*
	Acidity	21.29	3112.6	0.64	93.6	94*
	Alkalinity	3.24	473.7			
MC5	Montgomery Creek downstream of confluence with MT5 tributary					
	Fe	0.30	42.0	0.30	42.0	0*
	Mn	0.54	75.6	0.17	23.8	61*
	Al	0.68	95.2	0.29	40.6	49*
	Acidity	12.97	1815.1	1.30	181.9	89*
	Alkalinity	7.77	1087.4			
MT1	Unnamed tributary to Montgomery Creek at mouth					
	Fe	2.39	9.2	0.31	1.2	87
	Mn	4.90	18.8	0.25	1.0	95
	Al	2.00	7.7	0.16	0.6	92
	Acidity	12.89	49.5	3.73	14.3	71
	Alkalinity	27.90	107.0			
MT2	Unnamed tributary to Montgomery Creek at mouth					
	Fe	3.44	12.6	0.45	1.3	89*
	Mn	8.33	30.6	0.25	0.6	98*
	Al	1.96	7.2	0.31	1.1	84*
	Acidity	23.47	86.1	3.05	11.2	87*
	Alkalinity	17.53	64.3			
MT2A	Unnamed tributary to Montgomery Creek in the headwaters					
	Fe	1.20	1.1	0.35	0.3	71
	Mn	1.82	1.7	0.28	0.3	85
	Al	0.72	0.7	0.22	0.2	70
	Acidity	0.56	0.5	0.55	0.5	0
	Alkalinity	44.04	40.4			
MT3	Unnamed tributary to Montgomery Creek at mouth					
	Fe	7.13	48.8	0.50	3.4	0*
	Mn	49.10	335.8	0.44	3.0	97*
	Al	14.72	100.7	0.30	2.1	92*
	Acidity	259.82	1776.9	0	0	100*
	Alkalinity	0.03	0.2			
MT3A	Unnamed tributary on right to unnamed tributary to Montgomery Creek					
	Fe	25.24	46.3	0.25	0.5	99

Station	Parameter	Measured Sample Data		Allowable		Reduction Identified
		Conc. (mg/l)	Load (lb/day)	LTA Conc. (mg/l)	Load (lb/day)	Percent
	Mn	62.63	114.9	0.44	0.8	99.3
	Al	25.21	46.3	0.25	0.5	99
	Acidity	368.99	677.0	0	0	100
	Alkalinity	0.07	0.1			
MT3B	Unnamed tributary on left to unnamed tributary to Montgomery Creek					
	Fe	14.12	45.9	0.28	0.9	98
	Mn	35.31	114.8	0.28	0.9	99.2
	Al	9.91	32.2	0.20	0.7	98
	Acidity	224.17	729.1	0	0	100
	Alkalinity	0.36	1.2			
MT4	Unnamed tributary to Montgomery Creek at mouth					
	Fe	0.55	0.3	0.55	0.3	0
	Mn	15.24	8.9	0.46	0.3	97
	Al	15.68	9.2	0.16	0.1	99
	Acidity	180.30	105.3	0	0	100
	Alkalinity	0	0			
MT5	Unnamed tributary to Montgomery Creek at mouth					
	Fe	0.36	1.9	0.28	1.4	21
	Mn	3.29	17.0	0.26	1.3	92
	Al	3.30	17.1	0.23	1.2	93
	Acidity	37.74	195.1	0.76	3.9	98
	Alkalinity	2.79	14.4			
D7	Mine Discharge 7 into unnamed tributary to Montgomery Creek					
	Fe	1.54	0.3	0.63	0.1	59
	Mn	73.99	12.3	0.67	0.1	99.1
	Al	NA	NA	NA	NA	NA
	Acid	296.81	49.5	0	0	100
	Alkalinity	0	0			
D8	Mine Discharge 8 into unnamed tributary to Montgomery Creek					
	Fe	1.18	0.1	0.83	0.07	30
	Mn	70.13	5.8	0.70	0.06	99
	Al	NA	NA	NA	NA	NA
	Acid	280.54	23.4	0	0	100
	Alkalinity	0	0			

* These percent reductions take reductions at upstream points into account.

Waste load allocations were assigned to the two permitted discharges for iron, manganese and aluminum from the SRP Reed#1 site, which discharges to an unnamed tributary to Montgomery Creek upstream of point MT2, and from the SRP McPherson#2 site, which discharges to an unnamed tributary to Montgomery Creek upstream of pint MC1. The waste load allocations are based on measured flow data and the permit limits, which are Best Available Technology (BAT) limits. No required reduction of these permits is necessary at this time because there are non-point contributions upstream of MT2 and MC1 that when reduced will satisfy the TMDL. All necessary reductions are assigned to the non-point sources. Table 4 contains the waste load allocations for the two permitted discharges, SRP1 and SRP2. Flow data for these discharges is located in Appendix G.

Table 4. Waste Load Allocation of Permitted Discharge

Parameter	Allowable Average Monthly Conc. (mg/l)	Average Flow (MGD)	Allowable Load (lbs/day)
Discharge SRP1			
Fe	3.0	0.031	0.8
Mn	2.0	0.031	0.5
Al	2.0	0.031	0.5
Discharge SRP2			
Fe	3.0	0.017	0.4
Mn	2.0	0.017	0.3

RECOMMENDATIONS

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

Additional opportunities for water quality improvement are both ongoing and anticipated. Historically, a great deal of research into mine drainage has been conducted by Pa. DEP's Bureau of Abandoned Mine Reclamation, which administers and oversees the Abandoned Mine Reclamation Program in Pennsylvania, the U. S. Office of Surface Mining, the National Mine Land Reclamation Center, the National Environmental Training Laboratory, and many other agencies and individuals. Funding from EPA's 319 Grant program and Pennsylvania's Growing Greener program have been used extensively to remedy mine drainage impacts. These many activities are expected to continue and result in water quality improvement.

There is currently a watershed group forming in the Montgomery Creek Watershed area. This watershed organization could complete a comprehensive assessment of the watershed and work to implement projects to achieve the reductions recommended in this TMDL document. Some of the discharges in the watershed may be conducive to passive treatment.

PUBLIC PARTICIPATION

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on December 14, 2002 and *The Progress* on January 11, 2003 to foster public comment on the allowable loads calculated. A public meeting was held on January 14, 2003 at the Hyde Fire Company Social Hall in Hyde, Pa., to discuss the proposed TMDL.

REFERENCES

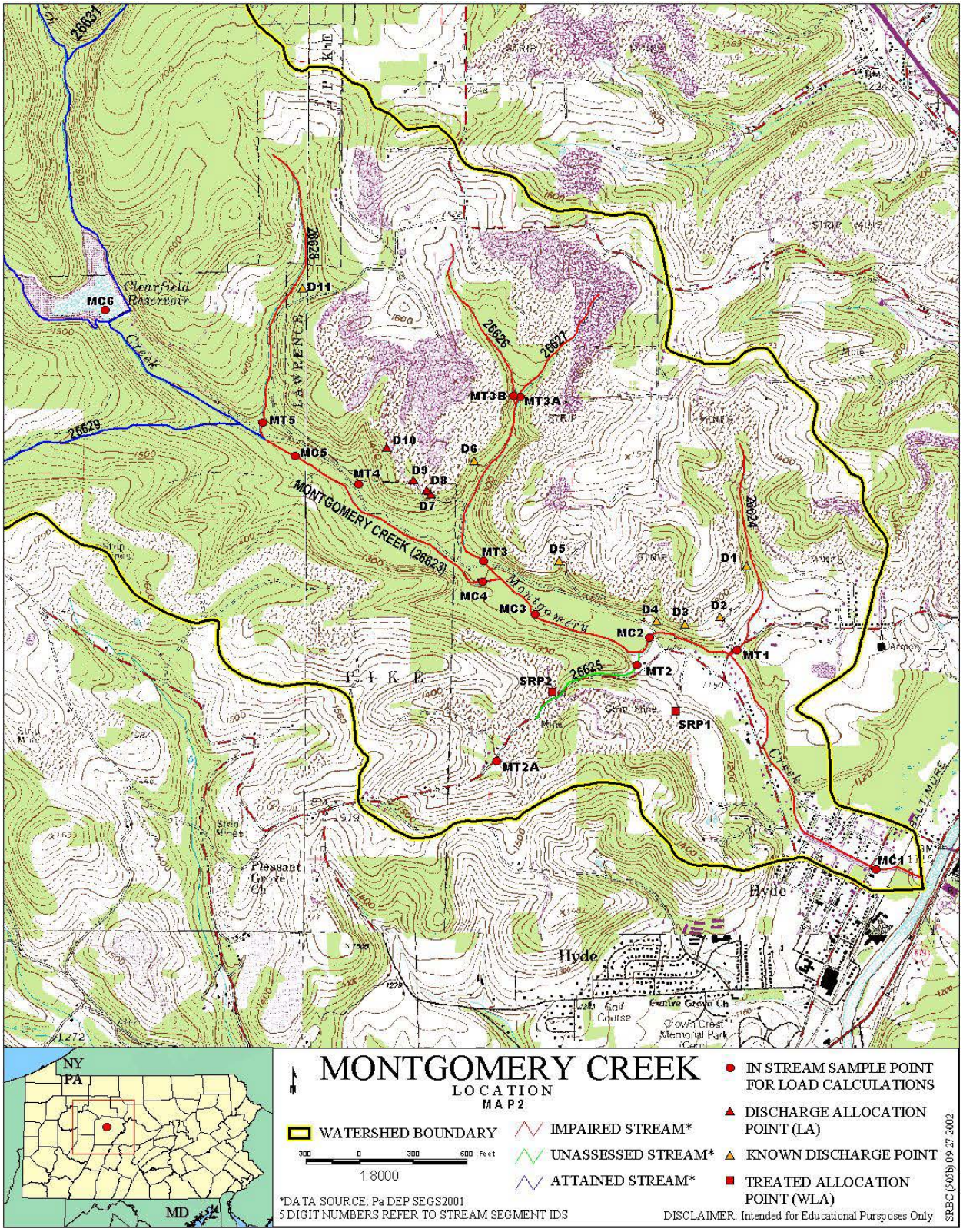
Bisko, David. March 31, 1994. Preliminary Hydrologic Report, Acid Mine Drainage Discharges, Sky Haven Coal Inc., MDP# 4574SM33, Otto #1 Operation, Lawrence Township, Clearfield County. Commonwealth of Pennsylvania, Pa. Department of Environmental Resources, Hawk Run District Office.

Pennsylvania Fish Commission. October 1970. Stream Survey Report for Montgomery Creek by Reed and Billingsley. Commonwealth of Pennsylvania, Pennsylvania Fish Commission, Division of Fisheries.

Attachment A

Montgomery Creek Watershed Maps


MAP 2
26634
26639
26628
26626
26627
26629
MC6
MT5
MT3B
MT3A
MC5
MT4
MONTGOMERY CREEK (26623)
MT3
26624
MC4
MC3
MC2
MT1
MT2
26625
MT2A
MC1
NY
PA
MD
MONTGOMERY CREEK
LOCATION
MAP 1
WATERSHED BOUNDARY
0.1 0 0.1 0.2 Miles
1:16500
IMPAIRED STREAM*
UNASSESSED STREAM*
ATTAINED STREAM*
*DATA SOURCE: Pa DEP SEGS2001
5 DIGIT NUMBERS REFER TO STREAM SEGMENT IDS
IN STREAM SAMPLE POINT FOR LOAD CALCULATIONS
DISCHARGE ALLOCATION POINT (LA)
KNOWN DISCHARGE POINT
TREATED ALLOCATION POINT (WLA)
DISCLAIMER: Intended for Educational Pursposes Only
SRBC (505a) 09-27-2002


MONTGOMERY CREEK
LOCATION
MAP 2
WATERSHED BOUNDARY
IMPAIRED STREAM*
UNASSESSED STREAM*
ATTAINED STREAM*
1:8000
*DATA SOURCE: Pa DEP SEGS2001
5 DIGIT NUMBERS REFER TO STREAM SEGMENT IDS
IN STREAM SAMPLE POINT FOR LOAD CALCULATIONS
DISCHARGE ALLOCATION POINT (LA)
KNOWN DISCHARGE POINT
TREATED ALLOCATION POINT (WLA)
DISCLAIMER: Intended for Educational Pursposes Only
SRBC (505b) 09-27-2002
MONTGOMERY CREEK (26623)
Clearfield Reservoir
LAWRENCE
PIKE
Hyde
NY
PA
MD
MC6
MC5
MC4
MC3
MC2
MC1
MT5
MT4
MT3
MT3B
MT3A
MT2
MT2A
MT1
SRP2
SRP1
D11
D10
D9
D8
D7
D6
D5
D4
D3
D2
D1
26631
26628
26629
26626
26627
26624
26625

Attachment B

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

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

In the 1996 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 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 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).

The most notable difference between the 1998 and Draft 2000 303(d) lists are the listing of unnamed tributaries in 2000. In 1998, the GIS stream layer was coded to the named stream level so there was no way to identify the unnamed tributary records. As a result, the unnamed tributaries were listed as part of the first downstream named stream. The GIS stream coverage used to generate the 2000 list had the unnamed tributaries coded with the PA. DEP's five-digit stream code. As a result, the unnamed tributary records are now split out as separate records on the 2000 303(d) list. This is the reason for the change in the appearance of the list and the noticeable increase in the number of pages. After due consideration of comments from EPA and PA DEP on the draft 2000 Section 303(d) list, the draft 2002 Pa. Section 303(d) list was written in a manner similar to the 1998 Section 303(d) list.

Attachment C

Remining in Pennsylvania

This attachment provides an overview and history of the re-mining requirements as related to NPDES permitting and TMDLs. Described in the following text is an overview of the regulations and incentives that pertain to the water quality aspect of the current re-mining programs in Pennsylvania.

Acid drainage from abandoned underground and surface coal mines and coal refuse piles is a large problem in the Appalachian Coal Region of the Eastern United States. Prior to the passage of the federal Surface Mining Control and Reclamation Act (SMCRA) in 1977, reclamation of mining sites was not a federal requirement and therefore, was not often done. One of SMCRA's goals was to promote the reclamation of mined areas left without adequate reclamation prior to the enactment of SMCRA and which continue, in their unreclaimed condition, to substantially degrade the quality of the environment; damage the beneficial use of land or water resources; or endanger the health or safety of the public.

In 1982, EPA promulgated final effluent limit guidelines under the Clean Water Act to limit the discharges from the coal mining industry point source category. The rule amended previously promulgated effluent limit guidelines based on "best practicable control technology" (BPT) and "new source performance standards" (NSPS), and established new guidelines based on "best available technology economically achievable" (BAT). The issue of re-mining was raised during the comment period following the 1982 proposal of the final rule. Comments addressed the fact that technology-based standards would likely serve as a deterrent to re-mining activities, since the operator would have to assume responsibility for treating effluent from previous operations that already may be significantly contaminated. This was not addressed in the final rule, and EPA stated that generally, the effluent limitations guidelines are applicable to all point source discharges even if those discharges pre-dated the re-mining operation.

In 1987, the "Rahall Amendment" to the Clean Water Act was passed, and provided incentives for re-mining abandoned mine lands that were mined prior to the 1977 passage of SMCRA. The amendment established that BAT effluent limitations for iron, manganese and pH are not required for discharges that existed prior to re-mining activities. Instead, site-specific BAT limits, determined by Best Professional Judgment (BPJ) are applicable to these pre-existing discharges, and the permit effluent limits for iron, manganese, and pH (acidity) may not exceed pre-existing baseline levels. Prior to the federal law changes in 1987, the Pennsylvania (PA) legislature amended PA SMCRA in 1984 to include re-mining incentives. Under the PA law and related regulations [25 PA Code 87, Subchapter F (bituminous coal) and Chapter 88 (anthracite coal)], a baseline pollution load is established; a pollution abatement plan is submitted incorporating best technology; and the effluent limits for the pre-existing discharges are determined by the BPJ process.

Pennsylvania has issued over 260 re-mining permits dating back to 1985 and continues to do so. For the purpose of TMDL development in watersheds where re-mining operations are occurring, the pre-existing discharges associated with the re-mining activity will not be given wasteload allocations. These loads will be accounted for in the TMDL as part of the overall load allocation. This is consistent with the Clean Water Act and PA regulations, since the current operator is not responsible for cleanup and remediation of these pre-existing discharges.

Literature Cited: U.S. EPA. 2000. Draft Coal Remining–Best Management Practices Guidance Manual. Report No. EPA-821-R-00-007. U.S. EPA, Washington, D.C.

Attachment D

AMD Methodology, the pH Method and Surface Mining Control and Reclamation Act

AMD Methodology

Two approaches are used for the TMDL analysis of AMD-affected stream segments. Both of these approaches use the same statistical method for determining the instream allowable loading rate at the point of interest. The difference between the two is based on whether the pollution sources are defined as discharges that are permitted or have a responsible party, which are considered point sources. Nonpoint sources are then any pollution sources that are not point sources.

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

TMDLs and load allocations for each pollutant were determined using Monte Carlo simulation. 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 any required percent reduction so that the water quality criteria 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

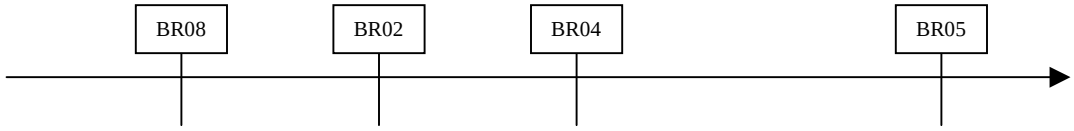
[3] @Risk – Risk Analysis and Simulation Add-in for Microsoft Excel, Palisade Corporation, Newfield, NY, 1990-1997.

Once the required percent reduction for each pollutant source was determined, a second series of Monte Carlo simulations were performed to determine if the cumulative loads from multiple sources allow instream water quality criteria to be met at all points at least 99 percent of the time. The second series of simulations combined the flows and loads from individual sources in a step-wise fashion, so that the level of attainment could be determined immediately downstream of each source. Where available data allowed, pollutant-source flows used were the average flows. Where data were insufficient to determine a source flow frequency distribution, the average flow derived from linear regression was used.

In general, these cumulative impact evaluations indicate that, if the percent reductions determined during the first step of the analysis are achieved, water quality criteria will be achieved at all upstream points, and no further reduction in source loadings is required.

Accounting for Upstream Reductions in AMD TMDLs

In AMD TMDLs, sample points are evaluated in headwaters (most upstream) to stream mouth (most downstream) order. As the TMDL evaluation moves downstream the impact of the previous, upstream, evaluations must be considered. The following examples are from the Beaver Run AMD TMDL (2003):



In the first example BR08 is the most upstream sample point and BR02 is the next downstream sample point. The sample data, for both sample points, are evaluated using @Risk (explained above) to calculate the existing loads, allowable loads, and a percentage reduction for aluminum, iron, manganese, and acidity (when flow and parameter data are available).

Any calculated load reductions for the upstream sample point, BR08, must be accounted for in the calculated reductions at sample point BR02. To do this (see table A) the allowable load is subtracted from the existing load, for each parameter, to determine the total load reduction.

Table A	Alum.	Iron	Mang.	Acidity
BR08	(#/day)	(#/day)	(#/day)	(#/day)
existing load=	3.8	2.9	3.5	0.0
allowable load=	3.8	2.9	3.5	0.0
Total Load Reduction=	**0.0**	**0.0**	**0.0**	**0.0**

In table B the Total Load Reduction BR08 is subtracted from the Existing loads at BR02 to determine the Remaining Load. The Remaining Load at BR02 has the previously calculated Allowable Loads at BR02 subtracted to determine any load reductions at sample point BR02. This results in load reductions for aluminum, iron and manganese at sample point BR02.

Table B. Necessary Reductions at Beaver Run BR02

	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Loads at BR02	13.25	38.44	21.98	6.48
Total Load Reduction BR08	0.00	0.00	0.00	0.00
Remaining Load (Existing Load at BR02 - BR08)	13.25	38.44	21.98	6.48
Allowable Loads at BR02	2.91	9.23	7.03	6.48
Percent Reduction	78.0%	76.0%	68.0%	NA
Additional Removal Required at BR02	10.33	29.21	14.95	0.00

At sample point BR05 this same procedure is also used to account for calculated reductions at sample points BR08 and BR02. As can be seen in Tables C and D this procedure results in additional load reductions for iron, manganese and acidity at sample point BR04.

At sample point BR05 (the most downstream) no additional load reductions are required, see Tables E and F.

Table C	Alum.	Iron	Mang.	Acidity
BR08 & BR02	(#/day)	(#/day)	(#/day)	(#/day)
Total Load Reduction=	**10.33**	**29.21**	**14.95**	**0.0**

Table E	Alum.	Iron	Mang.	Acidity
BR08 BR02 &BR04	(#/day)	(#/day)	(#/day)	(#/day)
Total Load Reduction=	10.3	29.2	14.9	0.0

Table D. Necessary Reductions at Beaver Run BR04				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Loads at BR04	12.48	138.80	54.47	38.76
Total Load Reduction BR08 & BR02	10.33	29.21	14.95	0.00
Remaining Load (Existing Load at BBR04 - TLR Sum	2.15	109.59	39.53	38.76
Allowable Loads at BR04	8.99	19.43	19.06	38.46
Percent Reduction	NA	82.3%	51.8%	0.8%
Additional Removal Required at BR04	0.00	90.16	20.46	0.29

Table F. Necessary Reductions at Beaver Run BR05				
	Al (#/day)	Fe (#/day)	Mn (#/day)	Acidity (#/day)
Existing Loads at BR05	0.0	31.9	22.9	4.1
Total Load Reduction BR08, BR02 & BR04	10.3	119.4	35.4	0.3
Remaining Load (Existing Load at BBR05 - TLR Sum	NA	NA	NA	3.8
Allowable Loads at BR05	0.0	20.4	15.1	4.1
Percent Reduction	NA	NA	NA	NA
Additional Removal Required at BR05	0.0	0.0	0.0	0.0

Although the evaluation at sample point BR05 results in no additional removal this does not mean there are no AMD problems in the stream segment BR05 to BR04. The existing and allowable loads for BR05 show that iron and manganese exceed criteria and, any abandoned mine discharges in this stream segment will be addressed.

Method for Addressing 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. DEP demonstrates that by plotting net alkalinity (alkalinity-acidity) vs. pH for 794 mine sample points, the resulting pH value from a sample possessing a net alkalinity of zero is approximately equal to six (Figure 1). Where net alkalinity is positive (greater than or equal to zero), the pH range is most commonly six to eight, which is within the EPA's acceptable range of six to nine and meets Pennsylvania water quality criteria in Chapter 93.

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

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

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

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

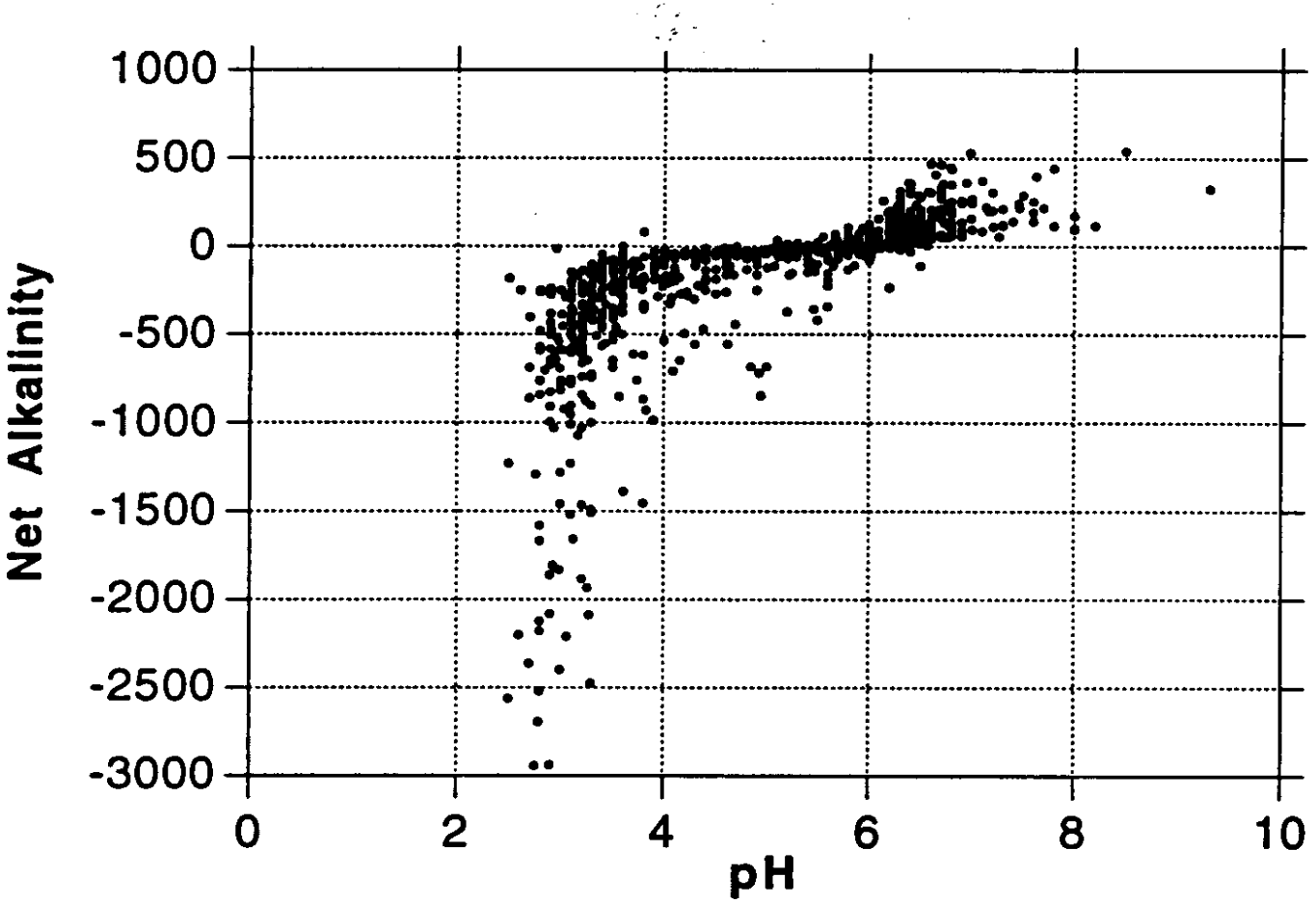


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania.

Surface Mining Control and Reclamation Act

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

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

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

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

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

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

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

Related Definitions

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

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

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

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

Attachment E

Example Calculation: Lorberry Creek

Lorberry Creek was evaluated for impairment due to high metals contents in the following manner: the analysis was completed in a stepwise manner, starting at the headwaters of the stream and moving to the mouth. The Rowe Tunnel (Swat-04) was treated as the headwaters of Lorberry Creek for the purpose of this analysis.

1. A simulation of the concentration data at point Swat-04 was completed. This estimated the necessary reduction needed for each metal to meet water quality criteria 99 percent of the time as a long-term average daily concentration. Appropriate concentration reductions were made for each metal.

2. A simulation of the concentration data at point Swat-11 was completed. It was determined that no reductions in metals concentrations are needed for Stumps Run at this time. Therefore, no TMDL for metals in Stumps Run is required at this time.

3. A mass balance of loading from Swat-04 and Swat-11 was completed to determine if there was any need for additional reductions as a result of combining the loads. No additional reductions were necessary.

4. The mass balance was expanded to include the Shadle Discharge (L-1). It was estimated that best available technology (BAT) requirements for the Shadle Discharge were adequate for iron and manganese. There is no BAT requirement for aluminum. A wasteload allocation was necessary for aluminum at point L-1.

There are no other known sources below the Shadle Discharge. However, there is additional flow from overland runoff and one unnamed tributary not impacted by mining. It is reasonable to assume that the additional flow provides assimilation capacity below point L-1, and no further analysis is needed downstream.

The calculations are detailed in the following section (Tables 1-8). Table 9 shows the allocations made on Lorberry Creek.

1. A series of four equations was used to determine if a reduction was needed at point Swat-04, and, if so the magnitude of the reduction.

Table 1. Equations Used for Rowe Tunnel Analysis (SWAT 04)

	Field Description	Equation	Explanation
1	Swat-04 Initial Concentration Value (Equation 1A)	= Risklognorm (Mean, St Dev)	This simulates the existing concentration of the sampled data.
2	Swat-04 % Reduction (from the 99th percentile of percent reduction)	= (Input a percentage based on reduction target)	This is the percent reduction for the discharge.
3	Swat-04 Final Concentration Value	= Sampled Value x (1-percent reduction)	This applies the given percent reduction to the initial concentration.
4	Swat-04 Reduction Target (PR)	= Maximum (0, 1- Cd/Cc)	This computes the necessary reduction, if needed, each time a value is sampled. The final reduction target is the 99th percentile value of this computed field.

2. The reduction target (PR) was computed taking the 99th percentile value of 5,000 iterations of the equation in row four of Table 1. The targeted percent reduction is shown, in boldface type, in the following table.

Table 2. Swat-04 Estimated Target Reductions			
Name	**Swat-04 Aluminum**	**Swat-04 Iron**	**Swat-04 Manganese**
Minimum =	0	0.4836	0
Maximum =	0.8675	0.9334	0.8762
Mean =	0.2184	0.8101	0.4750
Std. Deviation =	0.2204	0.0544	0.1719
Variance =	0.0486	0.0030	0.0296
Skewness =	0.5845	-0.8768	-0.7027
Kurtosis =	2.0895	4.3513	3.1715
Errors Calculated =	0	0	0
Targeted Reduction % =	**72.2**	**90.5**	**77.0**
Target #1 (Perc%)=	99	99	99

3. This PR value was used as the percent reduction in the equation in row three of Table 1. Testing was done to see that the water quality criterion for each metal was achieved at least 99 percent of the time. This verified the estimated percent reduction necessary for each metal. Table 3 shows, in boldface type, the percent of the time criteria for each metal was achieved during 5,000 iterations of the equation in row three of Table 1.

Table 3. Swat-04 Verification of Target Reductions			
Name	**Swat-04 Aluminum**	**Swat-04 Iron**	**Swat-04 Manganese**
Minimum =	0.0444	0.2614	0.1394
Maximum =	1.5282	2.0277	1.8575
Mean =	0.2729	0.7693	0.4871
Std Deviation =	0.1358	0.2204	0.1670
Variance =	0.0185	0.0486	0.0279
Skewness =	1.6229	0.8742	1.0996
Kurtosis =	8.0010	4.3255	5.4404
Errors Calculated =	0	0	0
Target #1 (value) (WQ Criteria)=	0.75	1.5	1
Target #1 (Perc%)=	**99.15**	**99.41**	**99.02**

4. These same four equations were applied to point Swat-11. The result was that no reduction was needed for any of the metals. Tables 4 and 5 show the reduction targets computed for, and the verification of, reduction targets for Swat-11.

Table 4. Swat-11 Estimated Target Reductions			
Name	**Swat-11 Aluminum**	**Swat-11 Iron**	**Swat-11 Manganese**
Minimum =	0.0000	0.0000	0.0000
Maximum =	0.6114	0.6426	0.0000
Mean =	0.0009	0.0009	0.0000
Std Deviation =	0.0183	0.0186	0.0000
Variance =	0.0003	0.0003	0.0000
Skewness =	24.0191	23.9120	0.0000
Kurtosis =	643.4102	641.0572	0.0000
Errors Calculated =	0	0	0
Targeted Reduction % =	**0**	**0**	**0**
Target #1 (Perc%) =	99	99	99

Table 5. Swat-11 Verification of Target Reductions			
Name	**Swat-11 Aluminum**	**Swat-11 Iron**	**Swat-11 Manganese**
Minimum =	0.0013	0.0031	0.0246
Maximum =	1.9302	4.1971	0.3234
Mean =	0.0842	0.1802	0.0941
Std Deviation =	0.1104	0.2268	0.0330
Variance =	0.0122	0.0514	0.0011
Skewness =	5.0496	4.9424	1.0893
Kurtosis =	48.9148	48.8124	5.1358
Errors Calculated =	0	0	0
WQ Criteria =	**0.75**	**1.5**	**1**
% of Time Criteria Achieved =	**99.63**	**99.60**	**100**

5. Table 6 shows variables used to express mass balance computations.

Table 6. Variable Descriptions for Lorberry Creek Calculations	
Description	**Variable Shown**
Flow from Swat-04	Q_{swat04}
Swat-04 Final Concentration	C_{swat04}
Flow from Swat-11	Q_{swat11}
Swat-11 Final Concentration	C_{swat11}
Concentration below Stumps Run	C_{stumps}
Flow from L-1 (Shadle Discharge)	Q_{L1}
Final Concentration From L-1	C_{L1}
Concentration below L-1	C_{allow}

6. Swat-04 and Swat-11 were mass balanced in the following manner:

   The majority of the sampling done at point Swat-11 was done in conjunction with point Swat-04 (20 matching sampling days). This allowed for the establishment of a significant correlation between the two flows (the R-squared value was 0.85). Swat-04 was used as the

base flow, and a regression analysis on point Swat-11 provided an equation for use as the flow from Swat-11.

The flow from Swat-04 (Q_{swat04}) was set into an @RISK function so it could be used to simulate loading into the stream. The cumulative probability function was used for this random flow selection. The flow at Swat-04 is as follows (Equation 1):

$$Q_{swat04} = \text{RiskCumul(min,max,bin range, cumulative percent of occurrence)} \quad (1)$$

The RiskCumul function takes four arguments: minimum value, maximum value, the bin range from the histogram, and cumulative percent of occurrence.

The flow at Swat-11 was randomized using the equation developed through the regression analysis with point Swat-04 (Equation 2).

$$Q_{swat11} = Q_{swat}04 \times 0.142 + 0.088 \quad (2)$$

The mass balance equation is as follows (Equation 3):

$$C_{stumps} = ((Q_{swat04} * C_{swat04}) + (Q_{swat11} * C_{swat11}))/(Q_{swat04}+Q_{swat11}) \quad (3)$$

This equation was simulated through 5,000 iterations, and the 99th percentile value of the data set was compared to the water quality criteria to determine if standards had been met. The results show there is no further reduction needed for any of the metals at either point. The simulation results are shown in Table 7.

Table 7. Verification of Meeting Water Quality Standards Below Stumps Run

Name	Below Stumps Run Aluminum	Below Stumps Run Iron	Below Stumps Run Manganese
Minimum =	0.0457	0.2181	0.1362
Maximum =	1.2918	1.7553	1.2751
Mean =	0.2505	0.6995	0.4404
Std Deviation =	0.1206	0.1970	0.1470
Variance =	0.0145	0.0388	0.0216
Skewness =	1.6043	0.8681	1.0371
Kurtosis =	7.7226	4.2879	4.8121
Errors Calculated =	0	0	0
WQ Criteria =	**0.75**	**1.5**	**1**
% of Time Criteria Achieved =	**99.52**	**99.80**	**99.64**

7. The mass balance was expanded to determine if any reductions would be necessary at point L-1.

The Shadle Discharge originated in 1997, and very few data are available for it. The discharge will have to be treated or eliminated. It is the current site of a USGS test

remediation project. The data that were available for the discharge were collected at a point prior to a settling pond. Currently, no data for effluent from the settling pond are available.

Modeling for iron and manganese started with the BAT-required concentration value. The current effluent variability based on limited sampling was kept at its present level. There was no BAT value for aluminum, so the starting concentration for the modeling was arbitrary. The BAT values for iron and manganese are 6 mg/l and 4 mg/l, respectively. Table 8 shows the BAT-adjusted values used for point L-1.

Table 8. L-1 Adjusted BAT Concentrations

Parameter	**Measured Value**		**BAT adjusted Value**	
	Average Conc.	*Standard Deviation*	*Average Conc.*	*Standard Deviation*
Iron	538.00	19.08	6.00	0.21
Manganese	33.93	2.14	4.00	0.25

The average flow (0.048 cfs) from the discharge will be used for modeling purposes. There were not any means to establish a correlation with point Swat-04.

The same set of four equations used for point Swat-04 was used for point L-1. The equation used for evaluation of point L-1 is as follows (Equation 4):

$$C_{allow} = ((Q_{swat04}*C_{swat04})+(Q_{swat11}*C_{swat11})+(Q_{L1}*C_{L1}))/(Q_{swat04}+Q_{swat11}+Q_{L1}) \quad (4)$$

This equation was simulated through 5,000 iterations, and the 99th percentile value of the data set was compared to the water quality criteria to determine if standards had been met. It was estimated that an 81 percent reduction in aluminum concentration was needed for point L-1.

8. Table 9 shows the simulation results of the equation above.

Table 9. Verification of Meeting Water Quality Standards Below Point L-1

Name	**Below L-1 Aluminum**	**Below L-1 Iron**	**Below L-1 Manganese**
Minimum =	0.0815	0.2711	0.1520
Maximum =	1.3189	2.2305	1.3689
Mean =	0.3369	0.7715	0.4888
Std Deviation =	0.1320	0.1978	0.1474
Variance =	0.0174	0.0391	0.0217
Skewness =	1.2259	0.8430	0.9635
Kurtosis =	5.8475	4.6019	4.7039
Errors Calculated =	0	0	0
WQ Criteria=	**0.75**	**1.5**	**1**
Percent of time achieved=	**99.02**	**99.68**	**99.48**

9. Table 10 presents the estimated reductions needed to meet water quality standards at all points in Lorberry Creek.

Table 10. Lorberry Creek Summary

		Measured Sample Data		Allowable		Reduction Identified
Station	Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)	%
Swat 04						
	Al	1.01	21.45	0.27	5.79	73%
	Fe	8.55	181.45	0.77	16.33	91%
	Mn	2.12	44.95	0.49	10.34	77%
Swat 11						
	Al	0.08	0.24	0.08	0.24	0%
	Fe	0.18	0.51	0.18	0.51	00%
	Mn	0.09	0.27	0.09	0.27	00%
L-1						
	Al	34.90	9.03	6.63	1.71	81%
	Fe	6.00	1.55	6.00	1.55	0%
	Mn	4.00	1.03	4.00	1.03	0%

All values shown in this table are long-term average daily values

The TMDL for Lorberry Creek requires that a load allocation be made to the Rowe Tunnel Discharge (Swat-04) for the three metals listed, and that a wasteload allocation is made to the Shadle Discharge (L-1) for aluminum. There is no TMDL for metals required for Stumps Run (Swat-11) at this time.

Margin of Safety

For this study, the margin of safety is applied implicitly. 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:

- None of the data sets were filtered by taking out extreme measurements. Because the 99 percent level of protection is designed to protect for the extreme event, it was pertinent not to filter the data set.

- Effluent variability plays a major role in determining the average value that will meet water quality criteria over the long term. This analysis maintained that the variability at each point would remain the same. The general assumption can be made that a treated discharge would be less variable than an untreated discharge. This implicitly builds in another margin of safety.

Attachment F
TMDLs By Segment

Montgomery Creek Above MC6

Montgomery Creek above point MC6 is Montgomery Creek from the Clearfield Reservoir upstream to the headwaters. Point MC6 represents Montgomery Creek at the Clearfield Reservoir. This segment of Montgomery Creek is attaining its designated uses and is, therefore, not included on the 303(d) list. Two segments listed in the 1996 303(d) list, an unnamed tributary to North Branch Montgomery Creek (stream code 25534) and an unnamed tributary to Tinker Run (stream code 26639), also were evaluated using the Pa. DEP Unassessed Waters protocol. These streams were listed for impairment due to AMD. However, these streams are meeting their designated uses and will be delisted. Therefore, they will not be addressed in this TMDL document. MC6 is included as a reference point for all other points downstream. Alkalinity for this point was not used as a water quality standard for downstream points on Montgomery Creek because the data lacked paired acidity and alkalinity, and pH data. Because the reach of Montgomery Creek containing MC6 is not listed as impaired, a TMDL will not be done for Montgomery Creek upstream of MC6.

Unnamed Tributary to Montgomery Creek Above MT5

The unnamed tributary to Montgomery Creek at point MT5 represents the tributary just upstream of its confluence with Montgomery Creek. The tributary receives drainage from at least one mine discharge (D11) into the stream. This subwatershed has recently been extensively forested and most of the trees removed along the stream corridor. The remaining upstream land use is largely forested with some abandoned mine lands, residential and agricultural lands.

Sample data at point MT5 show pH ranging from 3.05 to 5.55; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream, which will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for the unnamed tributary to Montgomery Creek consists of a load allocation to all of the watershed area above point MT5. Addressing the mining impacts above this point addresses the impairment for the segment. An average flow measurement was available for point MT5 (0.62 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT5. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 that percent reduction times that sampled value was run to insure that criteria were met 99 percent of the time. The mean value from this data set represents that long-

term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT5 for this stream segment are presented in Table F1.

Table F1. Reductions for the Unnamed Tributary to Montgomery Creek Above MT5					
Station MT5	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	0.36	1.9	0.28	1.4	21
Mn	3.29	17.0	0.26	1.3	92
Al	3.30	17.1	0.23	1.2	93
Acidity	37.74	195.1	0.76	3.9	98
Alkalinity	2.79	14.4			

All values shown in this table are long-term average daily values.

The TMDL for point MT5 requires that a load allocation be applied to all areas of the unnamed tributary to Montgomery Creek above MT5 for total iron, total manganese, total aluminum and acidity.

Montgomery Creek Between MC6 and MC5

Montgomery Creek between MC6 and MC5 receives drainage from the MT5 unnamed tributary to Montgomery Creek. Point MC5 is located just downstream of the gated area for the Clearfield Municipal Authority and upstream of the confluence with the MT4 unnamed tributary.

Sample data at point MC5 show pH ranging from 4.85 to 6.20; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between MC6 and MC5. Addressing the mining impacts between these points addresses the impairment for the segment. An average flow was available for point MC5 (16.78 mgd).

An allowable long-term average instream concentration was determined at point MC5 for iron, manganese, aluminum and acidity. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at MC5 for this stream segment are presented in Table F2.

Table F2. Long Term Average (LTA) for Montgomery Creek Between MC6 and MC5				
Station MC5	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	0.30	42.0	0.30	42.0
Mn	0.54	75.6	0.17	23.8
Al	0.68	95.2	0.29	40.6
Acidity	12.97	1,815.1	1.30	181.9
Alkalinity	7.77	1,087.4		

All values shown in this table are long-term average daily values.

The loading reductions for point MT5 were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MC5. This value was compared to the allowable load at point MC5. Reductions at point MC5 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MC5 are shown in Table F3. Necessary reductions at point MC5 are shown in Table F4.

Table F3. Summary of Loads Affecting Point MC5				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT5				
Load Reduction	0.5	15.7	15.9	191.2

Table F4. Reductions Necessary at Point MC5				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MC5	42.0	75.6	95.2	1,815.1
Total Load Reduction (MT5)	0.5	15.7	15.9	191.2
Remaining Load	41.5	59.9	79.3	1,623.9
Allowable Loads at MC5	42.0	23.8	40.6	181.9
Percent Reduction	0	61	49	89
Load Reduction	0	36.1	38.7	1,442.0

The TMDL for Montgomery Creek at point MC5 requires that a load allocation be made between MC6 and MC5 for total manganese, total aluminum and acidity.

Unnamed Tributary to Montgomery Creek Above MT4

The unnamed tributary to Montgomery Creek originates in a highly disturbed area that was previously surface mined. It does not appear on the USGS quadrangle map. However, water quality data available for the tributary show that it is impaired by AMD and will be addressed in this TMDL. It receives mine drainage from at least one source, D10, a deep mine discharge. Pre-Act clay mines exist in this area. Point MT4 represents all of the upstream watershed areas of the unnamed tributary to Montgomery Creek just upstream of its confluence with Montgomery Creek.

Sample data at point MT4 show pH ranging from 3.14 to 4.20; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area above point MT4. Addressing the mining impacts above this point addresses the impairments for the segment. An average flow measurement was available for point MT4 (0.07 mgd).

An allowable long-term average instream concentration was determined at point MT4 for iron, manganese, aluminum and acidity. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT4 for this stream segment are presented in Table F5.

Table F5. Reductions for the Unnamed Tributary to Montgomery Creek Above MT4

Station MT4	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	0.55	0.3	0.55	0.3	0
Mn	15.24	8.9	0.46	0.3	97
Al	15.68	9.2	0.16	0.1	99
Acidity	180.30	105.3	0	0	100
Alkalinity	0	0			

All values shown in this table are long-term average daily values.

The TMDL for the unnamed tributary to Montgomery Creek at point MT4 requires that a load allocation be made for all areas above MT4 for total manganese, total aluminum and acidity.

Montgomery Creek Between MC5 and MC4

Montgomery Creek between MC5 and MC4 receives drainage from the MT4 unnamed tributary, which is impaired by AMD. Point MC4 represents Montgomery Creek just upstream of its confluence with the MT3 unnamed tributary to Montgomery Creek.

Sample data at point MC4 show pH ranging from 2.69 to 6.79; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to MC4. Addressing the mining impacts above this point addresses the impairment for the segment. The average flow was calculated for point MC4 using the linear regression method (17.53 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at MC4. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MC4 for this stream segment are presented in Table F6.

Table F6. Long Term Average (LTA) for Montgomery Creek Between MC5 and MC4

Station MC4	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	0.17	24.9	0.17	24.9
Mn	1.98	289.5	0.20	29.2
Al	0.98	143.3	0.18	26.3
Acidity	21.29	3,112.6	0.64	93.6
Alkalinity	3.24	473.7		

All values shown in this table are long-term average daily values.

The loading reductions for point MT4 and MC5 were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MC4. This value was compared to the allowable load at point MC4. Reductions at point MC4 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MC4 are shown in Table F7. Necessary reductions at point MC4 are shown in Table F8.

Table F7. Summary of Loads Affecting Point MC4				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT5				
Load Reduction	0.5	15.7	15.9	191.2
MT4				
Load Reduction	0	8.6	9.1	105.3
MC5				
Load Reduction	0	36.1	38.7	1,442.0

Table F8. Reductions Necessary at Point MC4				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MC4	24.9	289.5	143.3	3,112.6
Total Load Reduction (MT4, MC5, MT5)	0.5	60.4	63.7	1738.5
Remaining Load	24.4	229.1	79.6	1374.1
Allowable Loads at MC4	24.9	29.2	26.3	93.6
Percent Reduction	0	88	67	94
Load Reduction	0	199.9	53.3	1280.5

The TMDL for point MC4 requires that a load allocation be applied to the watershed area of Montgomery Creek between MC5 and MC4 for total manganese, total aluminum and acidity.

Unnamed Tributary to Montgomery Creek Above MT3A

The unnamed tributary to Montgomery Creek above MT3A originates in an area heavily surface mined by the Sky Haven Mining Company (MP# 17713099). The headwaters area is located in a reclaimed surface mine. Land use becomes primarily forested in the lower section of the tributary as it enters a forested ravine. Point MT3A represents all of the watershed area upstream of the mouth of the unnamed tributary.

Sample data at point MT3A show pH ranging from 2.81 to 4.70; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for the unnamed tributary to Montgomery Run consists of a load allocation to all of the watershed area above point MT3A. Addressing the mining impacts above this point addresses the impairment for the segment. An instream flow measurement was available for point MT3A (0.22 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT3A. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT3A for this stream segment are presented in Table F9.

Table F9. Reductions for the Unnamed Tributary to Montgomery Creek Above MT3A

Station MT3A	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	25.24	46.3	0.25	0.5	99
Mn	62.63	114.9	0.44	0.8	99.3
Al	25.21	46.3	0.25	0.5	99
Acidity	368.99	677.0	0	0	100
Alkalinity	0.07	0.1			

All values shown in this table are long-term average daily values.

The TMDL for point MT3A requires that load allocations be applied to the unnamed tributary to Montgomery Run above MT3A for total iron, total manganese, total aluminum and acidity.

Unnamed Tributary to Montgomery Creek Above MT3B

The unnamed tributary to Montgomery Creek above MT3B originates in an area with a forested corridor that is surrounded by reclaimed surface mined lands upstream of the Otto#1 permit. Land use remains forested along the length of the tributary as it enters a forested ravine. Benjamin Coal Co. installed a passive treatment system to treat a discharge at the head of the tributary in lieu of penalties; the system does not have an NPDES permit for its effluent. Point MT3B represents all of the watershed area upstream of the mouth of the unnamed tributary.

Sample data at point M3B show pH ranging from 2.84 to 6.70; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading

reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for the unnamed tributary to Montgomery Run consists of a load allocation to all of the watershed area above point MT3B. Addressing the mining impacts above this point addresses the impairment for the segment. An instream flow measurement was available for point MT3B (0.39 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT3B. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT3B for this stream segment are presented in Table F10.

Table F10. Reductions for the Unnamed Tributary to Montgomery Creek Above MT3B

Station MT3B	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	14.12	45.9	0.28	0.9	98
Mn	35.31	114.8	0.28	0.9	99.2
Al	9.91	32.2	0.20	0.7	98
Acidity	224.17	729.1	0	0	100
Alkalinity	0.36	1.2			

All values shown in this table are long-term average daily values.

The TMDL for point MT3B requires that load allocations be applied to the unnamed tributary to Montgomery Run above MT3B for total iron, total manganese, total aluminum and acidity.

Mine Discharge 7 (D7)

Mine discharge 7 is the lowest discharge of a series of three in elevation. These discharges originate from collapsed deep mine openings around the perimeter of the Otto#1 surface mine permit. These discharges drain small abandoned deep mines probably used to mine coal for local uses. Point D7 represents the discharge at its origin.

Sample data at point D7 show pH ranging from 3.48 to 3.70; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that

will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for mine discharge 7 consists of a load allocation to the discharge. Addressing the mining impacts above this point addresses the impairment. An average flow measurement was available for point D7 (0.02 mgd).

An allowable long-term average instream concentration for iron, manganese and acidity was determined at point D7. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point D7 for this discharge are presented in Table F11.

Table F11. Reductions for Mine Discharge 7

Station D7	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	1.54	0.3	0.63	0.1	59
Mn	73.99	12.3	0.67	0.1	99.1
Al	NA	NA	NA	NA	NA
Acidity	296.81	49.5	0	0	100
Alkalinity	0	0			

All values shown in this table are long-term average daily values.

The TMDL for point D7 requires that load allocations be applied to mine discharge 7 for total iron, total manganese and acidity

Mine Discharge 8 (D8)

Mine discharge 8 is the middle discharge of a series of three in elevation. These discharges originate from collapsed deep mine openings around the perimeter of the Otto#1 surface mine permit. These discharges drain small abandoned deep mines probably used to mine coal for local uses. Point D8 represents the discharge at its origin.

Sample data at point D8 show pH ranging from 3.60 to 4.30; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that

will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for mine discharge 8 consists of a load allocation to the discharge. Addressing the mining impacts above this point addresses the impairment. An average flow measurement was available for point D8 (0.01 mgd).

An allowable long-term average instream concentration for iron, manganese and acidity was determined at point D8. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point D8 for this discharge are presented in Table F12.

Table F12. Reductions for Mine Discharge 8

Station D8	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	1.18	0.1	0.83	0.07	30
Mn	70.13	5.8	0.70	0.06	99
Al	NA	NA	NA	NA	NA
Acidity	280.54	23.4	0	0	100
Alkalinity	0	0			

All values shown in this table are long-term average daily values.

The TMDL for point D8 requires that load allocations be applied to mine discharge 8 for total iron, total manganese and acidity.

Unnamed Tributary to Montgomery Creek Between the Confluence of MT3A and MT3B with MT3

The unnamed tributary to Montgomery Creek between the confluence of points MT3A and MT3B with point MT3 represents the unnamed tributary to Montgomery Creek immediately upstream of its confluence with Montgomery Creek. The unnamed tributary receives drainage from at least four abandoned mine discharges upstream, all of them into the MT3B tributary.

Sample data at point MT3 show pH ranging from 2.75 to 4.78; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between points MT3A and MT3B, and point MT3. Addressing the mining impacts between these points addresses the impairment for the segment. An average flow measurement was available for point MT3 (0.82 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT3. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT3 for this stream segment are presented in Table F13.

Table F13. Long Term Average (LTA) Concentrations for the Unnamed Tributary to Montgomery Creek Between the Confluence of MT3A and MT3B With MT3

Station MT3	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	7.13	48.8	0.50	3.4
Mn	49.10	335.8	0.44	3.0
Al	14.72	100.7	0.30	2.1
Acidity	259.82	1,776.9	0	0
Alkalinity	0.03	0.2		

All values shown in this table are long-term average daily values.

The loading reductions for points MT3A, D7, D8 and MT3B were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MT3. This value was compared to the allowable load at point MT3. Reductions at point MT3 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MT3 are shown in Table F14. Necessary reductions at point MT3 are shown in Table F15.

Table F14. Summary of Loads Affecting Point MT3				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT3A				
Load Reduction	45.8	114.1	45.8	677.0
MT3B				
Load Reduction	45.0	113.9	31.5	729.1
D7				
Load Reduction	0.2	12.2	NA	49.5
D8				
Load Reduction	0.03	5.74	NA	23.4

Table F15. Reductions Necessary at Point MT3				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MT3	48.8	335.8	100.7	1,776.9
Total Load Reduction (MT3A, MT3B,D7,D8)	91.03	245.94	77.3	1479.0
Remaining Load	0	89.86	23.4	297.9
Allowable Loads at MT3	3.4	3.0	2.1	0
Percent Reduction	0	97	92	100
Load Reduction	0	86.86	21.3	297.9

The TMDL for point MT3 requires that a load allocation be applied to all areas of the unnamed tributary to Montgomery Creek between the confluence of MT3A and MT3B with MT3 for total manganese, total aluminum and acidity.

Montgomery Creek Between MC4 and MC3

Montgomery Creek between MC4 and MC3 receives drainage from the MT3 unnamed tributary. No other tributaries or sources of mine drainage enter Montgomery Creek between the two points.

Sample data at point MC3 show pH ranging from 3.20 to 5.05; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between points MC4 and MC3. Addressing the mining impacts between these points addresses the impairment for the segment. An average flow measurement was available for point MC3 (19.05 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MC3. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter

99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MC3 for this stream segment are presented in Table F16.

Table F16. Long Term Average (LTA) Concentrations for Montgomery Creek Between MC4 & MC3

Station MC3	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	0.76	120.7	0.31	49.3
Mn	5.01	796.0	0.15	23.8
Al	2.02	320.9	0.14	22.2
Acidity	33.00	5,242.9	0.99	157.3
Alkalinity	4.80	762.6		

All values shown in this table are long-term average daily values.

The loading reductions for all points upstream were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MC3. This value was compared to the allowable load at point MC3. Reductions at point MC3 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MC3 are shown in Table F17. Necessary reductions at point MC3 are shown in Table F18.

Table F17. Summary of Loads Affecting Point MC3

	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT4,MT5,MC5,MT3A,MT3B,D7,D8				
Load Reduction	91.53	306.34	141.0	3217.5
MC4				
Load Reduction	0	199.9	53.3	1280.5
MT3				
Load Reduction	0	86.86	21.3	297.9

Table F18. Reductions Necessary at Point MC3				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MC3	120.7	796.0	320.9	5242.9
Total Load Reduction (MT4, MT5, MC5, D7, D8, MT3A, MT3B, MC4, MT3)	91.53	593.1	215.6	4795.9
Remaining Load	29.25	202.9	105.3	447.0
Allowable Loads at MC3	49.3	23.8	22.2	157.3
Percent Reduction	0	89	79	65
Load Reduction	0	179.1	83.1	289.7

The TMDL for point MC3 requires that a load allocation be applied to all areas of Montgomery Creek between MC4 and MC3 for total manganese, total aluminum and acidity.

Unnamed Tributary to Montgomery Creek Above MT2A

The unnamed tributary to Montgomery Creek above point MT2A is mostly residential land use. The tributary flows past a reclaimed surface mine with a pre-Act discharge before reaching the SRP2 point where it receives treated drainage from the SRP Reed#1 permit. Point MT2A represents the unnamed tributary in its headwaters (upstream of point SRP2).

Sample data at point MT2A show pH ranging from 6.10 to 7.10; pH will be not addressed for this segment of the unnamed tributary to Montgomery Creek because it is net alkaline.

The TMDL for this section of the unnamed tributary to Montgomery Creek consists of a load allocation to all of the watershed area above MT2A. Addressing the mining impacts above this point addresses the impairment for the segment. An average flow measurement was available for point MT2A (0.11 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT2A. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT2A for this stream segment are presented in Table F19.

Table F19. Reductions for the Unnamed Tributary to Montgomery Creek above MT2A					
Station MT2A	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	1.20	1.1	0.35	0.3	71
Mn	1.82	1.7	0.28	0.3	85
Al	0.72	0.7	0.22	0.2	70
Acidity	0.56	0.5	0.55	0.5	0
Alkalinity	44.04	40.4			

All values shown in this table are long-term average daily values.

The TMDL for point MT2A requires that a load allocation be applied to all areas of the unnamed tributary to Montgomery Creek above MT2A for total iron, total manganese and total aluminum.

SRP2 Wasteload Allocation

The S.R.P. Coal Company Reed #1 permit was a surface mine that affected pre-Act abandoned deep mine discharges existing on its permit area. Because the mining activity affected the discharges, S.R.P. (now Sky Haven) is responsible for treating the discharge. The discharge flows from the abandoned deep mine into holding ponds. Lime and limestone are added to the ponds to increase the pH and precipitate the metals. Discharge from the treatment system is intermittent, with periods of up to a year between discharge events. Effluent from the system flows into the MT2 unnamed tributary to Montgomery Creek.

The wasteload allocations for SRP2 were determined from measured flow data and the monthly average permit limits for iron and manganese. Table F20 shows the wasteload allocations for the discharge.

Table F20. Wasteload Allocations for Reed#1 Mine Drainage Treatment System			
Station SRP2	***Monthly Average Allocable Concentration (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.017	0.4
Mn	2.0	0.017	0.3

Unnamed Tributary to Montgomery Creek between MT2A and MT2

The unnamed tributary to Montgomery Creek between points MT2A and MT2 receives drainage from the SRP2 Reed#1 treatment. Mine drainage enters the tributary both upstream and downstream of the treatment system and leads to degradation of the tributary between the effluent from the treatment system and point MT2.

Sample data at point MT2 show pH ranging from 6.60 to 7.15; however, pH will be addressed as part of this TMDL because the water quality data are net acidic due to mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range.

The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between points MT2A and MT2. Addressing the mining impacts between these points addresses the impairment for the segment. An instream flow measurement was available for point MT2 (0.44 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT2. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. To account for the permitted discharges on this stream segment, the wasteload allocations were subtracted from the calculated allowable loads, "Fe = 1.7 – 0.4" and "Mn = 0.9 – 0.3". The load allocations made at point MT2 for this stream segment are presented in Table F21.

Table F21. Long Term Average (LTA) Concentrations for the Unnamed Tributary to Montgomery Creek Between MT2A & MT2

Station MT2	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	3.44	12.6	0.45	1.3 (1.7)*
Mn	8.33	30.6	0.25	0.6 (0.9)*
Al	1.96	7.2	0.31	1.1
Acidity	23.47	86.1	3.05	11.2
Alkalinity	17.53	64.3		

All values shown in this table are long-term average daily values.

* Values in parentheses are allowable loads at MT2 before subtracting loads from the wasteload allocation for SRP2.

The loading reduction for point MT2A was used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MT2. This value was compared to the allowable load at point MT2. Reductions at point MT2 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MT2 are shown in Table F22. Necessary reductions at point MT2 are shown in Table F23.

Table F22. Summary of Loads Affecting Point MT2				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT2A				
Load Reduction	0.8	1.4	0.5	0

Table F23. Reductions Necessary at Point MT2				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MT2	12.6	30.6	7.2	86.1
Total Load Reduction (MT2A)	0.8	1.4	0.5	0
Remaining Load	11.8	29.2	6.7	86.1
Allowable Loads at MT2	1.3	0.6	1.1	11.2
Percent Reduction	89	98	84	87
Load Reduction	10.5	28.6	5.6	74.9

The TMDL for point MT2 requires that a load allocation be applied to all areas of the unnamed tributary to Montgomery Creek between MT2A and MT2, except the SRP2 treatment system, for total iron, total manganese, total aluminum and acidity.

Montgomery Creek Between MC3 and MC2

Montgomery Creek between MC3 and MC2 receives drainage from the MT2 unnamed tributary. It also receives drainage from D5, an intermittent abandoned mine discharge that flows into Montgomery Creek through a drainage channel.

There were no data at point MC2 for pH. However, because the acidity and alkalinity paired data show that the stream is net acidic at MC2, pH will be addressed as part of this TMDL. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between points MC3 and MC2. Addressing the mining impacts between these points addresses the impairment for the segment. The average flow was calculated for point MC2 using the linear regression method (20.32 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MC2. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MC2 for this stream segment are presented in Table F24.

Table F24. Long Term Average (LTA) Concentrations for Montgomery Creek Between MC3 & MC2

Station MC2	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	1.26	213.5	0.39	66.1
Mn	9.47	1604.9	0.19	32.2
Al	3.68	623.6	0.18	30.5
Acidity	55.14	9344.5	1.10	186.4
Alkalinity	5.43	920.2		

All values shown in this table are long-term average daily values.

The loading reductions for all points upstream were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MC2. This value was compared to the allowable load at point MC2. Reductions at point MC2 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MC2 are shown in Table F25. Necessary reductions at point MC2 are shown in Table F26.

Table F25. Summary of Loads Affecting Point MC2

	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT4,MT5,MC5,MC4,MT3,D7,D8, MT3A, MT3B,MT2A				
Load Reduction	92.33	594.5	216.1	4795.9
MC3				
Load Reduction	0	179.1	83.1	289.7
MT2				
Load Reduction	10.5	28.6	5.6	74.9

Table F26. Reductions Necessary at Point MC2				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MC2	213.5	1,604.9	623.6	9,344.5
Total Load Reduction (MT4, MT5, MC5, MC4, MT3, D7, D8, MT3A, MT3B, MC3, MT2A, MT2)	102.83	802.2	304.8	5160.5
Remaining Load	110.67	802.7	318.8	4184.0
Allowable Loads at MC2	66.1	32.2	30.5	186.4
Percent Reduction	41	96	91	96
Load Reduction	44.57	770.5	288.3	3997.6

The TMDL for point MC2 requires that a load allocation be applied to all areas of Montgomery Creek between MC3 and MC2 for total iron, total manganese, total aluminum and acidity.

Unnamed Tributary to Montgomery Creek Above MT1

The unnamed tributary to Montgomery Creek above MT1 is affected by mine drainage from one abandoned mine discharge, D1. It is possible that other sources of mine drainage affect the MT1 tributary. Point MT1 represents the unnamed tributary to Montgomery Creek upstream of its confluence with Montgomery Creek.

Sample data at point MT1 show pH ranging from 6.60 to 6.85; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for the unnamed tributary to Montgomery Creek consists of a load allocation to all of the watershed area above point MT1. Addressing the mining impacts above this point addresses the impairment for the segment. An average flow measurement was available for point MT1 (0.46 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MT1. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. The load allocations made at point MT1 for this stream segment are presented in Table F27.

Table F27. Reductions for the Unnamed Tributary to Montgomery Creek above MT1					
Station MT1	***Measured Sample Data***		***Allowable***		***Reduction Identified***
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***	***Percent***
Fe	2.39	9.2	0.31	1.2	87
Mn	4.90	18.8	0.25	1.0	95
Al	2.00	7.7	0.16	0.6	92
Acidity	12.89	49.5	3.73	14.3	71
Alkalinity	27.90	107.0			

All values shown in this table are long-term average daily values.

The TMDL for point MT1 requires that a load allocation be applied to all areas of the unnamed tributary to Montgomery Creek above MT1 for total iron, total manganese, total aluminum and acidity.

SRP1 Wasteload Allocation

The S.R.P. Coal Company McPherson#2 permit was a surface mine that affected pre-Act abandoned deep mine discharges existing on its permit area. Because the mining activity affected the discharges, S.R.P. (now Sky Haven) is responsible for treating the discharge. The discharge flows from the abandoned deep mine through a passive limestone channel. Discharge from the treatment system is fairly constant. Effluent from the system flows into an unnamed tributary to Montgomery Creek.

The wasteload allocations for SRP1 were determined from measured flow data and the monthly average permit limits for iron and manganese. Table F28 shows the wasteload allocations for the discharge.

Table F28. Wasteload Allocations for McPherson#2 Mine Drainage Treatment System			
Station SRP1	***Monthly Average Allocable Concentration (mg/l)***	***Average Flow (MGD)***	***Allowable Load (lbs/day)***
Fe	3.0	0.031	0.8
Mn	2.0	0.031	0.5
Al	2.0	0.031	0.5

Montgomery Creek Between MC2 and MC1

Montgomery Creek between MC2 and MC1 receives drainage from the MT1 unnamed tributary, the S.R.P. McPherson#2 passive treatment system through another unnamed tributary, and three abandoned mine discharges (D2, D3, D4). Point MC1 represents Montgomery Creek at its confluence with the West Branch Susquehanna River near the town of Hyde.

Sample data at point MC1 show pH ranging from 3.90 to 4.70; pH will be addressed as part of this TMDL because of the mining impacts. The objective is to reduce acid loading to the stream

that will in turn raise the pH to the desired range. The result of this analysis is an acid loading reduction that equates to meeting water quality standards for pH (see Table 2). The method and rationale for addressing pH is contained in Attachment D.

The TMDL for this section of Montgomery Creek consists of a load allocation to all of the watershed area between points MC2 and MC1. Addressing the mining impacts between these points addresses the impairment for the segment. An average flow measurement was available for point MC1 (22.20 mgd).

An allowable long-term average instream concentration for iron, manganese, aluminum and acidity was determined at point MC1. The analysis is designed to produce a long-term average value that, when met, will be protective of the water quality criterion for that parameter 99 percent 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 percent of the time. The simulation was run assuming the data set was lognormally distributed. Using the mean and the standard deviation of the data set, 5,000 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 percent of the time. The mean value from this data set represents that long-term daily average concentration that needs to be met to achieve water quality standards. To account for the permitted discharges on this stream segment, the wasteload allocations were subtracted from the calculated allowable loads, "Fe = 55.5 – 0.8", "Mn = 40.7 – 0.5" and "Al = 33.3 – 0.5". The load allocations made at point MC1 for this stream segment are presented in Table F29.

Table F29. Long Term Average (LTA) Concentrations for Montgomery Creek Between MC2 & MC1

Station MC1	***Measured Sample Data***		***Allowable***	
	Conc. (mg/l)	***Load (lb/day)***	***LTA Conc. (mg/l)***	***Load (lb/day)***
Fe	0.30	55.5	0.30	54.7 (55.5)*
Mn	5.44	1,007.2	0.22	40.2 (40.7)*
Al	2.23	412.9	0.18	32.8 (33.3)*
Acidity	41.33	7,652.2	0.41	75.9
Alkalinity	6.07	1,123.8		

All values shown in this table are long-term average daily values.

* Values in parentheses are allowable loads at MC1 before subtracting the wasteload allocation for SRP1.

The loading reductions for all points upstream were used to show the total load that was removed from upstream sources. For each parameter, the total load that was removed upstream was subtracted from the existing load at point MC1. This value was compared to the allowable load at point MC1. Reductions at point MC1 are necessary for any parameter that exceeds the allowable load at this point. A summary of all loads that affect point MC1 are shown in Table F30. Necessary reductions at point MC1 are shown in Table F31.

Table F30. Summary of Loads Affecting Point MC1				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
MT4,MT5,MC5,MC4,MT3,MT3A,MT3B,D7,D8, MC3,MT2A,MT2, MC2				
Load Reduction	147.4	1572.7	593.1	9158.1
MT1				
Load Reduction	8.0	17.8	7.1	35.2

Table F31. Reductions Necessary at Point MC1				
	Iron (lb/day)	***Manganese (lb/day)***	***Aluminum (lb/day)***	***Acidity (lb/day)***
Existing Loads at MC1	55.5	1007.2	412.9	7652.2
Total Load Reduction (MT4, MT3, MC5, MC4, MT3, D7, D8, MT3A, MT3B, MC3, MT2A, MT2, MT1, MC2)	155.4	1590.5	600.2	9193.3
Remaining Load	0	0	0	0
Allowable Loads at MC1	54.7	40.2	32.8	75.9
Percent Reduction	0	0	0	0
Load Reduction	0	0	0	0

The TMDL for point MC1 does not require that a load allocation be applied to Montgomery Creek between MC2 and MC1.

Margin of Safety

Pa. DEP used an implicit MOS in these TMDLs derived from the Monte Carlo statistical analysis. The water quality standard states that water quality criteria must be met at least 99 percent of the time. All of the @Risk analyses results surpass the minimum 99 percent level of protection. Another MOS used for this TMDL analyses results from:

- 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 MOS.
- An additional MOS is that the calculations were performed with a daily iron 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 G

Water Quality Data Used
In TMDL Calculations

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
MC1	MTGM0.1	SRBC Monitoring		2/13/2001	22603.14	4.40	0.30	1.34	0.65	10.00	7.60
	MTGM0.1	SRBC Monitoring		4/11/2001	31549.24	4.70	0.30	1.88	1.02	7.80	7.20
	MTGM0.1	SRBC Monitoring		5/16/2001	5467.66	4.50	0.30	4.45	2.23	12.40	4.40
	MTGM0.1	SRBC Monitoring		6/27/2001	28025.02	4.50	0.30	1.67	0.95	45.60	7.80
	MTGM0.1	SRBC Monitoring		8/7/2001	2435.36	3.90	0.30	10.90	4.14	96.20	2.60
	MTGM0.1	SRBC Monitoring		8/27/2001	2358.16	4.00	0.30	12.40	4.38	76.00	6.80
				Average	15406.43	4.33	0.30	5.44	2.23	41.33	6.07
				StDev	13482.56	0.31	0.00	4.96	1.67	37.88	2.10
MC2	MP02	SRP Coal Co.	17803108	9/17/1986	*	*	2.82	26.30	9.61	136.00	0.00
	MP02	SRP Coal Co.	17803108	6/12/1986	*	*	0.79	1.43	0.78	12.00	8.00
	MP02	SRP Coal Co.	17803108	3/5/1986	*	*	0.56	8.06	2.99	52.00	8.00
	MP02	SRP Coal Co.	17803108	9/12/1985	*	*	2.46	9.53	4.33	68.00	4.00
	MP02	SRP Coal Co.	17803108	12/20/1988	*	*	0.67	9.80	3.24	48.00	4.00
	MP02	SRP Coal Co.	17803108	12/10/1987	*	*	0.55	2.90	1.32	38.00	8.00
	MP02	SRP Coal Co.	17803108	6/23/1987	*	*	0.95	8.24	3.49	32.00	6.00
				Average	*	*	1.26	9.47	3.68	55.14	5.43
				StDev	*	*	0.96	8.11	2.89	39.70	2.99
MC3	MTGM1.0	SRBC Monitoring		2/13/2001	21384.56	5.00	0.30	0.44	0.50	4.20	7.20
	MTGM1.0	SRBC Monitoring		4/10/2001	29086.06	4.40	0.30	0.05	0.50	9.20	6.80
	MTGM1.0	SRBC Monitoring		5/16/2001	3358.16	5.05	0.30	0.88	0.74	7.60	7.60
	MTGM1.0	SRBC Monitoring		6/27/2001	22015.17	4.50	0.30	1.70	0.99	51.00	7.20
	MTGM1.0	SRBC Monitoring		8/5/2001	1610.86	3.65	1.88	11.80	4.24	54.00	0.00
	MTGM1.0	SRBC Monitoring		8/27/2001	1869.83	3.20	1.50	15.20	5.12	72.00	0.00
				Average	13220.77	4.30	0.76	5.01	2.02	33.00	4.80
				StDev	12301.23	0.74	0.73	6.68	2.09	29.42	3.73
MC4	MP19	Warren Hartman	17800134	1/30/1982	*	4.68	<0.05	2.36	*	4.00	<1
	MP19	Warren Hartman	17800134	2/23/1982	6500.00	4.28	<0.05	1.81	*	18.00	<1
	MP19	Warren Hartman	17800134	3/16/1982	13000.00	3.56	<0.05	1.44	*	19.00	<1
	MP19	Warren Hartman	17800134	4/29/1982	2800.00	4.21	0.05	1.56	*	35.00	<1
	MP19	Warren Hartman	17800134	5/25/1982	6000.00	3.70	<0.05	0.90	*	66.00	<1
	MP19	Warren Hartman	17800134	9/7/1982	350.00	3.75	0.12	2.68	*	9.00	<1
	MP19	Warren Hartman	17800134	11/18/1982	3000.00	4.10	0.13	1.65	*	9.00	<1
	MP19	Warren Hartman	17800134	2/10/1983	8500.00	4.40	0.14	2.06	*	20.00	<1
	MP19	Warren Hartman	17800134	5/17/1983	6500.00	4.60	0.07	1.54	*	10.00	<1
	MP19	Warren Hartman	17800134	8/4/1983	1100.00	4.55	0.10	4.86	*	22.00	<1
	MP19	Warren Hartman	17800134	12/1/1983	15000.00	5.50	0.05	1.63	*	9.00	<1
	MP19	Warren Hartman	17800134	2/20/1984	23000.00	4.80	<0.05	1.30	*	8.00	<1
	MP19	Warren Hartman	17800134	5/10/1984	30000.00	4.70	<0.05	1.10	*	6.00	15.00
	MP19	Warren Hartman	17800134	9/6/1984	5350.00	4.25	0.06	2.41	*	17.00	<1
	MP19	Warren Hartman	17800134	12/11/1984	3000.00	4.65	0.12	1.64	*	13.00	<1
	MP03	SRP Coal Co.	17820141	3/22/1992	*	*	<0.3	0.76	1.03	16.40	5.00
	MP03	SRP Coal Co.	17820141	12/30/1986	*	*	0.60	5.61	2.86	56.00	6.00
	MP19	Warren Hartman	17800134	3/22/1985	1200.00	4.15	<0.02	1.41	*	34.00	10.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	7/30/1979	*	4.29	0.20	2.70	*	29.80	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/5/1979	*	4.45	0.20	2.70	*	80.80	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/11/1979	*	4.90	0.20	1.30	*	8.80	1.20
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/19/1980	*	4.63	0.10	0.60	*	31.20	0.80
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/26/1980	*	3.91	0.10	2.70	*	33.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/9/1980	4000.00	4.30	0.10	2.30	*	51.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/5/1980	*	4.07	0.10	3.20	*	22.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	1/27/1981	*	4.32	0.20	2.80	*	16.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	*	4.38	0.10	1.10	*	12.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP7	Sky Haven Coal Inc.	Otto #1 Report	7/13/1981	800.00	4.64	0.17	1.82	*	59.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/27/1981	2500.00	4.71	0.05	1.88	*	24.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	2/23/1982	1000.00	4.75	0.04	1.80	*	29.00	12.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	3000.00	4.45	0.09	0.50	*	13.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	700.00	4.00	0.07	2.66	*	36.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	120.00	3.95	0.39	8.76	*	87.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	700.00	4.82	0.05	1.39	*	24.00	7.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	1100.00	4.80	0.12	1.35	*	17.00	7.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/1/1983	300.00	4.15	0.37	14.12	*	150.00	5.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/8/1983	600.00	4.45	0.22	1.50	*	28.00	4.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	1500.00	4.75	0.06	1.45	*	17.00	6.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	5/10/1984	30000.00	4.94	0.05	1.10	*	6.00	15.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/6/1984	*	4.66	0.06	2.41	*	17.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/11/1984	30000.00	4.64	0.12	1.64	*	13.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/22/1985	1200.00	4.64	0.02	1.41	*	34.00	10.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	450.00	4.53	0.07	1.22	*	10.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	260.00	4.72	0.21	3.69	*	24.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	*	2.69	0.05	1.89	*	21.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	9000.00	4.65	0.11	0.81	*	12.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	4000.00	4.59	0.04	1.65	*	17.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	5500.00	4.49	0.11	1.59	*	16.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	1000.00	4.64	0.02	0.93	*	9.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	4200.00	4.74	0.02	2.00	*	24.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/2/1987	5000.00	4.80	0.02	6.00	*	6.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	8/7/1987	3100.00	4.76	0.16	1.28	*	11.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	3600.00	4.77	0.02	1.09	*	9.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	860.00	4.68	0.02	0.42	*	7.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/30/1988	700.00	4.74	0.14	1.59	*	10.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	2100.00	4.57	0.21	4.61	*	27.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/14/1988	5600.00	4.77	0.15	1.31	*	10.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	5100.00	4.74	0.16	1.24	*	14.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	13931.00	4.74	0.10	1.08	*	11.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	8/16/1989	1005.00	4.43	0.15	4.12	*	33.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/12/1989	2250.00	4.89	0.09	0.76	*	8.00	3.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/12/1990	9100.00	4.77	1.67	1.30	*	14.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/12/1990	13800.00	4.73	0.08	0.37	*	5.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	9/5/1990	2968.00	4.63	0.27	1.12	*	8.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/4/1990	17500.00	4.95	0.09	0.64	*	5.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/12/1991	13950.00	4.72	0.04	1.04	*	7.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	2385.00	4.69	0.09	1.61	*	15.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	8/30/1991	299.00	6.79	0.52	1.10	*	4.00	13.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	11/25/1991	340.00	4.29	0.20	6.69	*	50.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	3/3/1992	14400.00	4.88	0.17	0.57	*	7.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	5/21/1992	7445.00	4.91	0.33	1.07	*	9.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	8/25/1992	352.00	4.74	0.11	2.14	*	16.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/15/1992	5500.00	4.51	0.26	1.64	*	14.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	4/24/1993	3080.00	4.57	0.13	1.04	*	13.00	0.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	5/25/1993	1750.00	4.81	0.15	1.23	*	9.00	1.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	7/13/1993	1100.00	5.65	0.19	0.60	*	3.00	2.00
	MP7	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	5700.00	4.83	0.15	1.34	*	12.00	1.00
	MTGM2.0	SRBC Monitoring		2/13/2001	19373.79	5.50	0.30	0.17	0.50	2.60	7.40
	MTGM2.0	SRBC Monitoring		4/9/2001	27152.04	4.80	0.30	0.15	0.50	2.20	8.40
	MTGM2.0	SRBC Monitoring		5/16/2001	3352.32	5.75	0.30	0.32	0.50	3.80	7.20
	MTGM2.0	SRBC Monitoring		6/26/2001	20637.26	4.80	0.30	0.37	0.52	15.60	7.20
	MTGM2.0	SRBC Monitoring		8/6/2001	1098.29	6.20	0.47	0.69	0.85	28.80	7.20
	MTGM2.0	SRBC Monitoring		8/27/2001	1368.04	6.00	0.30	1.69	1.10	34.00	7.40
				Average	6330.38	4.64	0.17	1.98	0.98	21.29	3.24
				StDev	7843.53	0.55	0.21	1.99	0.80	21.96	3.72

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
MC5	MTGM3.0	SRBC Monitoring		2/13/2001	19284.93	5.50	0.30	0.10	0.50	1.60	7.00
	MTGM3.0	SRBC Monitoring		4/9/2001	26182.12	4.85	0.30	0.18	0.50	3.00	8.40
	MTGM3.0	SRBC Monitoring		5/16/2001	3667.85	6.40	0.30	0.12	0.50	1.00	8.20
	MTGM3.0	SRBC Monitoring		6/26/2001	19052.88	5.00	0.30	0.23	0.50	13.40	7.80
	MTGM3.0	SRBC Monitoring		8/6/2001	774.23	6.20	0.30	0.82	0.84	18.80	7.80
	MTGM3.0	SRBC Monitoring		8/27/2001	879.26	6.00	0.30	1.76	1.26	40.00	7.40
				Average	11640.21	5.66	0.30	0.54	0.68	12.97	7.77
				StDev	11156.01	0.64	0.00	0.66	0.31	15.08	0.51
MC6	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	6/30/2002	*	*	*	0.04	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	6/28/2002	*	*	*	0.05	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	6/1/2002	*	*	0.04	0.06	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	4/21/2002	*	*	*	0.05	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	4/7/2002	*	*	*	0.05	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	3/24/2002	*	*	0.04	0.04	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	3/4/2002	*	*	*	*	*	*	1.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	1/31/2002	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	1/3/2002	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	11/23/2001	*	*	0.19	*	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	11/19/2001	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	11/18/2001	*	*	*	0.06	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	11/4/2001	*	*	*	0.06	*	*	*
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	10/11/2001	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	8/23/2001	*	*	*	*	*	*	4.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	7/20/2001	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	6/22/2001	*	*	*	*	*	*	2.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	4/12/2001	*	*	*	*	*	*	8.00
	Intake	Clearfield Reservoir	Clrfd. Mun. Auth.	3/21/2001	*	*	*	*	*	*	2.00
				Average	*	*	0.09	0.05	*	*	2.70
				StDev	*	*	0.09	0.01	*	*	2.00
MT1	MTTR0.1	SRBC Monitoring		2/13/2001	683.12	6.65	0.30	1.45	0.50	0.00	13.80
	MTTR0.1	SRBC Monitoring		4/10/2001	635.99	6.75	0.30	0.13	0.50	0.00	17.00
	MTTR0.1	SRBC Monitoring		5/16/2001	216.34	6.60	0.30	1.67	0.50	0.00	15.80
	MTTR0.1	SRBC Monitoring		6/26/2001	400.36	6.80	0.43	1.25	0.50	17.20	17.80
	MTTR0.1	SRBC Monitoring		8/6/2001	43.99	6.85	0.42	1.20	0.50	0.00	14.60
	MTTR0.1	SRBC Monitoring		8/27/2001	107.72	6.80	0.30	1.32	0.50	0.00	22.00
	MP30	Shale Hill Coal Co.	17850106	6/23/1999	*	*	<0.3	0.66	<0.5	0.00	18.40
	MP30	Shale Hill Coal Co.	17850106	12/9/1997	*	*	<0.3	3.29	0.62	0.60	22.00
	MP30	Shale Hill Coal Co.	17850106	5/27/1997	*	*	<0.3	1.33	<0.5	5.00	18.20
	MP30	Shale Hill Coal Co.	17850106	8/28/1996	*	*	<0.3	3.24	<0.5	7.20	20.00
	MP30	Shale Hill Coal Co.	17850106	5/15/1996	*	*	0.21	2.96	0.40	3.80	14.60
	MP30	Shale Hill Coal Co.	17850106	3/22/1995	*	*	<0.3	3.10	0.62	0.00	16.60
	MP30	Shale Hill Coal Co.	17850106	12/13/1994	*	*	<0.3	2.88	0.68	15.60	16.60
	MP30	Shale Hill Coal Co.	17850106	9/27/1994	*	*	<0.3	3.75	<0.5	24.00	22.00
	MP05	SRP Coal Co.	17803108	12/30/1986	*	*	2.78	4.03	1.63	22.00	30.00
	MP05	SRP Coal Co.	17803108	9/17/1986	*	*	0.44	7.22	0.83	0.00	50.00
	MP05	SRP Coal Co.	17803108	6/12/1986	*	*	1.04	0.52	<0.5	0.00	38.00
	MP05	SRP Coal Co.	17803108	3/5/1986	*	*	0.85	10.11	<0.5	8.00	42.00
	MP05	SRP Coal Co.	17803108	9/12/1985	*	*	1.53	6.22	1.96	24.00	22.00
	MP05	SRP Coal Co.	17803108	7/29/1985	*	*	*	*	*	*	*
	MP05	SRP Coal Co.	17803108	10/24/1984	150.00	*	3.30	6.30	7.50	36.00	20.00
	MP05	SRP Coal Co.	17803108	8/30/2001	*	*	7.76	18.70	2.03	102.00	11.60
	MP05	SRP Coal Co.	17803108	11/18/1999	*	*	5.53	7.61	0.91	3.60	26.00
	MP05	SRP Coal Co.	17803108	3/23/1999	*	*	1.38	2.47	1.64	0.00	19.40
	MP05	SRP Coal Co.	17803108	2/11/1998	*	*	2.48	4.18	2.23	3.20	17.40

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP05	SRP Coal Co.	17803108	12/9/1997	*	*	2.59	5.49	3.73	12.40	18.00
	MP05	SRP Coal Co.	17803108	1/23/1997	*	*	3.51	6.34	3.42	30.00	18.80
	MP05	SRP Coal Co.	17803108	11/21/1996	*	*	2.79	7.72	5.19	34.00	13.20
	MP05	SRP Coal Co.	17803108	9/26/1996	*	*	2.10	6.89	4.66	14.00	10.80
	MP05	SRP Coal Co.	17803108	7/25/1995	*	*	3.20	8.03	2.10	26.00	26.00
	MP05	SRP Coal Co.	17803108	5/22/1995	*	*	1.79	2.58	1.13	0.00	26.00
	MP05	SRP Coal Co.	17803108	1/30/1995	*	*	3.06	6.35	4.01	34.00	11.60
	MP05	SRP Coal Co.	17803108	11/16/1994	*	*	7.52	7.62	3.62	0.00	32.00
	MP05	SRP Coal Co.	17803108	8/9/1994	*	*	7.59	12.90	3.20	74.00	18.20
	MP05	SRP Coal Co.	17803108	6/29/1994	*	*	1.68	4.43	1.33	11.20	24.00
	MP05	SRP Coal Co.	17803108	12/21/1993	*	*	3.10	4.16	3.19	22.00	15.60
	MP05	SRP Coal Co.	17803108	9/28/1993	*	*	0.93	5.07	<0.5	0.00	42.00
	MP05	SRP Coal Co.	17803108	2/26/1993	*	*	6.85	5.50	<0.5	0.00	34.00
	MP05	SRP Coal Co.	17803108	6/23/1992	*	*	0.69	6.43	<0.5	0.00	24.00
	MP05	SRP Coal Co.	17803108	3/23/1992	*	*	2.20	11.10	2.08	11.40	22.00
	MP05	SRP Coal Co.	17803108	12/20/1988	*	*	0.52	5.99	<0.5	0.00	80.00
	MP05	SRP Coal Co.	17803108	12/10/1987	*	*	1.95	1.83	0.97	0.00	114.00
	MP05	SRP Coal Co.	17803108	6/23/1987	*	*	2.36	1.87	1.30	0.00	116.00
				Average	319.65	6.74	2.39	4.90	2.00	12.89	27.90
				StDev	257.89	0.10	2.21	3.69	1.70	20.68	23.31
MT2	MTTR1.0	SRBC Monitoring		2/13/2001	586.17	7.15	1.30	2.34	0.92	0.00	22.00
	MTTR1.0	SRBC Monitoring		4/9/2001	476.66	6.75	1.87	3.56	2.16	2.00	16.40
	MTTR1.0	SRBC Monitoring		5/16/2001	93.36	6.60	4.48	7.06	3.03	0.80	13.20
	MTTR1.0	SRBC Monitoring		6/26/2001	468.13	6.90	2.02	4.41	1.35	22.00	26.00
	MTTR1.0	SRBC Monitoring		8/6/2001	30.52	6.60	7.05	18.40	2.74	60.00	11.40
	MTTR1.0	SRBC Monitoring		8/27/2001	182.67	6.60	3.90	14.20	1.57	56.00	16.20
				Average	306.25	6.77	3.44	8.33	1.96	23.47	17.53
				StDev	232.47	0.22	2.16	6.50	0.82	28.00	5.50
MT2A	MP1	SRP Coal Co.	17803108	10/29/1992	*	6.60	1.19	3.75	<0.5	0.00	52.00
	MP1	SRP Coal Co.	17803108	4/24/1991	*	6.70	1.18	0.65	<0.5	0.00	30.00
	MP1	SRP Coal Co.	17803108	12/30/1987	*	6.40	0.45	0.63	<0.5	12.00	34.00
	MP1	SRP Coal Co.	17803108	9/11/1986	*	6.30	<0.3	1.37	<0.5	0.00	54.00
	MP1	SRP Coal Co.	17803108	6/12/1986	*	6.60	1.63	0.58	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	3/5/1986	*	6.30	0.45	0.52	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	7/9/1985	50.00	7.10	0.99	0.65	<0.5	0.00	98.00
	MP1	SRP Coal Co.	17803108	10/16/1984	100.00	6.60	4.30	1.00	0.30	0.00	70.00
	MP1	SRP Coal Co.	17803108	11/18/1999	*	6.40	0.59	2.54	<0.5	0.00	42.00
	MP1	SRP Coal Co.	17803108	2/11/1998	*	6.30	0.51	1.12	<0.5	0.00	30.00
	MP1	SRP Coal Co.	17803108	12/9/1997	*	6.30	0.59	1.30	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	1/23/1997	*	6.40	0.78	1.81	<0.5	3.00	39.00
	MP1	SRP Coal Co.	17803108	11/23/1996	*	6.50	0.95	2.07	<0.5	0.00	38.00
	MP1	SRP Coal Co.	17803108	9/26/1996	*	6.10	0.61	2.01	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	6/26/1996	*	6.80	0.39	0.86	<0.5	0.00	38.00
	MP1	SRP Coal Co.	17803108	7/26/1995	*	6.60	0.88	2.31	<0.5	0.00	54.00
	MP1	SRP Coal Co.	17803108	5/23/1995	*	6.70	0.63	0.93	0.21	0.00	26.00
	MP1	SRP Coal Co.	17803108	1/30/1995	*	6.60	2.76	2.39	1.11	0.00	32.00
	MP1	SRP Coal Co.	17803108	11/16/1994	*	6.70	3.74	3.99	1.27	0.00	54.00
	MP1	SRP Coal Co.	17803108	8/9/1994	*	6.50	0.64	3.50	<0.5	0.00	46.00
	MP1	SRP Coal Co.	17803108	6/30/1994	*	6.20	0.80	1.56	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	9/28/1993	*	6.60	1.00	2.38	<0.5	0.00	60.00
	MP1	SRP Coal Co.	17803108	2/26/1993	*	6.70	1.25	2.70	<0.5	0.00	36.00
	MP1	SRP Coal Co.	17803108	6/18/1992	*	6.90	0.86	4.64	<0.5	0.00	44.00
	MP1	SRP Coal Co.	17803108	6/17/1988	*	6.60	<0.3	1.98	<0.5	0.00	44.00
	MP1	SRP Coal Co.	17803108	12/10/1987	*	6.40	2.11	1.04	0.70	0.00	38.00
	MP1	SRP Coal Co.	17803108	6/25/1987	*	6.40	0.75	0.80	<0.5	0.00	50.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
				Average	75.00	6.53	1.20	1.82	0.72	0.56	44.04
				StDev	35.36	0.22	1.01	1.14	0.47	2.36	14.85
MT3	MTTR3.0	SRBC Monitoring		2/13/2001	959.15	3.50	3.01	19.80	7.22	88.00	0.00
	MTTR3.0	SRBC Monitoring		4/9/2001	1119.39	3.25	2.47	25.80	10.20	126.00	0.00
	MTTR3.0	SRBC Monitoring		5/15/2001	453.77	3.30	3.03	32.10	14.40	126.00	0.00
	MTTR3.0	SRBC Monitoring		6/26/2001	970.37	3.50	1.71	19.60	7.93	118.60	0.00
	MTTR3.0	SRBC Monitoring		8/6/2001	388.24	3.00	2.89	39.30	13.70	186.40	0.00
	MTTR3.0	SRBC Monitoring		8/27/2001	312.39	2.75	3.45	35.40	11.30	178.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	10/25/2001	*	4.30	3.30	26.40	7.35	138.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	12/16/1997	*	*	4.51	35.60	15.20	210.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	9/11/1997	*	*	4.69	37.70	11.70	224.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	8/16/1996	*	*	3.86	41.40	14.70	236.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	2/26/1996	*	*	2.12	21.10	8.41	118.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	11/30/1995	*	*	5.04	27.30	8.34	122.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	9/27/1995	*	*	8.40	55.50	14.60	296.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	12/14/1994	*	*	4.60	22.80	8.18	128.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	9/29/1994	*	*	6.60	46.20	15.30	206.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	10/29/1993	*	*	8.94	50.20	13.00	224.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	6/22/1993	*	*	6.66	53.00	17.50	166.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	3/31/1993	*	*	4.31	19.40	11.40	78.00	3.00
	MP6	Sky Haven Coal Inc.	4574SM33	9/11/1992	*	*	9.76	76.40	26.20	212.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	5/22/1992	*	*	9.59	59.30	21.60	302.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	12/30/1991	*	*	11.80	49.50	13.20	224.00	0.00
	MP6	Sky Haven Coal Inc.	4574SM33	9/30/1991	*	*	16.50	74.50	19.60	256.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	7/30/1979	*	3.58	2.00	26.40	*	135.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/5/1979	634.00	3.50	3.70	36.40	*	502.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/11/1979	*	3.56	3.30	23.70	*	104.80	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/19/1980	*	3.87	2.10	14.30	*	67.20	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/26/1980	*	3.19	2.10	32.60	*	308.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/9/1980	500.00	4.60	4.10	38.50	*	262.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	10/8/1980	*	3.40	3.93	38.94	12.71	192.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/5/1980	75.00	3.80	5.00	37.00	*	240.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	1/27/1981	335.00	3.19	3.20	26.60	*	156.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	500.00	3.75	2.90	25.30	*	151.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/12/1981	*	3.80	2.40	13.73	8.50	106.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/30/1981	*	3.50	2.04	27.20	16.74	200.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	7/13/1981	500.00	3.48	2.87	46.90	*	359.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/17/1981	*	3.40	6.23	34.00	19.64	170.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/27/1981	100.00	3.66	3.72	40.50	*	174.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	2/23/1982	250.00	3.90	3.32	36.90	*	266.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	500.00	3.60	2.59	38.50	*	252.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/6/1982	*	3.90	5.49	48.26	16.80	236.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	75.00	2.90	5.26	58.20	*	564.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	65.00	2.95	9.30	56.18	*	289.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	100.00	3.72	9.50	36.10	*	238.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	260.00	3.55	10.40	45.48	*	285.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/30/1983	250.00	3.35	12.20	70.30	*	414.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/8/1983	*	3.30	8.91	59.66	22.04	434.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/8/1983	270.00	3.10	16.00	64.30	*	415.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	100.00	3.65	8.44	41.60	*	238.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/16/1984	1300.00	3.39	4.80	50.60	*	189.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/6/1984	*	3.13	10.80	73.80	*	362.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/11/1984	1500.00	3.46	8.66	41.10	*	261.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/22/1985	130.00	3.30	10.40	68.80	*	444.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	55.00	2.96	13.40	80.90	*	495.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	50.00	3.09	12.70	60.60	*	422.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	150.00	4.78	13.60	84.90	*	462.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	750.00	3.70	3.55	34.70	*	226.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	200.00	3.18	9.18	72.70	*	364.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	350.00	2.97	10.90	65.70	*	324.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	150.00	3.47	6.22	38.80	*	295.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	330.00	3.35	12.70	67.40	*	598.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/2/1987	195.00	3.16	9.25	69.00	*	412.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/7/1987	*	3.47	10.60	70.80	*	197.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	211.00	2.94	13.80	65.90	*	586.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	1100.00	3.37	7.80	50.80	*	350.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/30/1988	90.00	3.14	16.00	80.30	*	238.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	475.00	3.27	10.50	52.80	*	283.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/14/1988	365.00	3.27	14.60	68.80	*	377.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	616.00	3.66	12.20	54.60	*	361.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	1021.00	3.62	6.10	53.60	*	366.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/30/1989	305.00	3.19	12.40	102.00	*	591.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/19/1989	*	3.42	17.30	68.50	*	670.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/13/1990	1220.00	3.50	6.53	50.20	*	477.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/13/1990	900.00	3.32	5.64	47.10	*	269.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/19/1990	590.00	3.41	6.45	54.10	*	173.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/4/1990	1840.00	3.70	3.35	28.10	*	118.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/12/1991	1350.00	3.60	4.72	49.10	*	203.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	322.00	3.23	10.00	65.90	*	260.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/12/1991	166.00	3.20	12.20	77.40	*	279.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/30/1991	*	3.20	16.50	74.50	19.60	256.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	11/22/1991	735.00	3.28	8.76	52.50	*	195.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/24/1991	*	3.30	11.80	49.50	13.20	224.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/13/1992	822.00	3.40	5.55	37.00	*	229.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/21/1992	*	3.40	9.59	59.30	21.60	302.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	5/22/1992	492.00	3.31	6.03	63.80	*	272.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/10/1992	*	3.40	9.76	76.40	26.20	212.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	9/29/1992	232.00	3.28	7.79	56.40	*	218.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/15/1992	188.00	3.34	8.80	52.10	*	308.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/25/1993	340.00	3.56	3.18	23.20	*	150.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	3/30/1993	*	4.00	4.31	19.40	11.40	78.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	4/28/1993	428.00	3.62	3.04	37.80	*	213.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	6/22/1993	*	3.40	6.66	53.00	17.50	166.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/24/1993	200.00	3.20	9.87	68.20	17.00	262.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	8/25/1993	*	3.20	10.20	64.20	16.00	70.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	10/1/1993	285.00	3.19	8.53	90.70	*	398.00	0.00
	MP6	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	174.00	3.37	7.05	53.10	*	259.00	0.00
	MP18	Warren Hartman	17800134	1/30/1982	*	3.70	3.50	46.10	*	236.00	<1
	MP18	Warren Hartman	17800134	2/23/1982	2000.00	3.59	3.06	42.60	*	362.00	<1
	MP18	Warren Hartman	17800134	3/16/1982	1200.00	3.64	1.71	18.90	*	106.00	<1
	MP18	Warren Hartman	17800134	4/29/1982	1000.00	3.69	3.57	46.10	*	233.00	<1
	MP18	Warren Hartman	17800134	5/25/1982	1250.00	3.50	1.48	20.50	*	64.00	<1
	MP18	Warren Hartman	17800134	9/7/1982	200.00	3.35	6.92	67.00	*	175.00	<1
	MP18	Warren Hartman	17800134	11/18/1982	250.00	3.40	5.85	61.00	*	177.00	<1
	MP18	Warren Hartman	17800134	2/10/1983	550.00	3.50	3.97	39.40	*	213.00	<1
	MP18	Warren Hartman	17800134	5/17/1983	390.00	3.50	6.65	49.50	*	241.00	<1
	MP18	Warren Hartman	17800134	8/4/1983	125.00	3.20	5.26	69.90	*	250.00	<1
	MP18	Warren Hartman	17800134	12/1/1983	1500.00	4.65	5.67	49.90	*	134.00	<1
	MP18	Warren Hartman	17800134	2/20/1984	1800.00	4.30	6.99	38.50	*	208.00	<1
	MP18	Warren Hartman	17800134	5/10/1984	1300.00	3.55	4.80	50.60	*	189.00	<1
	MP18	Warren Hartman	17800134	9/6/1984	*	3.15	10.80	73.80	*	362.00	<1
	MP18	Warren Hartman	17800134	12/11/1984	1500.00	3.45	8.66	41.10	*	261.00	<1
	MP18	Warren Hartman	17800134	3/22/1985	130.00	3.55	10.40	68.80	*	444.00	<1
				Average	569.03	3.46	7.13	49.10	14.72	259.82	0.03
				StDev	496.91	0.35	3.94	18.59	5.10	125.75	0.31

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
MT3A	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/5/1980	50.00	3.70	7.86	4.22	*	241.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	600.00	3.33	15.30	55.70	*	376.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/2/1981	50.00	3.30	25.70	75.60	48.90	548.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	10/1/1981	30.00	3.47	9.00	47.90	*	190.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/9/1981	100.00	3.28	29.60	91.90	*	418.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	2/23/1982	70.00	3.60	18.70	74.10	*	331.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	300.00	3.50	18.80	40.90	*	340.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	10.00	3.05	54.00	59.00	*	622.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	10.00	3.35	6.50	29.80	*	494.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	10.00	3.88	2.93	29.10	*	459.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	20.00	3.50	44.60	98.70	*	583.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	8/30/1983	80.00	3.55	1.54	5.47	*	98.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/8/1983	*	3.20	45.41	101.40	30.59	618.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	175.00	3.55	31.50	80.70	*	445.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	5/10/1984	60.00	3.16	23.10	87.60	*	409.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/11/1984	1000.00	3.36	16.40	63.00	*	334.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/25/1985	120.00	3.54	10.20	62.60	*	278.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	8.00	2.89	61.00	9.70	*	542.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/16/1985	2.00	3.07	66.90	89.50	*	555.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	20.00	3.14	25.90	106.00	*	637.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	150.00	3.36	6.60	38.60	*	253.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	100.00	3.00	37.30	104.00	*	615.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	75.00	2.86	33.20	87.00	*	524.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	225.00	3.30	15.40	52.00	*	382.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	70.00	3.17	32.90	83.10	*	755.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	31.00	2.81	52.60	83.00	*	816.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	330.00	2.53	23.10	72.40	*	520.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/23/1988	36.00	2.90	34.90	85.70	*	710.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	150.00	3.09	46.50	69.30	*	340.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/13/1988	155.00	3.10	48.40	83.70	*	264.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	145.00	3.66	26.60	77.60	*	488.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	305.00	3.66	8.44	46.80	*	352.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	8/30/1989	58.00	3.02	52.50	106.00	*	795.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/19/1989	43.00	3.31	82.10	79.80	*	533.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/13/1990	240.00	3.38	22.80	72.90	*	450.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/8/1990	275.00	3.08	19.20	62.70	*	527.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/20/1990	51.00	3.26	9.60	54.50	*	339.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/19/1990	315.00	3.73	9.25	31.30	*	146.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/26/1991	180.00	3.38	15.40	57.50	*	243.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	22.00	3.24	44.90	81.50	*	383.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/13/1991	21.00	2.98	48.40	79.00	*	319.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	11/26/1991	27.00	2.89	45.10	72.20	*	272.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/19/1992	61.00	3.14	23.10	72.00	*	427.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	5/27/1992	35.00	3.13	31.30	86.30	*	454.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	9/30/1992	38.00	3.11	31.40	70.70	*	318.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/16/1992	42.00	3.23	23.10	63.90	*	415.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	3/25/1993	54.00	3.34	11.90	29.90	*	206.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	7/1/1993	137.00	3.23	17.20	83.40	*	423.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	8/28/1993	80.00	3.30	20.70	64.10	9.25	222.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	10/1/1993	10.00	2.92	35.80	66.60	*	474.00	0.00
	MP19	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	37.00	3.19	20.10	69.80	*	486.00	0.00
	MP6	Warren Hartman	1800134	1/30/1982	*	3.49	8.98	43.70	*	181.00	<1
	MP6	Warren Hartman	1800134	2/23/1982	*	3.48	7.09	37.90	*	264.00	<1
	MP6	Warren Hartman	1800134	3/16/1982	1000.00	3.40	1.52	20.40	*	109.00	<1
	MP6	Warren Hartman	1800134	4/29/1982	450.00	3.73	7.92	55.90	*	323.00	<1
	MP6	Warren Hartman	1800134	5/25/1982	500.00	3.60	5.34	20.50	*	146.00	<1
	MP6	Warren Hartman	1800134	9/7/1982	400.00	4.65	3.98	65.90	*	58.00	<1
	MP6	Warren Hartman	1800134	11/18/1982	50.00	3.45	35.60	68.70	*	244.00	<1

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP6	Warren Hartman	1800134	2/10/1983	250.00	3.95	8.65	56.40	*	213.00	<1
	MP6	Warren Hartman	1800134	5/19/1983	60.00	3.40	29.50	66.00	*	34.00	<1
	MP6	Warren Hartman	1800134	8/4/1983	30.00	3.50	39.90	74.40	*	241.00	<1
	MP6	Warren Hartman	1800134	12/1/1983	80.00	4.00	30.60	53.50	*	112.00	<1
	MP6	Warren Hartman	1800134	2/20/1984	200.00	4.70	16.00	33.00	*	92.00	<1
	MP6	Warren Hartman	1800134	5/10/1984	185.00	3.80	4.44	70.50	*	212.00	<1
	MP6	Warren Hartman	1800134	9/6/1984	*	3.35	19.40	67.50	*	365.00	<1
	MP6	Warren Hartman	1800134	12/11/1984	*	3.75	17.90	54.80	*	326.00	<1
	MP6	Warren Hartman	1800134	3/25/1985	60.00	4.65	11.70	30.40	*	177.00	4.00
	MP13	Sky Haven Coal Inc.	17713099	9/28/1994	*	*	25.50	50.60	18.90	279.00	0.00
	MP13	Sky Haven Coal Inc.	17713099	6/23/1993	*	*	16.90	52.20	17.70	196.00	0.00
	MP13	Sky Haven Coal Inc.	17713099	6/20/1991	*	*	30.90	61.40	25.90	288.00	0.00
				Average	152.87	3.38	25.24	62.63	25.21	368.99	0.07
				StDev	203.32	0.40	17.13	23.76	13.72	179.02	0.54
MT3B	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/1/1980	*	4.10	3.92	4.27	*	33.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	2/12/1981	175.00	6.70	0.40	0.80	*	7.00	4.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	800.00	3.55	3.30	6.20	*	38.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/2/1981	60.00	3.70	9.87	14.00	4.00	114.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/9/1981	200.00	3.68	4.03	12.40	*	63.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	2/23/1982	60.00	4.10	3.97	13.80	*	54.00	1.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	150.00	3.50	13.40	41.80	*	282.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	40.00	3.35	11.60	19.70	*	146.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	20.00	3.45	10.34	20.52	*	133.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	40.00	4.72	2.72	3.26	*	33.00	9.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	100.00	3.85	1.14	23.20	*	181.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	8/30/1983	80.00	3.45	1.40	10.82	*	114.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/8/1983	*	3.20	22.60	53.39	10.36	408.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	160.00	3.85	10.18	13.66	*	91.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	5/10/1984	230.00	3.45	2.45	12.90	*	83.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/11/1984	900.00	3.72	4.43	12.00	*	58.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/25/1985	140.00	4.02	3.64	13.90	*	33.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	20.00	2.84	30.60	70.60	*	472.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	*	4.40	6.10	8.03	2.60	42.00	6.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/16/1985	25.00	3.15	23.80	48.10	*	404.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	15.00	3.20	16.00	41.20	*	360.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	100.00	3.74	2.79	12.50	*	134.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	100.00	3.13	19.70	51.10	*	299.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	75.00	3.00	15.10	44.00	*	341.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	250.00	3.61	5.64	17.60	*	137.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	75.00	3.32	15.50	40.40	*	469.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/2/1987	75.00	3.05	18.40	48.00	*	375.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	8/7/1987	68.00	3.35	8.27	18.80	*	435.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	69.00	2.92	21.70	52.00	*	493.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	400.00	3.66	10.10	29.30	*	205.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/23/1988	45.00	2.99	15.50	68.90	*	503.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	175.00	3.30	16.80	32.10	*	183.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/13/1988	15.00	3.17	35.50	62.70	*	410.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	210.00	3.95	17.80	34.90	*	281.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	892.00	4.53	3.88	12.20	*	58.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	8/30/1989	86.00	3.05	43.20	97.00	*	729.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/19/1989	48.00	3.34	31.20	53.10	*	412.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/13/1990	42.00	3.47	12.00	29.50	*	202.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/8/1990	500.00	3.19	17.70	42.10	*	425.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/20/1990	281.00	3.34	4.62	35.40	*	182.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/19/1990	1015.00	3.74	3.87	12.80	*	65.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/26/1991	515.00	3.58	9.69	25.70	*	90.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	41.00	3.17	34.50	65.00	*	279.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/13/1991	27.00	3.01	49.00	79.10	*	319.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	11/26/1991	41.00	2.90	39.40	60.90	*	233.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/19/1992	184.00	3.32	12.90	24.70	*	236.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	5/27/1992	57.00	3.16	31.70	56.50	*	309.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	9/30/1992	54.00	3.60	20.40	36.30	*	210.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/16/1992	64.00	3.33	14.60	28.60	*	183.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	3/25/1993	130.00	3.70	3.87	9.83	*	71.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	4/28/1993	1115.00	3.73	3.72	8.25	*	92.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	8/24/1993	120.00	3.10	25.00	69.40	14.60	304.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	10/1/1993	27.00	2.97	30.00	52.70	*	419.00	0.00
	MP20	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	53.00	3.22	24.60	38.50	*	234.00	0.00
	MP7	Warren Hartman	1800134	1/30/1982	*	3.57	8.80	44.10	*	191.00	<1
	MP7	Warren Hartman	1800134	2/23/1982	*	3.49	6.56	29.70	*	200.00	<1
	MP7	Warren Hartman	1800134	3/16/1982	2000.00	3.65	2.00	15.30	*	96.00	<1
	MP7	Warren Hartman	1800134	4/29/1982	550.00	3.55	12.20	54.10	*	335.00	<1
	MP7	Warren Hartman	1800134	5/25/1982	1000.00	3.67	3.84	16.90	*	134.00	<1
	MP7	Warren Hartman	1800134	9/7/1982	70.00	3.30	15.90	75.10	*	228.00	<1
	MP7	Warren Hartman	1800134	11/18/1982	150.00	3.35	21.70	62.00	*	250.00	<1
	MP7	Warren Hartman	1800134	2/10/1983	300.00	3.60	9.09	30.90	*	185.00	<1
	MP7	Warren Hartman	1800134	5/19/1983	100.00	3.20	14.90	55.50	*	267.00	<1
	MP7	Warren Hartman	1800134	8/4/1983	80.00	3.15	20.50	82.00	*	366.00	<1
	MP7	Warren Hartman	1800134	12/1/1983	800.00	4.00	6.30	28.20	*	88.00	<1
	MP7	Warren Hartman	1800134	2/20/1984	375.00	4.15	4.44	16.90	*	76.00	<1
	MP7	Warren Hartman	1800134	5/10/1984	750.00	3.85	6.81	27.40	*	129.00	<1
	MP7	Warren Hartman	1800134	9/6/1984	*	4.25	17.50	64.60	*	197.00	<1
	MP7	Warren Hartman	1800134	12/11/1984	650.00	3.65	5.80	22.30	*	94.00	<1
	MP7	Warren Hartman	1800134	3/25/1985	200.00	3.75	4.35	23.40	*	370.00	<1
	MP14	Sky Haven Coal Inc.	17713099	6/20/1991	*	*	37.30	64.00	18.00	244.00	0.00
				Average	268.58	3.55	14.12	35.31	9.91	224.17	0.36
				StDev	365.12	0.55	11.34	22.62	6.63	148.74	1.53
MT4	MP17	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	300.00	3.60	0.20	13.00	*	200.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	11/17/1981	*	3.70	0.53	12.35	15.20	110.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/9/1981	35.00	3.14	0.31	10.40	*	431.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	2/23/1982	10.00	3.90	0.26	8.70	*	304.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	40.00	3.50	0.52	15.20	*	198.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	15.00	3.30	0.64	14.82	*	158.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	1.00	3.40	0.40	15.42	*	132.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	10.00	3.80	0.40	13.70	*	184.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	40.00	3.75	0.72	20.80	*	256.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	8/30/1983	5.00	3.60	0.71	17.66	*	184.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	11/8/1983	10.00	3.50	0.62	18.18	*	255.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	60.00	3.65	0.35	11.20	*	148.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	5/10/1984	225.00	3.68	0.32	15.10	*	155.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/6/1984	6.00	3.58	0.76	17.80	*	225.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/13/1984	570.00	3.72	0.25	10.10	*	171.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/8/1985	*	3.80	*	15.47	18.05	148.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/25/1985	70.00	3.69	0.23	10.50	*	42.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	3.00	3.44	0.46	18.00	*	231.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	5.00	3.48	0.51	18.70	*	225.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	*	3.70	0.33	7.77	3.89	56.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	*	3.72	0.40	22.70	*	304.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	100.00	4.20	0.20	5.91	*	57.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	5.00	3.71	0.77	20.30	*	247.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	10.00	3.44	0.95	23.40	*	249.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	25.00	3.74	0.34	11.50	*	142.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	*	3.82	0.49	16.70	*	304.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/2/1987	7.00	3.45	0.65	19.00	*	215.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/17/1987	*	3.60	0.79	17.80	15.00	132.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	8/7/1987	3.00	3.78	1.23	19.70	*	215.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/29/1987	*	3.60	1.08	28.70	24.00	222.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	2.00	3.34	0.65	19.30	*	183.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	37.00	3.65	0.48	15.60	*	254.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/30/1988	1.00	3.65	0.81	24.90	*	326.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	12.00	3.63	0.81	16.30	*	158.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/14/1988	5.00	3.78	0.61	6.18	*	211.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	22.00	3.91	0.78	14.70	*	185.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	139.00	3.76	0.47	12.80	*	95.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/19/1989	*	3.83	0.52	16.90	*	114.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/13/1990	38.00	3.78	0.53	11.80	*	179.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/13/1990	20.00	3.58	0.83	13.60	*	147.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/19/1990	19.00	3.73	0.58	13.40	*	97.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/4/1990	116.00	3.70	0.20	5.37	*	61.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/12/1991	78.00	3.73	0.55	15.30	*	176.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	1.00	3.63	1.07	24.40	*	229.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	11/22/1991	9.00	3.70	0.32	14.10	*	122.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/24/1991	*	3.70	0.34	15.60	12.40	150.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/13/1992	24.00	3.64	0.51	11.30	*	154.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	5/21/1992	*	3.70	0.50	18.60	22.40	184.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	5/22/1992	7.00	3.60	0.53	18.60	*	177.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/10/1992	*	3.60	0.77	20.90	22.30	144.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	9/29/1992	9.00	3.56	0.55	14.80	*	175.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/15/1992	17.00	3.69	0.65	13.90	*	157.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/23/1993	18.00	3.90	0.54	9.33	*	75.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	3/29/1993	*	4.00	0.30	5.39	7.88	54.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	4/28/1993	133.00	3.76	0.39	10.20	*	151.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	10/1/1993	54.00	3.55	0.51	17.90	*	203.00	0.00
	MP17	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	12.00	3.73	0.42	17.00	*	216.00	0.00
				Average	51.73	3.66	0.55	15.24	15.68	180.30	0.00
				StDev	99.39	0.17	0.23	4.98	6.85	73.91	0.00
MT5	MTTR5.0	SRBC Monitoring		2/13/2001	901.25	4.10	0.30	1.03	1.50	17.00	5.00
	MTTR5.0	SRBC Monitoring		4/9/2001	679.08	3.85	0.30	1.32	1.99	18.80	5.80
	MTTR5.0	SRBC Monitoring		5/15/2001	211.40	3.80	3.24	7.60	8.73	28.00	0.00
	MTTR5.0	SRBC Monitoring		6/26/2001	1017.95	3.95	0.30	1.17	1.72	60.40	5.80
	MTTR5.0	SRBC Monitoring		8/6/2001	64.18	3.40	0.41	5.31	5.48	94.80	0.00
	MTTR5.0	SRBC Monitoring		8/27/2001	364.00	3.05	0.30	5.29	5.30	76.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	10/25/2001	*	4.50	0.65	2.94	2.47	58.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	9/11/1997	*	*	1.00	5.71	5.46	70.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	9/27/1995	*	*	<0.3	9.64	4.83	58.00	3.80
	MP5	Sky Haven Coal Inc.	4574SM33	6/30/1995	*	*	0.43	*	*	34.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	12/13/1994	*	*	0.34	1.08	1.38	22.00	7.40
	MP5	Sky Haven Coal Inc.	4574SM33	10/29/1993	*	*	0.89	5.97	5.73	68.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	6/22/1993	*	*	0.34	3.87	3.91	32.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	3/31/1993	*	*	0.71	0.95	2.12	14.80	9.00
	MP5	Sky Haven Coal Inc.	4574SM33	9/11/1992	*	*	0.50	5.27	4.69	40.00	0.00
	MP5	Sky Haven Coal Inc.	4574SM33	5/22/1992	*	*	<0.3	2.13	2.79	19.60	4.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/9/1974	*	4.60	0.14	*	*	14.00	6.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/11/1979	*	4.44	0.30	2.40	*	30.60	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/19/1980	*	4.15	0.70	1.30	*	71.60	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/26/1980	*	3.63	0.10	2.50	*	64.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/9/1980	350.00	3.83	0.10	4.70	*	39.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	10/8/1980	*	4.40	0.11	4.31	2.28	22.00	4.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/5/1980	125.00	4.60	0.10	3.00	*	29.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	1/27/1981	*	3.88	0.20	2.90	*	28.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	4/23/1981	250.00	4.30	0.10	1.50	*	19.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/12/1981	*	4.70	0.18	0.73	0.72	28.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/30/1981	30.00	4.70	0.60	1.40	0.69	34.00	6.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	7/13/1981	200.00	4.23	0.22	3.62	*	29.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/17/1981	*	4.40	0.13	2.16	2.49	30.00	5.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/9/1981	100.00	4.50	0.12	2.34	*	22.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	2/23/1983	250.00	4.95	0.13	1.54	*	29.00	12.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	4/22/1982	400.00	3.95	0.16	2.37	*	41.00	1.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	8/2/1982	100.00	3.65	0.08	3.29	*	60.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	10/25/1982	65.00	3.85	0.12	3.67	*	38.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	2/8/1983	100.00	4.60	0.13	1.42	*	24.00	7.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/19/1983	240.00	4.38	0.29	2.12	*	33.00	5.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	8/30/1983	80.00	4.10	0.18	6.31	*	104.00	4.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/8/1983	120.00	3.90	0.48	3.86	*	58.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/7/1984	175.00	4.30	0.11	2.20	*	31.00	5.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/10/1984	675.00	4.76	0.07	14.69	*	19.00	12.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/13/1984	1200.00	4.37	0.08	2.13	*	22.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/25/1985	350.00	4.34	0.10	1.65	*	12.00	7.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/25/1985	40.00	3.94	0.07	3.70	*	39.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/11/1985	25.00	3.85	0.39	5.67	*	48.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/30/1985	*	3.28	0.17	3.02	*	41.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/11/1986	750.00	4.30	0.14	1.21	*	24.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/15/1986	250.00	4.12	0.09	2.87	*	36.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	7/31/1986	550.00	3.83	0.25	3.54	*	35.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/13/1986	375.00	4.27	0.11	1.41	*	23.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	2/4/1987	3000.00	5.55	0.02	0.04	*	3.00	3.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/2/1987	205.00	3.81	0.15	3.11	*	35.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	8/7/1987	80.00	4.26	0.41	3.54	*	45.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/11/1987	110.00	3.71	0.28	3.92	*	46.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/15/1988	580.00	4.23	0.13	1.56	*	38.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/30/1988	10.00	4.56	0.20	3.52	*	33.00	2.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/19/1988	450.00	3.95	0.46	4.57	*	41.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/14/1988	200.00	4.17	0.36	3.08	*	40.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/14/1989	395.00	4.07	0.26	2.10	*	34.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/5/1989	1678.00	4.29	0.57	1.69	*	29.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	8/30/1989	25.00	3.87	0.40	7.13	*	57.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/19/1989	*	3.97	0.46	3.87	*	56.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/13/1990	725.00	4.14	0.18	1.76	*	52.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/13/1990	900.00	4.24	0.51	1.49	*	25.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/19/1990	303.00	4.03	0.46	3.47	*	32.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/4/1990	1840.00	4.42	0.36	1.17	*	19.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/12/1991	960.00	4.35	0.48	1.74	*	36.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/6/1991	57.00	4.13	0.18	3.83	*	37.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/12/1991	9.00	4.05	0.26	10.20	*	68.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	11/22/1991	540.00	3.75	0.61	4.77	*	56.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/13/1992	629.00	4.18	0.22	1.38	*	44.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/21/1992	*	4.20	0.30	2.13	2.79	19.60	4.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	5/22/1992	308.00	4.08	0.28	2.13	*	22.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/10/1992	*	3.90	0.50	5.27	2.69	40.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	9/29/1992	138.00	3.87	0.33	3.30	*	56.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/15/1992	124.00	3.88	0.63	2.65	*	32.00	*
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/23/1993	210.00	4.67	0.27	1.39	*	18.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	3/29/1993	*	4.50	0.71	0.94	2.12	14.80	9.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	4/28/1993	513.00	4.60	0.42	1.38	*	22.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	6/23/1993	*	3.90	0.34	3.87	3.91	32.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	10/1/1993	55.00	3.58	0.90	7.47	*	61.00	0.00
	MP5	Sky Haven Coal Inc.	Otto #1 Report	12/29/1993	*	4.66	0.42	2.79	*	25.00	1.00
				Average	430.03	4.16	0.35	3.29	3.30	37.74	2.79
				StDev	527.56	0.40	0.39	2.38	1.96	18.79	3.46

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
D1	MP29	Shale Hill Coal Co.	17850106	12/31/1991	*	4.80	<0.3	0.17	<0.5	15.40	5.00
	MP29	Shale Hill Coal Co.	17850106	6/4/1991	*	5.00	<0.3	0.11	<0.5	4.80	6.00
	MP29	Shale Hill Coal Co.	17850106	11/26/1990	*	5.00	<0.3	0.10	<0.5	6.20	6.00
	MP29	Shale Hill Coal Co.	17850106	11/1/1990	*	5.00	<0.3	0.18	<0.5	22.00	7.00
	MP29	Shale Hill Coal Co.	17850106	9/24/1990	*	4.90	0.39	0.20	0.56	3.80	6.00
				Average	*	4.94	0.39	0.15	0.56	10.44	6.00
				StDev	*	0.09	*	0.04	*	7.94	0.71
D2	MP10	Shale Hill Coal Co.	17850106	3/13/2001	*	*	<0.3	1.75	1.46	3.60	10.40
	MP10	Shale Hill Coal Co.	17850106	6/23/1999	*	*	<0.3	1.72	<0.5	0.00	14.40
	MP10	Shale Hill Coal Co.	17850106	12/9/1997	*	*	<0.3	4.04	0.84	8.20	14.80
	MP10	Shale Hill Coal Co.	17850106	9/23/1997	*	*	<0.3	1.12	<0.5	3.40	15.80
	MP10	Shale Hill Coal Co.	17850106	5/27/1997	*	*	<0.3	2.15	<0.5	8.20	16.00
	MP10	Shale Hill Coal Co.	17850106	1/31/1997	*	*	<0.3	2.77	<0.5	11.40	18.00
	MP10	Shale Hill Coal Co.	17850106	8/28/1996	*	*	<0.3	2.84	<0.5	9.40	15.80
	MP10	Shale Hill Coal Co.	17850106	5/15/1996	*	*	0.04	4.54	0.84	4.60	13.00
	MP10	Shale Hill Coal Co.	17850106	2/28/1996	*	*	<0.3	3.64	0.69	6.40	10.80
	MP10	Shale Hill Coal Co.	17850106	6/30/1995	*	*	<0.3	2.68	<0.5	0.00	22.00
	MP10	Shale Hill Coal Co.	17850106	3/22/1995	*	*	<0.3	3.46	0.51	0.00	18.60
	MP10	Shale Hill Coal Co.	17850106	12/13/1994	*	*	<0.3	2.18	0.57	14.20	16.20
	MP10	Shale Hill Coal Co.	17850106	9/27/1994	*	*	<0.3	2.17	<0.5	0.00	24.00
	MP10	Shale Hill Coal Co.	17850106	6/29/1994	*	*	<0.3	2.20	<0.5	0.00	19.60
	MP10	Shale Hill Coal Co.	17850106	12/21/1993	*	*	<0.3	7.02	0.93	22.00	14.60
	MP10	Shale Hill Coal Co.	17850106	9/24/1993	*	*	0.68	2.24	0.69	1.80	10.00
	MP10	Shale Hill Coal Co.	17850106	6/8/1993	*	*	<0.3	3.62	0.67	0.00	20.00
	MP10	Shale Hill Coal Co.	17850106	5/18/1993	*	5.50	<0.01	0.06	0.22	5.80	13.00
	MP10	Shale Hill Coal Co.	17850106	2/10/1993	*	*	<0.3	4.77	0.61	2.20	16.00
	MP10	Shale Hill Coal Co.	17850106	10/21/1992	*	*	<0.3	2.72	<0.5	5.40	30.00
	MP10	Shale Hill Coal Co.	17850106	7/22/1992	30.00	*	<0.3	4.77	1.18	11.60	10.00
	MP10	Shale Hill Coal Co.	17850106	5/13/1992	*	*	<0.3	5.32	1.07	1.40	15.00
	MP10	Shale Hill Coal Co.	17850106	3/24/1992	*	*	<0.3	1.00	<0.5	0.00	50.00
	MP10	Shale Hill Coal Co.	17850106	9/24/1991	*	*	<0.3	1.66	1.06	19.20	26.00
	MP10	Shale Hill Coal Co.	17850106	12/27/1991	*	*	<0.3	2.09	1.54	12.60	22.00
	MP10	Shale Hill Coal Co.	17850106	7/23/1991	*	*	<0.3	1.62	0.78	22.00	32.00
	MP10	Shale Hill Coal Co.	17850106	5/23/1991	*	*	<0.3	2.66	0.69	0.00	24.00
	MP10	Shale Hill Coal Co.	17850106	11/23/1990	*	*	<0.3	3.46	2.35	18.60	12.00
	MP10	Shale Hill Coal Co.	17850106	10/31/1990	*	*	<0.3	6.34	2.63	46.00	10.00
	MP10	Shale Hill Coal Co.	17850106	9/24/1990	*	*	<0.3	3.55	2.87	15.80	11.00
				Average	30.00	5.50	0.36	3.01	1.11	8.46	18.17
				StDev	*	*	0.45	1.57	0.72	10.01	8.39
D3	MP15	Shale Hill Coal Co.	17850106	12/21/1993	*	*	<0.3	1.88	0.62	22.00	7.00
	MP15	Shale Hill Coal Co.	17850106	6/8/1993	*	*	<0.3	2.76	2.34	22.00	8.00
	MP15	Shale Hill Coal Co.	17850106	5/18/1993	3.00	5.50	0.31	2.82	3.67	26.00	11.00
	MP15	Shale Hill Coal Co.	17850106	2/10/1993	*	*	<0.3	2.32	2.24	19.80	9.00
	MP15	Shale Hill Coal Co.	17850106	10/21/1992	*	*	<0.3	1.99	<0.5	17.80	10.00
	MP15	Shale Hill Coal Co.	17850106	7/22/1992	10.00	*	<0.3	2.61	2.40	24.00	7.00
	MP15	Shale Hill Coal Co.	17850106	5/13/1992	*	*	<0.3	1.97	1.92	16.60	26.00
	MP15	Shale Hill Coal Co.	17850106	4/8/1992	5.00	*	<0.3	2.44	2.66	16.40	8.00
				Average	6.00	5.50	0.31	2.35	2.26	20.58	10.75
				StDev	3.61	*	*	0.37	0.91	3.52	6.32
D4	MP18	Sky Haven Coal Inc.	Otto #1 Report	3/25/1981	8.00	3.00	6.30	33.80	*	184.00	0.00
	MP18	Sky Haven Coal Inc.	Otto #1 Report	9/8/1983	*	3.20	6.94	52.63	11.64	370.00	0.00
	MP18	Sky Haven Coal Inc.	Otto #1 Report	3/23/1988	5.00	3.10	34.50	86.90	24.40	344.00	0.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP18	Sky Haven Coal Inc.	Otto #1 Report	8/24/1993	3.00	2.90	22.00	78.30	20.40	384.00	0.00
				Average	5.33	3.05	17.44	62.91	18.81	320.50	0.00
				StDev	2.52	0.13	13.49	24.26	6.53	92.50	0.00
D5	MP13	Shale Hill Coal Co.	17850106	12/27/1991	*	*	0.45	1.34	3.04	46.00	0.00
	MP13	Shale Hill Coal Co.	17850106	7/23/1991	*	*	1.43	1.35	1.87	36.00	0.00
	MP13	Shale Hill Coal Co.	17850106	5/23/1991	*	*	0.87	0.76	1.62	22.00	0.00
	MP13	Shale Hill Coal Co.	17850106	9/24/1990	*	*	1.20	0.75	1.79	20.00	2.00
				Average	*	*	0.99	1.05	2.08	31.00	0.50
				StDev	*	*	0.43	0.34	0.65	12.27	1.00
D6	MP16	Shale Hill Coal Co.	17850106	9/24/1993	*	*	1.11	2.58	3.22	32.00	6.00
	MP16	Shale Hill Coal Co.	17850106	3/24/1992	*	*	<0.3	1.31	1.52	26.00	3.00
	MP16	Shale Hill Coal Co.	17850106	12/27/1991	*	*	0.37	1.94	2.80	40.00	0.00
	MP16	Shale Hill Coal Co.	17850106	9/24/1991	*	*	0.81	2.36	2.67	34.00	0.00
	MP16	Shale Hill Coal Co.	17850106	7/23/1991	*	*	0.54	1.71	1.80	34.00	0.00
	MP16	Shale Hill Coal Co.	17850106	5/23/1991	*	*	<0.3	0.94	1.52	22.00	0.00
	MP16	Shale Hill Coal Co.	17850106	11/23/1990	*	*	0.35	1.09	1.60	22.00	0.00
	MP16	Shale Hill Coal Co.	17850106	10/31/1990	*	*	0.40	1.12	1.69	36.00	1.00
	MP16	Shale Hill Coal Co.	17850106	9/24/1990	*	*	0.58	1.14	1.46	18.80	0.00
	MP16	Shale Hill Coal Co.	17850106	1/26/1990	*	*	<0.3	0.71	2.14	36.00	0.00
				Average	*	*	0.59	1.49	2.04	30.08	1.00
				StDev	*	*	0.28	0.63	0.63	7.28	2.00
D7	MP11		4574SM33	3/10/1997	14	3.70	0.97	70.70	*	266	<1
	MP11		4574SM33	6/6/1997	10	3.67	1.15	72.90	*	265	<1
	MP11		4574SM33	8/26/1997	9	3.64	1.86	89.70	*	252	<1
	MP11		4574SM33	11/21/1997	5	3.69	1.00	72.30	*	264	<1
	MP11		4574SM33	3/6/1998	10	3.66	0.83	71.00	*	311	<1
	MP11		4574SM33	6/8/1998	12	3.62	1.04	79.20	*	326	<1
	MP11		4574SM33	8/24/1998	5	3.49	1.82	105.00	*	427	<1
	MP11		4574SM33	11/9/1998	5	3.48	2.61	78.80	*	358	<1
	MP11		4574SM33	2/22/1999	31	3.64	0.92	76.00	*	291	<1
	MP11		4574SM33	6/14/1999	15	3.62	1.80	84.20	*	300	<1
	MP11		4574SM33	8/25/1999	8	3.37	2.41	75.60	*	322	<1
	MP11		4574SM33	11/8/1999	10	3.64	2.52	68.10	*	274	<1
	MP11		4574SM33	3/1/2000	27	3.70	1.19	53.50	*	260	<1
	MP11		4574SM33	5/15/2000	14	3.65	1.08	66.30	*	304	<1
	MP11		4574SM33	8/14/2000	22	3.68	1.12	60.00	*	305	<1
	MP11		4574SM33	11/7/2000	16	3.60	2.36	60.50	*	224	<1
				Average	13.31	3.62	1.54	73.99	*	296.81	<1
				StDev	7.64	0.09	0.64	12.34	*	48.14	0.00
D8	MP12		4574SM33	3/10/1997	5	3.90	0.85	70.50	*	249	0
	MP12		4574SM33	6/6/1997	4	3.90	1.07	67.30	*	245	0
	MP12		4574SM33	8/26/1997	2	4.30	1.49	78.30	*	246	0
	MP12		4574SM33	11/21/1997	3	4.00	0.96	75.20	*	264	0
	MP12		4574SM33	3/6/1998	5	3.60	0.73	62.40	*	303	0
	MP12		4574SM33	6/8/1998	6	3.70	1.06	74.70	*	314	0
	MP12		4574SM33	8/23/1996	3	3.90	1.69	74.10	*	266	0
	MP12		4574SM33	12/11/1996	4	3.60	1.03	66.80	*	284	0
	MP12		4574SM33	3/10/1997	5	3.90	0.85	70.50	*	249	0
	MP12		4574SM33	6/6/1997	4	3.90	1.07	67.30	*	245	0
	MP12		4574SM33	8/26/1997	2	4.30	1.49	78.30	*	246	0
	MP12		4574SM33	11/21/1997	3	4.00	0.96	75.20	*	264	0

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	MP12		4574SM33	3/6/1998	5	3.60	0.73	62.40	*	303	0
	MP12		4574SM33	6/8/1998	6	3.70	1.06	74.70	*	314	0
	MP12		4574SM33	8/24/1998	2	3.60	1.25	81.90	*	414	0
	MP12		4574SM33	11/9/1998	1	3.40	1.61	79.30	*	283	0
	MP12		4574SM33	2/22/1999	14	3.60	1.03	74.30	*	292	0
	MP12		4574SM33	6/14/1999	7	3.60	1.49	88.20	*	294	0
	MP12		4574SM33	8/25/1999	2	3.60	1.38	66.90	*	295	0
	MP12		4574SM33	11/8/1999	1	3.50	2.04	60.80	*	268	0
	MP12		4574SM33	3/1/2000	7	3.70	1.03	53.60	*	244	0
	MP12		4574SM33	5/15/2000	8	3.67	1.12	63.70	*	286	0
	MP12		4574SM33	8/14/2000	9	3.68	1.00	58.40	*	288	0
	MP12		4574SM33	11/7/2000	8	3.60	1.40	58.40	*	277	0
				Average	4.83	3.76	1.18	70.13	*	280.54	0.00
				StDev	3.00	0.23	0.33	8.45	*	36.62	0.00
D11	MP07	E.M. Brown Inc.	17810140	9/8/1988	*	*	0.50	4.38	3.34	38.00	3.00
	MP07	E.M. Brown Inc.	17810140	6/7/1988	*	*	<0.3	2.59	2.94	46.00	0.00
	MP07	E.M. Brown Inc.	17810140	11/17/1987	*	*	12.60	4.50	6.40	44.00	2.00
	MP07	E.M. Brown Inc.	17810140	7/20/1987	*	*	1.26	3.19	3.69	48.00	2.00
	MP07	E.M. Brown Inc.	17810140	6/9/1987	*	*	<0.3	4.21	4.56	66.00	4.00
	MP07	E.M. Brown Inc.	17810140	2/11/1987	*	*	0.44	4.03	4.38	64.00	3.00
	MP07	E.M. Brown Inc.	17810140	11/13/1986	*	*	<0.3	1.54	1.71	30.00	5.00
	MP07	E.M. Brown Inc.	17810140	2/21/1986	*	*	<0.3	1.17	1.86	16.00	4.00
	MP07	E.M. Brown Inc.	17810140	10/30/1985	*	*	3.07	5.57	4.39	58.00	3.00
	MP07	E.M. Brown Inc.	17810140	10/3/1985	*	*	0.69	3.64	8.33	36.00	2.00
				Average	*	*	3.09	3.48	4.16	44.60	2.80
				StDev	*	*	4.76	1.38	2.01	15.55	1.40
SRP1	MP24	SRP Coal Co.	17850145	8/30/2001	*	6.80	0.89	0.87	<0.5	0.00	60.00
	MP24	SRP Coal Co.	17850145	5/31/2001	15.00	6.20	<0.3	1.11	<0.5	0.00	32.00
	MP24	SRP Coal Co.	17850145	3/30/2001	*	5.10	0.72	2.29	3.60	9.20	10.20
	MP24	SRP Coal Co.	17850145	8/28/2000	10.00	6.50	0.71	1.51	0.81	0.00	40.00
	MP24	SRP Coal Co.	17850145	5/19/2000	25.00	6.40	0.16	1.53	<0.2	0.00	30.00
	MP24	SRP Coal Co.	17850145	2/29/2000	20.00	4.60	<0.3	2.81	4.11	22.00	8.40
	MP24	SRP Coal Co.	17850145	11/18/1999	15.00	6.40	<0.3	0.57	<0.5	0.00	64.00
	MP24	SRP Coal Co.	17850145	9/15/1999	15.00	6.80	<0.3	0.43	<0.5	0.00	114.00
	MP24	SRP Coal Co.	17850145	6/10/1999	15.00	6.60	<0.3	0.80	<0.5	0.00	60.00
	MP24	SRP Coal Co.	17850145	8/27/1998	15.00	7.30	<0.3	0.66	<0.5	0.00	138.00
	MP24	SRP Coal Co.	17850145	5/14/1998	80.00	5.10	<0.3	1.77	1.83	12.40	13.20
	MP24	SRP Coal Co.	17850145	2/11/1998	10.00	6.10	<0.3	1.61	1.48	0.00	20.00
	MP24	SRP Coal Co.	17850145	12/9/1997	*	6.00	<0.3	1.83	2.27	0.00	22.00
	MP24	SRP Coal Co.	17850145	11/21/1996	20.00	6.40	0.13	1.46	1.20	3.80	52.00
	MP24	SRP Coal Co.	17850145	7/24/1996	*	5.90	0.18	2.56	2.74	10.00	18.80
	MP24	SRP Coal Co.	17850145	6/26/1996	*	5.40	<0.3	2.78	3.10	20.00	11.00
	MP24	SRP Coal Co.	17850145	12/15/1995	*	6.40	<0.3	2.44	2.46	0.00	40.00
	MP24	SRP Coal Co.	17850145	9/6/1995	*	7.40	0.38	0.42	<0.5	0.00	236.00
	MP24	SRP Coal Co.	17850145	3/21/1995	*	6.90	<0.3	2.47	1.06	0.00	52.00
	MP24	SRP Coal Co.	17850145	10/29/1994	*	4.20	<0.3	3.26	2.69	96.00	4.80
				Average	21.82	6.13	0.45	1.66	2.28	8.67	51.32
				StDev	19.78	0.86	0.32	0.88	1.04	21.70	55.54
SRP2	effluent	SRP Coal Co.	17803108	7/29/1997	20.00	3.90	0.43	37.50	16.00	230.00	0.00
	effluent	SRP Coal Co.	17803108	6/26/1996	3.00	4.50	0.55	36.50	19.90	210.00	12.20
	effluent	SRP Coal Co.	17803108	4/26/1995	*	4.40	0.87	38.80	27.40	240.00	11.20
	effluent	SRP Coal Co.	17803108	12/21/1993	*	4.50	0.84	28.00	26.50	212.00	14.00
	effluent	SRP Coal Co.	17803108	12/23/1992	*	9.10	0.31	3.00	2.25	0.00	92.00

TMDL Point	Location	Company	Permit #	Date	Flow, GPM	pH	Iron, mg/l	Manganese, mg/l	Aluminum, mg/l	Acidity, mg/l	Alkalinity, mg/l
	effluent	SRP Coal Co.	17803108	11/13/1992	*	7.10	<0.3	0.93	0.55	0.00	44.00
	effluent	SRP Coal Co.	17803108	4/15/1992	*	10.10	<0.3	0.32	<0.5	0.00	64.00
	effluent	SRP Coal Co.	17803108	2/4/1992	*	10.30	<0.3	0.38	<0.5	0.00	254.00
				Average	11.50	6.74	0.60	18.18	15.43	111.50	61.43
				StDev	12.02	2.76	0.25	18.50	11.67	119.57	83.92

Attachment H
Comment and Response

No comments were received on this TMDL document during the public comment period.