FINAL

LITTLE DEER CREEK WATERSHED TMDL
Allegheny County

For Acid Mine Drainage Affected Segments

Prepared by:

Pennsylvania Department of Environmental Protection

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TMDL[1]
Little Deer Creek Watershed
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Introduction

This report presents the Total Maximum Daily Loads (TMDLs) developed for segments in the Little Deer Creek Watershed (Attachments A). These were done to address the impairments noted on the 1996 Pennsylvania Section 303(d) list of impaired waters, required under the Clean Water Act, and covers one segment on this list (shown in Table 1). High levels of metals caused these impairments. All impairments resulted from acid drainage from abandoned coalmines. The TMDL addresses the three primary metals associated with acid mine drainage (iron, manganese, and aluminum). Construction as a source of impairment no longer exists. All construction activities occurring at the time of the assessment have been completed; therefore, a TMDL to address impairments resulting from construction is no longer necessary.

Table 1. 303(d) Sub-List
State Water Plan (SWP) Subbasin: 18-A Deer Creek

Year	Miles	Segment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	5.1	NA	42289	Little Deer Creek	TSF	305(b) Report	RE	Metals
1998	7.82	New assessment; new survey id. 970801-1100-TVP	42289	Little Deer Creek	TSF	UP	Construction	Turbidity, Siltation, & Flow Alterations
							AMD	Salinity/TDS/ Chlorides & Metals
							Subsurface Mining	Salinity/TDS/ Chlorides
2002	No additional assessment.							

Resource Extraction=RE
Trout Stocking=TSF
Unassessed Project=UP
Abandoned Mine Drainage = AMD

See Attachment D, *Excerpts Justifying Changes Between the 1996, 1998, and 2002 Section 303(d) Lists.*

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

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

Directions to the Little Deer Creek Watershed

The Little Deer Creek Watershed is located in the north-northwestern portion of Allegheny County in southwestern Pennsylvania. The watershed lies within the New Kensington West United States Geological Survey topographic map 7.5- Minute Quadrangle. Most of the watershed is privately held and is partially forested. Land uses within the 14 square mile watershed include rural residential properties, industrial development, minor agricultural areas, and abandoned mine lands. The area sampled encompasses the lower half of the watershed. The remainder of the information presented in this report pertains to the impaired portion of the watershed area rather than the entire watershed.

The villages of Harmar Heights, Rural Ridge and Russelton lie within or adjacent to the watershed boundary. Access to the watershed is gained by taking Interstate I-76 (Turnpike) to the Harmarville Exit (old Exit 5). From the tollbooths, bear left onto Pittsburgh Street (heading toward Cheswick). Parallel the river, heading north, for approximately one mile to the first stoplight. Turn left onto Pearl Street and proceed north for approximately 1.5 to 2 miles to the village of Harmar Heights. At the stop sign, proceed straight ahead onto Russelton Road. Russelton Road essentially parallels the main stem of Little Deer Creek for several miles.

Little Deer Creek drains into Deer Creek approximately 2.2 miles upstream of the confluence of Deer Creek and the Allegheny River at Harmarville. The Allegheny River at this point supports recreational uses such as boating and some fishing.

The watershed area is located in the Pittsburgh Low Plateau Section of the Appalachian Plateaus Physiographic Province. The plateau is strongly dissected by stream valleys, of which Little Deer Creek is a good example. The position of the Allegheny River has helped determine base level for local groundwater systems. The mouth of Little Deer Creek lies at an elevation of approximately 780’ MSL. The areas of highest elevation within the impaired area lie north of Rural Ridge at approximately 1250’ MSL; for the entire watershed, the highest elevations lie north and east of Curtissville at elevations ranging between 1250’ and 1280’ MSL.

Segments addressed in this TMDL

There was one active Government Financed Construction Contract (GFCC) mining operation in the watershed, GFCC number 02-99-01, ACV Power Corp. Russellton South Site; however, all coal reprocessing is complete and the site has been reclaimed. All of the discharges in the watershed are from abandoned mines and are treated as non-point sources. Each segment on the Section 303(d) list is addressed as a separate TMDL. These TMDLs are expressed as long-term, average loadings. Due to the nature and complexity of mining effects on the watershed, expressing the TMDL as a long-term average gives a better representation of the data used for the calculations. See Attachment C for TMDL calculations.

Clean Water Act Requirements

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

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

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

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

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

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

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

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

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

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

Section 303(d) Listing Process

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

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

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

After the survey is completed, the biologist determines the status of the stream segment. The decision is based on habitat scores and a series of narrative biological statements used to evaluate the benthic macroinvertebrate community. If the stream is determined to be impaired, the source and cause of the impairment is documented. An impaired stream must be listed on the state's Section 303(d) list with the source and cause. A TMDL must be developed for the stream segment and each pollutant. In order for the process to be more effective, adjoining stream segments with the same source and cause listing are addressed collectively, and on a watershed basis.

Basic Steps for Determining a TMDL

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

1. Collection and summarization of pre-existing data (watershed characterization, inventory contaminant sources, determination of pollutant loads, etc.);
2. Calculating the TMDL for the waterbody using EPA approved methods and computer models;
3. Allocating pollutant loads to various sources;

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

4. Determining critical and seasonal conditions;
5. Public review and comment and comment period on draft TMDL;
6. Submittal of final TMDL; and
7. EPA approval of the TMDL.

Watershed History

The Little Deer Creek Watershed reflects the hydrologic impacts by past surface and deep mining operations. In addition, field studies show that intermittent logging has been continuous for at least the last century. Deep mining on the Upper Freeport coal seam took place beneath the entire watershed. Small-scale deep mines and surface mines on the overlying Pittsburgh coal seam lie scattered across much of the watershed area. The Pittsburgh seam acts as a cap seam at the higher elevations (ridge tops) while the Upper Freeport seam lies 100 to 400 feet below Little Deer Creek. Several abandoned coal refuse piles and several completed coal refuse reprocessing operations lie within the Little Deer Creek Watershed between Rural Ridge and Russelton. All of the deep mining operations have been abandoned for over a decade; much of the abandoned Freeport deep mines are flooded. A small-scale shale and clay surface mining operation lies just west of the confluence of the stream and Deer Creek. There are no NPDES discharges from the site to Little Deer Creek.

There are no known large-scale discharges present from the abandoned surface and deep mining within the watershed area. There are small-scale discharges located within the watershed. The sources of these discharges are the abandoned deep mines in the area or from the existing coal refuse piles. The mine drainage within portions of the receiving stream and its tributaries is related to these abandoned mine discharges in addition to small contributions of mine drainage from the small abandoned cap seam Pittsburgh mines along the tributaries and outer reaches of the watershed. The main stem of Little Deer Creek shows an increase in alkalinity and a decrease in overall metals concentrations when the upstream to downstream monitoring points are compared. Most of the tributaries reveal impacts from mine drainage as shown by variable metals.

The southern end of the southern half of the watershed has become moderately industrialized with medium and large-scale factories present. A portion of the southern watershed area also has a moderate population of residences, due to the expansion of the population from Pittsburgh into the adjacent rural areas.

AMD Methodology

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

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

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

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

PR = required percent reduction for the current iteration

Cc = criterion in mg/l

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

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

Mean = average observed concentration

Standard Deviation = standard deviation of observed data

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

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

LTA = Mean * (1 – PR99) where (2)

LTA = allowable LTA source concentration in mg/l

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

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

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

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

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

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

TMDL Endpoints

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

Because most of the pollution sources in the watershed are nonpoint sources, the TMDLs' component makeup will be Load Allocations (LAs). All allocations will be specified as long-term average daily concentrations. These long-term average concentrations are expected to meet water-quality criteria 99% of the time as required in PA Title 25 Chapter 96.3(c). The following table shows the applicable water-quality criteria for the selected parameters.

Table 2. Applicable Water Quality Criteria

Parameter	*Criterion Value (mg/l)*	*Total Recoverable/Dissolved*
Aluminum (Al)	0.75	Total Recoverable
Iron (Fe)	1.50	30 day average; Total Recoverable
Manganese (Mn)	1.00	Total Recoverable
pH *	6.0-9.0	N/A
TDS	500	Total Recoverable

*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.

Total Dissolved Solids

The cause of Salinity/TDS/Chlorides as listed on the 1998 PA Section 303(d) list is Total Dissolved Solids (TDS). Due to Title 25 Chapter 96.3(d), which requires the water quality criterion be met at the point of potable water withdrawal, a TMDL to address TDS is not necessary. The nearest potable water withdrawal to Little Deer Creek occurs approximately 3 miles downstream of the mouth at the Oakmont Borough Municipal Authority (PWSID #5020036) on the Allegheny River. TDS data from WQN0801, located on the Allegheny River at the Hulton Highway Bridge approximately 3.5 miles downstream of the mouth of Little Deer Creek, shows that the TDS criterion of 500 mg/L is not exceeded. The average TDS concentration calculated from 10 years of WQN TDS data is 182.28 mg/L. In addition, Monte-Carlo simulation determines that the 99th percentile value is 421 mg/L, which ensures the standard is met 99 percent of the time. A map of the water supply intake and WQN Station is located in Appendix A and TDS data for the WQN Station is located in Appendix E.

TMDL Elements (WLA, LA, MOS)

TMDL = WLA + LA + MOS

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

Allocation Summary

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

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

Each permitted discharge in a segment is assigned a waste load allocation and the total waste load allocation for each segment is included in this table. There are currently no NPDES permitted discharges in the watershed and therefore all waste load allocations are equal to zero. The difference between the TMDL and the WLA at each point is the load allocation (LA) at the point. The LA at each point includes all loads entering the segment, including those from upstream allocation points. The percent reduction is calculated to show the amount of load that needs to be reduced within a segment in order for water quality standards to be met at the point.

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

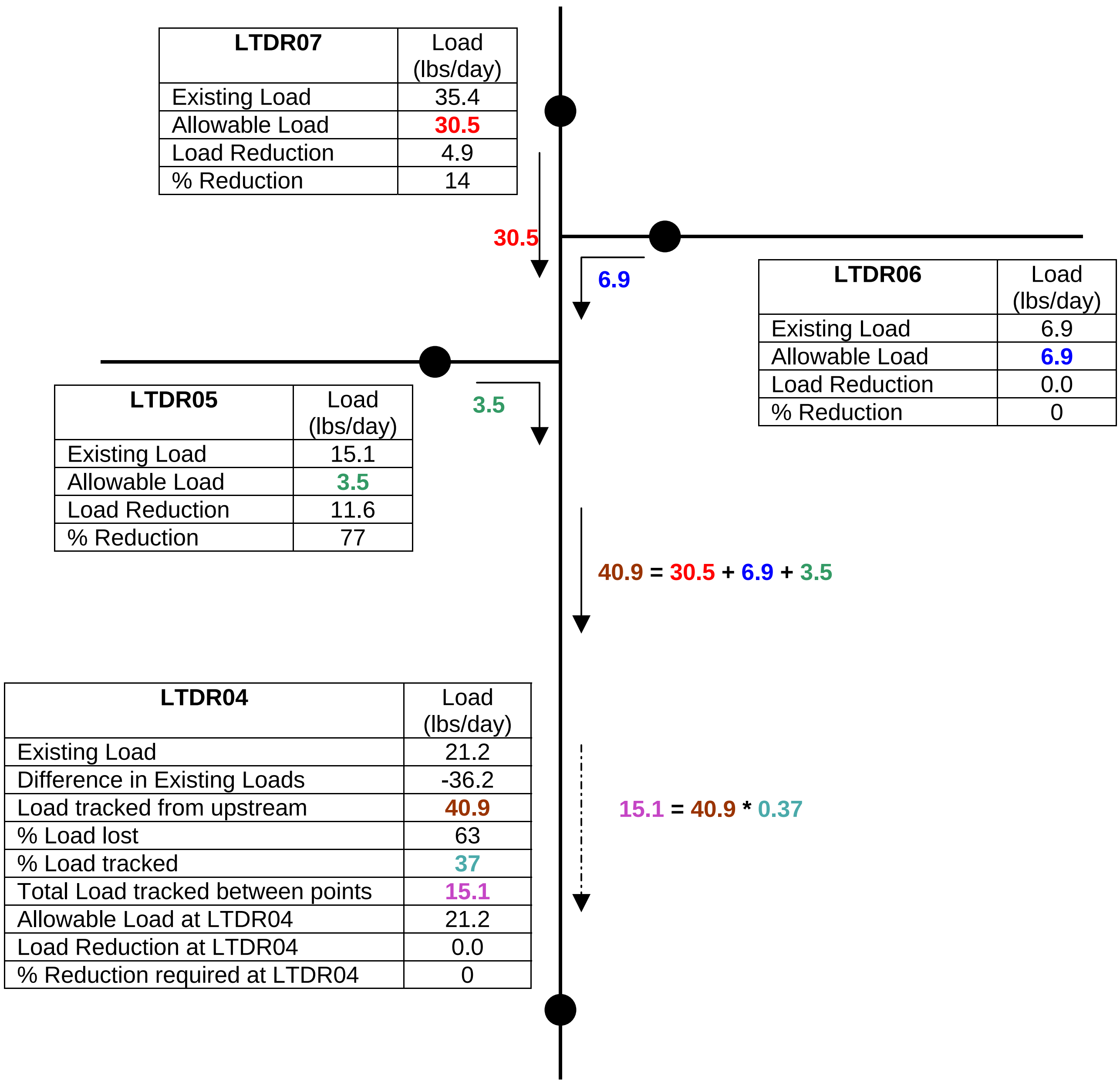
Table 3. TMDL Component Summary for the Little Deer Creek Watershed

Station	Parameter	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction %
LTDR07	*Little Deer Creek, upstream of Unnamed Tributary 42293*						
	Al	<0.5	NA	NA	NA	0.0	0
	Fe	35.4	30.5	0.0	30.5	4.9	14
	Mn	19.6	11.8	0.0	11.8	7.8	40
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR06	*Mouth of Unnamed Tributary 42293*						
	Al	6.0	3.2	0.0	3.2	2.8	46
	Fe	6.9	6.9	NA	NA	0.0	0
	Mn	1.2	1.2	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR05	*Mouth of Unnamed Tributary 42292*						
	Al	10.9	2.5	0.0	2.5	8.4	77
	Fe	15.1	3.5	0.0	3.5	11.6	77
	Mn	6.6	3.6	0.0	3.6	3.0	46
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR04	*Little Deer Creek, upstream of Unnamed Tributary 42291*						
	Al	23.8	23.8	NA	NA	0.0	0
	Fe	21.2	21.2	NA	NA	0.0	0
	Mn	8.8	8.8	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR03	*Mouth of Unnamed Tributary 42291*						
	Al	<0.5	NA	NA	NA	0.0	0
	Fe	<0.3	NA	NA	NA	0.0	0
	Mn	<0.05	NA	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR02	*Mouth of Unnamed Tributary 42290*						
	Al	<0.5	NA	NA	NA	0.0	0
	Fe	0.9	0.9	NA	NA	0.0	0
	Mn	0.1	0.1	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0
LTDR01	*Mouth of Little Deer Creek*						
	Al	<0.5	NA	NA	NA	0.0	0
	Fe	28.6	28.6	NA	NA	0.0	0
	Mn	3.7	3.7	NA	NA	0.0	0
	Acidity	0.0	0.0	NA	NA	0.0	0

NA, meets WQS. No TMDL necessary.

In the instance that the allowable load is equal to the existing load (e.g. iron point LTDR06, Table 3), the simulation determined that water quality standards are being met instream 99% of the time and no TMDL is necessary for the parameter at that point. Although no TMDL is necessary, the loading at the point is considered at the next downstream point. In addition, when all measured values are below the method detection limit (e.g. iron point LTDR03, Table 3), no TMDL is necessary. In this case the accounting for upstream loads is not carried through to the next downstream point. Rather, there is a disconnect noted and the allowable load is considered to start over because the water quality standard is satisfied.

Following is an example of how the allocations, presented in Table 3 are calculated. For this example, iron allocations for points LTDR07, LTDR06, LTDR05, and LTDR04 are shown. As demonstrated in the example, all upstream contributing loads are accounted for at each point. Attachment C contains the TMDLs by segment analysis for each allocation point in a detailed discussion. These analyses follow the example. Attachment A contains a map of the sampling point locations for reference.



LTDR07	Load (lbs/day)
Existing Load	35.4
Allowable Load	**30.5**
Load Reduction	4.9
% Reduction	14

LTDR06	Load (lbs/day)
Existing Load	6.9
Allowable Load	**6.9**
Load Reduction	0.0
% Reduction	0

LTDR05	Load (lbs/day)
Existing Load	15.1
Allowable Load	**3.5**
Load Reduction	11.6
% Reduction	77

LTDR04	Load (lbs/day)
Existing Load	21.2
Difference in Existing Loads	-36.2
Load tracked from upstream	**40.9**
% Load lost	63
% Load tracked	**37**
Total Load tracked between points	**15.1**
Allowable Load at LTDR04	21.2
Load Reduction at LTDR04	0.0
% Reduction required at LTDR04	0

Recommendations

Abandoned deep and surface mines have caused increases in metals to the streams within the Little Deer Creek Watershed. Small variations in metals, particularly in manganese and iron, appear to be the main sources of pollutants. Remediation or mitigation of the sources of mine drainage pollution could be addressed through a variety of methods. Additional active or passive treatment of known polluting mine discharges in the watershed would remove a moderate portion of the mine drainage impacts there. Daylighting of the existing small-scale deep mine(s) and reclamation of the smaller scale surface mines on the Pittsburgh seam would improve the overall water quality in the receiving streams.

The Deer Creek Watershed Association (DCWA), formed in 2001, is an active group within the Little Deer Creek Watershed. Their mission is to enhance, protect, and develop the fishery and other natural and recreational resources of the Deer Creek and Little Deer Creek Watersheds. The DCWA does not currently have any Growing Greener projects related to AMD remediation within the Little Deer Creek Watershed, but has expressed interest in partnering with the Department on AMD related projects. The DCWA was actively involved with the recent LTV Steel Co., Inc. bankruptcy case because they were concerned the mine pool elevation would rise, causing a breakout of mine water into the Little Deer Creek Watershed. LTV operated facilities associated with the Russelton deep mine operation in the Little Deer Creek Watershed. The Department has since taken over the pumping and treatment of the Russelton deep mine pool.

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

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

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

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

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

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

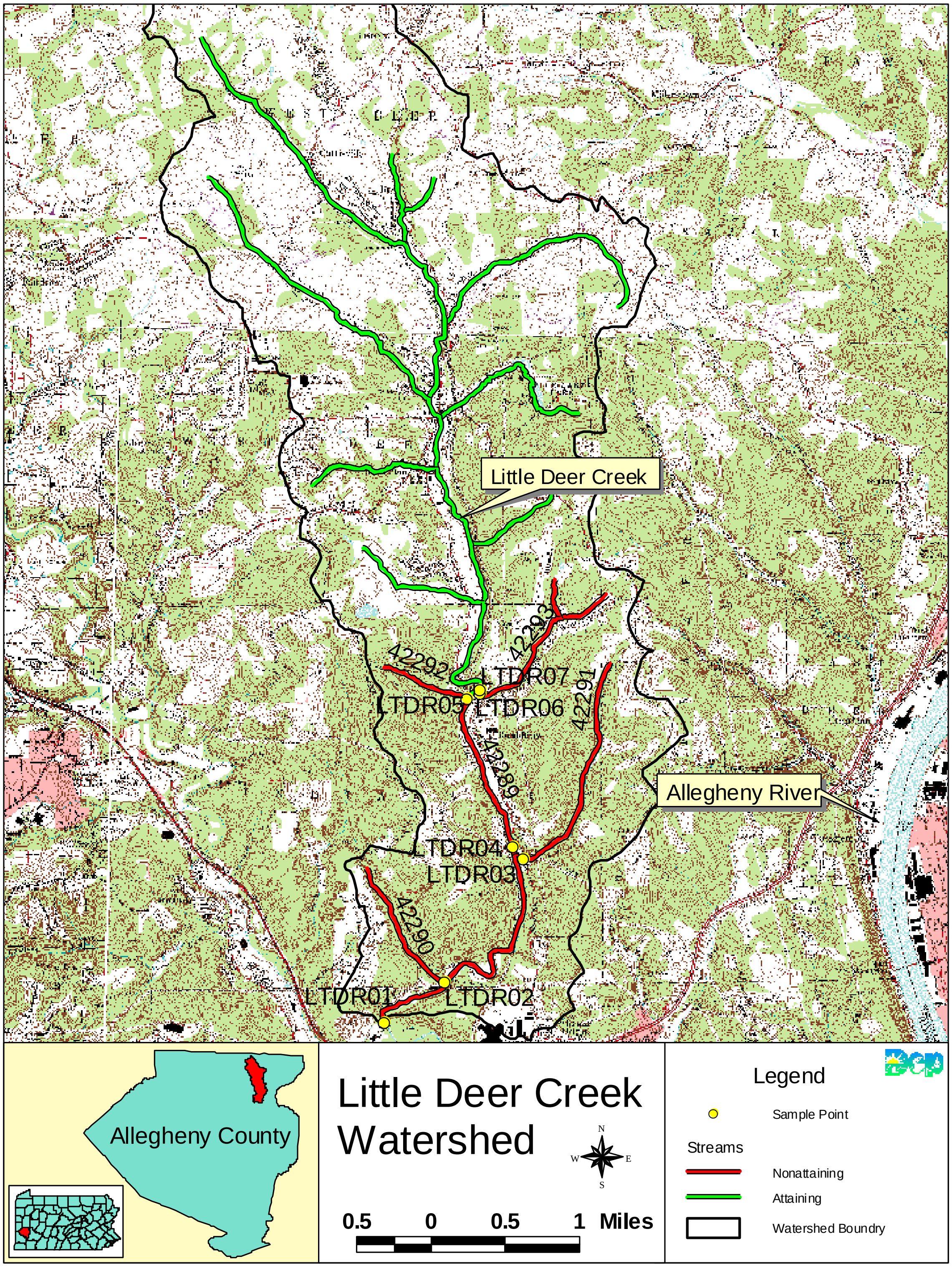
Reclaim PA is DEP's initiative designed to maximize reclamation of the state's quarter million acres of abandoned mineral extraction lands. Abandoned mineral extraction lands in Pennsylvania constituted a significant public liability – more than 250,000 acres of abandoned surface mines, 2,400 miles of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

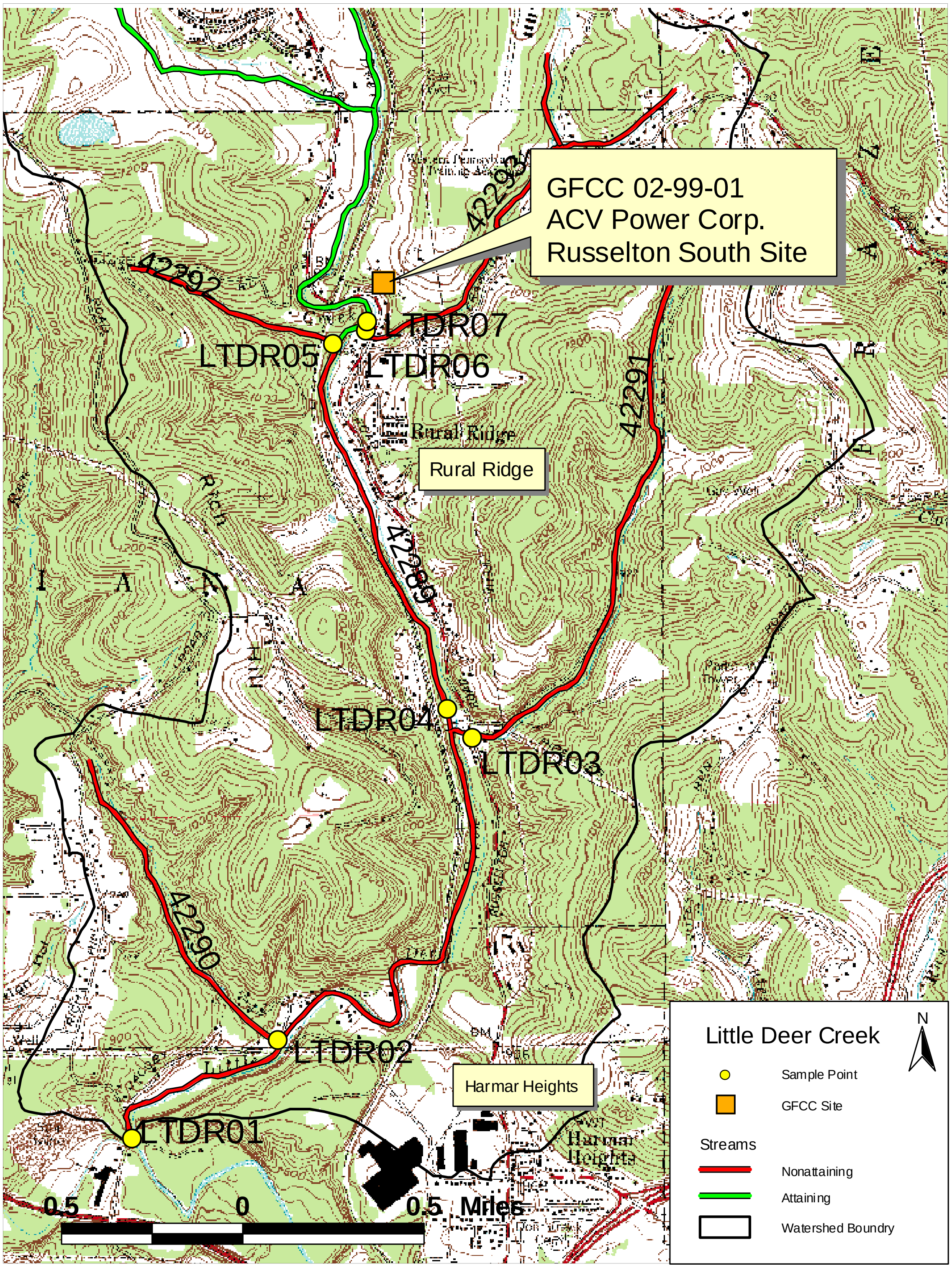
Public Participation

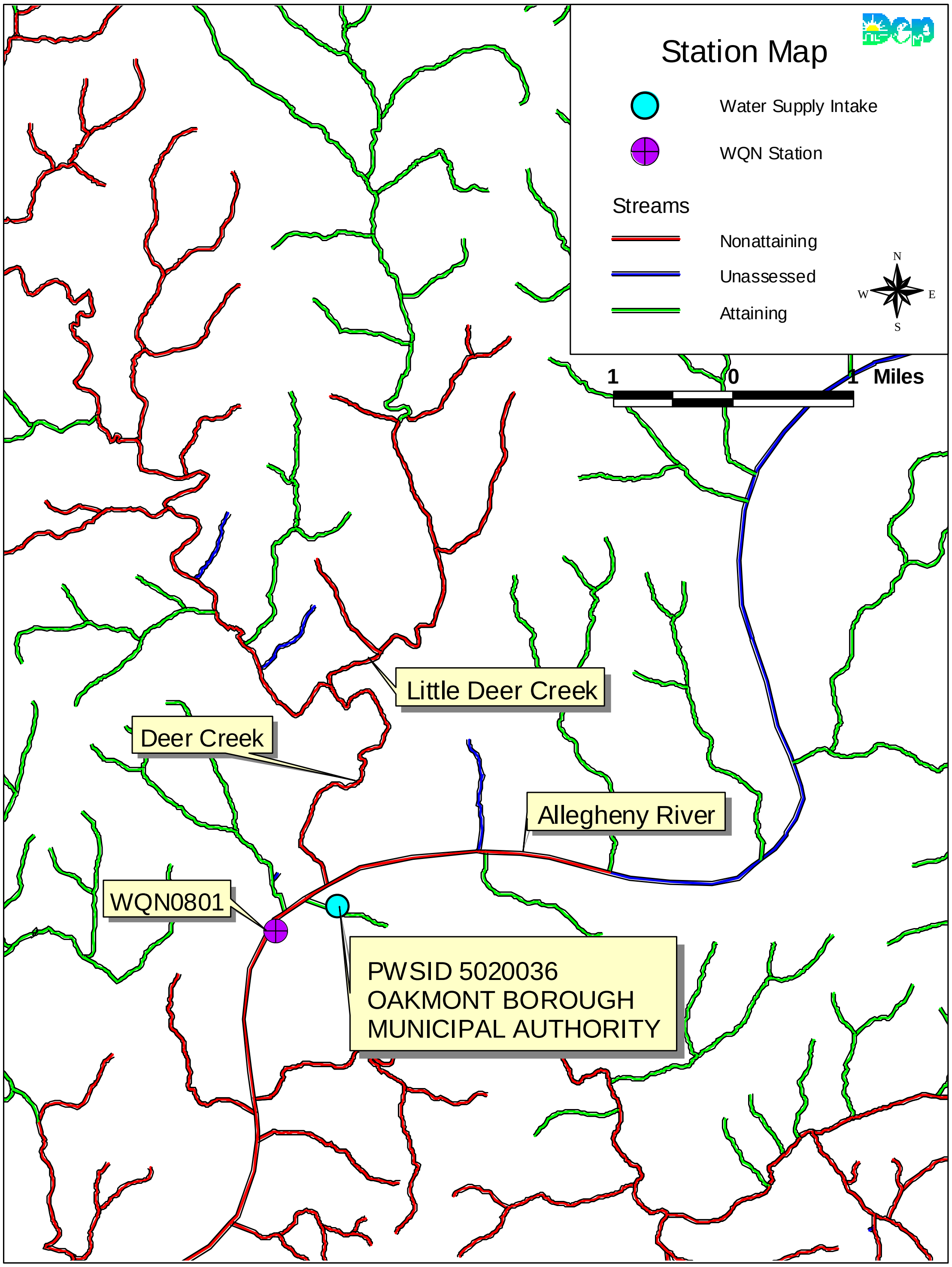
Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on November 6, 2004 and the *Pittsburgh Post-Gazette* on November 18, 2004 to foster public comment on the allowable loads calculated. The public comment period on this TMDL was open from November 6, 2004 to January 5, 2005. A public meeting was held on December 2, 2004 at the Plum Borough Municipal Building in Plum, PA to discuss the proposed TMDL.

Attachment A

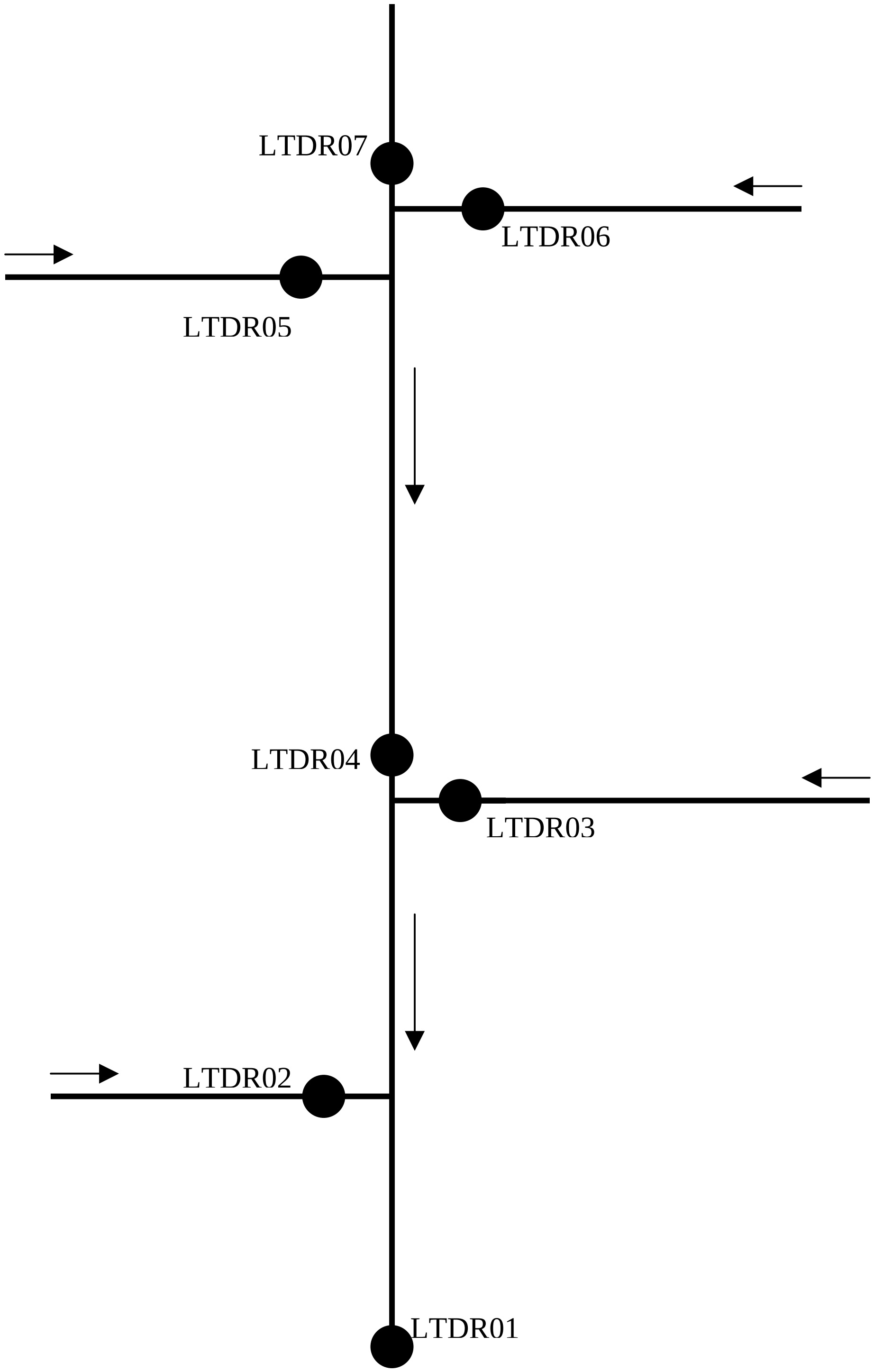
Little Deer Creek Watershed Maps


Little Deer Creek
Allegheny River
LTDR01
LTDR02
LTDR03
LTDR04
LTDR05
LTDR06
LTDR07
42290
42289
42291
42292
42293
Allegheny County
Little Deer Creek Watershed
N
E
S
W
0.5
0
0.5
1
Miles
Legend
Sample Point
Streams
Nonattaining
Attaining
Watershed Boundry


GFCC 02-99-01
ACV Power Corp.
Russelton South Site
42292
42293
LTDR07
LTDR05
LTDR06
42291
Rural Ridge
42289
LTDR04
LTDR03
42290
LTDR02
Harmar Heights
LTDR01
0.5
0
0.5 Miles
Little Deer Creek
N
Sample Point
GFCC Site
Streams
Nonattaining
Attaining
Watershed Boundry


Station Map
Water Supply Intake
WQN Station
Streams
Nonattaining
Unassessed
Attaining
N
W
E
S
1
0
1
Miles
Little Deer Creek
Deer Creek
Allegheny River
WQN0801
PWSID 5020036
OAKMONT BOROUGH
MUNICIPAL AUTHORITY

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



Attachment B

Method for Addressing Section 303(d) Listings for pH

Method for Addressing Section 303(d) Listings for pH

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

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

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

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

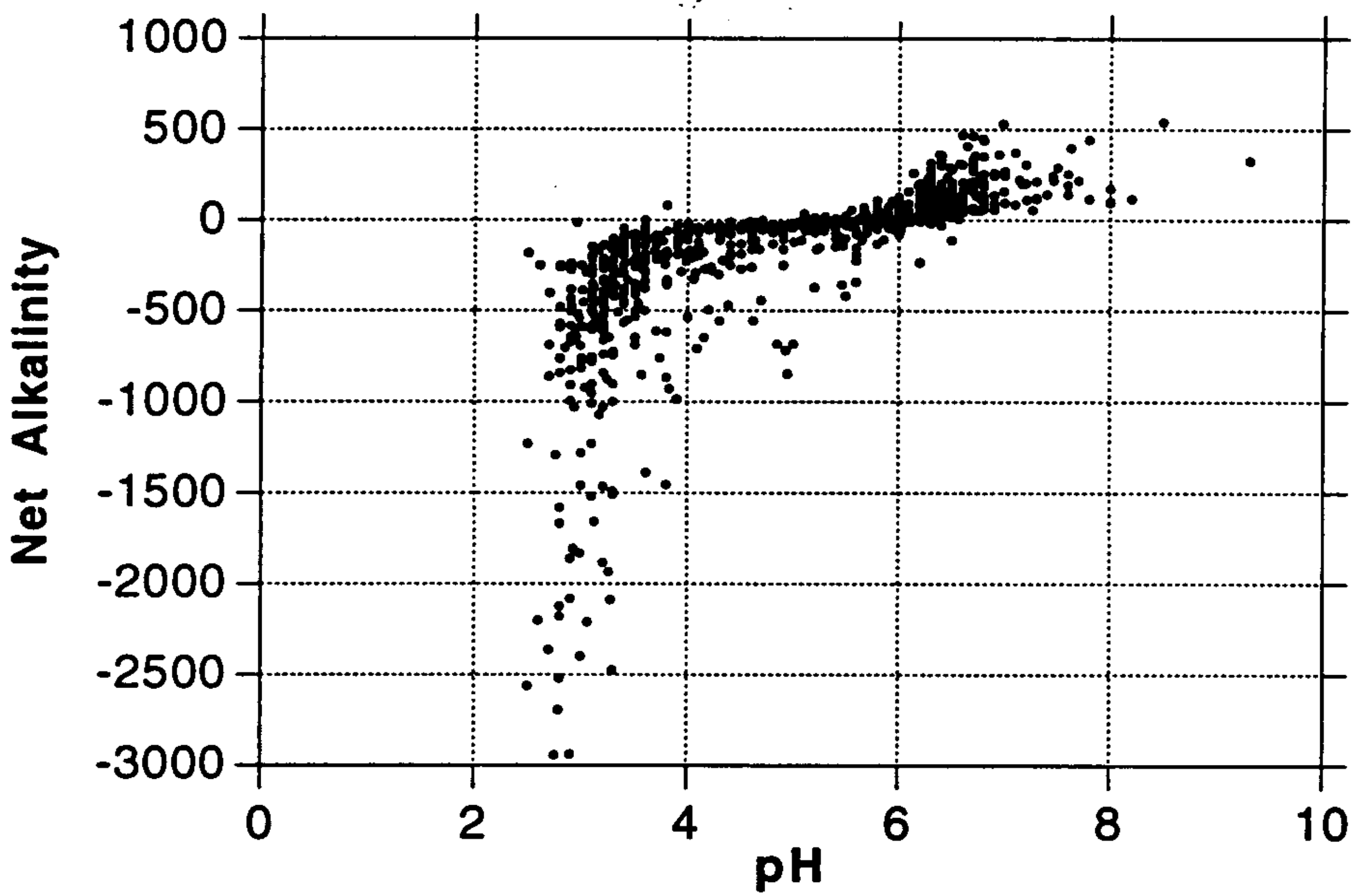


Figure 1. Net Alkalinity vs. pH. Taken from Figure 1.2 Graph C, pages 1-5, of Coal Mine Drainage Prediction and Pollution Prevention in Pennsylvania

Attachment C
TMDLs By Segment

Little Deer Creek

The TMDL for the Little Deer Creek consists of load allocations of four tributaries and three sampling sites along the stream.

Little Deer Creek is listed as impaired on the Pennsylvania Section 303(d) list by high metals from AMD as being the cause of the degradation to the stream. For all sampling events pH values fell within the acceptable range and the stream was net alkaline at all points. No TMDLs for pH are necessary in the Little Deer Creek Watershed. The method and rationale for addressing pH is contained in Attachment B.

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

TMDL Calculations - Sample Point LTDR07, Little Deer Creek upstream of Unnamed Tributary 42293

The TMDL for sample point LTDR07 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this segment was computed using water-quality sample data collected at point LTDR07. The average flow (4.15 MGD), measured at point LTDR07, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR07 shows pH ranging between 7.1 and 7.8, pH is not addressed in this TMDL.

All values for aluminum are below the method detection limit. Because the WQS is met, a TMDL for aluminum is not necessary. Point LTDR07 is the most upstream allocation point on Little Deer Creek; therefore, accounting for loads allocated upstream is not necessary at point LTDR07.

Table C1. TMDL Calculations at Point LTDR07				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	<0.5	NA	NA	NA
Fe	1.02	35.4	0.88	30.5
Mn	0.57	19.6	0.34	11.8
Acidity	0.00	0.0	0.00	0.0
Alkalinity	94.12	3,256.1		

Table C2. Calculation of Load Reduction Necessary at Point LTDR07				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	NA	35.4	19.6	0.0
Allowable Load	NA	30.5	11.8	0.0
Load Reduction	0.0	4.9	7.8	0.0
% Reduction Segment	0	14	40	0

TMDL Calculations - Sample Point LTDR06, mouth of Unnamed Tributary 42293

The TMDL for sample point LTDR06 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point LTDR06. The average flow (0.76 MGD), measured at point LTDR06, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR06 shows pH ranging between 7.6 and 8.3, pH is not addressed in this TMDL.

Water quality analysis determined that the measured iron and manganese loads are equal to the allowable iron and manganese loads. Because WQS are met, TMDLs for iron and manganese are not necessary. Although TMDLs are not necessary, the measured loads are considered at the next downstream point, LTDR04.

Table C3. TMDL Calculations at Point LTDR06				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	0.94	6.0	0.51	3.2
Fe	1.08	6.9	1.08	6.9
Mn	0.18	1.2	0.18	1.2
Acidity	0.00	0.0	0.00	0.0
Alkalinity	144.92	923.5		

Table C4. Calculation of Load Reduction Necessary at Point LTDR06				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	6.0	6.9	1.2	0.0
Allowable Load	3.2	6.9	1.2	0.0
Load Reduction	2.8	0.0	0.0	0.0
% Reduction Segment	46	0	0	0

TMDL Calculations - Sample Point LTDR05, mouth of Unnamed Tributary 42292

The TMDL for sample point LTDR05 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point LTDR05. The average flow (1.13 MGD), measured at point LTDR05, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR05 shows pH ranging between 7.8 and 8.4; pH is not addressed as part of this TMDL.

Table C5. TMDL Calculations at Point LTDR05				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	1.15	10.9	0.27	2.5
Fe	1.60	15.1	0.37	3.5
Mn	0.70	6.6	0.38	3.6
Acidity	0.00	0.0	0.00	0.0
Alkalinity	138.16	1,303.2		

Table C6. Calculation of Load Reduction Necessary at Point LTDR05				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	10.9	15.1	6.6	0.0
Allowable Load	2.5	3.5	3.6	0.0
Load Reduction	8.4	11.6	3.0	0.0
% Reduction Segment	77	77	46	0

TMDL Calculation - Sampling Point LTDR04, Little Deer Creek upstream of Unnamed Tributary 42291

The TMDL for sampling point LTDR04 consists of a load allocation of the area between sample points LTDR07, LTDR06, LTDR05, and LTDR04. The load allocation for this stream segment was computed using water-quality sample data collected at point LTDR04. The average flow (5.69 MGD), measured at point LTDR04, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR04 shows pH ranging between 7.2 and 8.3; pH is not addressed as part of this TMDL.

Water quality analysis determined that the measured and allowable metals loadings are equal. Because WQS are met, TMDLs for metals are not necessary. Loads from LTDR04 are considered at the next downstream point, LTDR01.

Table C7. TMDL Calculations at Point LTDR04				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	0.50	23.8	0.50	23.8
Fe	0.45	21.2	0.45	21.2
Mn	0.18	8.8	0.18	8.8
Acidity	0.00	0.0	0.00	0.0
Alkalinity	156.36	7,417.8		

The calculated load reductions for all the loads that enter point LTDR04 must be accounted for in the calculated reductions at sample point LTDR04 shown is Table C8. A comparison of measured loads between points LTDR07, LTDR06, LTDR05 and LTDR04 shows that there is additional aluminum loading entering the segment and a loss of iron and manganese loading. The total segment aluminum load is the sum of the upstream loads and any additional loading within the segment. For loss of iron and manganese loading, the percent of load lost within the segment is calculated and applied to the upstream loads to determine the amount of load that is tracked through the segment.

Table C8. Calculation of Load Reduction Necessary at Point LTDR04				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	23.8	21.2	8.8	0.0
Difference in Existing Loads	6.9	-36.2	-18.7	0.0
Load tracked from upstream	5.7	40.9	16.6	0.0
% Load lost	-	63	68	-
% Load tracked	-	37	32	-
Total Load tracked between	12.6	15.1	5.3	0.0
Allowable Load at LTDR04	23.8	21.2	8.8	0.0
Load Reduction at LTDR04	0.0	0.0	0.0	0.0
% Reduction required at LTDR04	0	0	0	0

TMDL Calculations - Sample Point LTDR03, mouth of Unnamed Tributary 42291

TMDLs are not necessary at LTDR03. All values for iron, manganese, and aluminum are below the method detection limits; therefore, no TMDLs are calculated for metals at LTDR03. Sample data at LTDR03 is between 7.2 and 7.8; pH is not addressed as part of this TMDL.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment.

TMDL Calculations - Sample Point LTDR02, mouth of Unnamed Tributary 42290

The TMDL for sample point LTDR02 consists of a load allocation to all of the area above the point (Attachment A). The load allocation for this tributary was computed using water-quality sample data collected at point LTDR02. The average flow (0.18 MGD), measured at point LTDR02, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR02 shows pH ranging between 7.3 and 8.3; pH is not addressed as part of this TMDL.

All values for aluminum are below the method detection limit. Water quality analysis determined that the measured iron and manganese loads are equal to the allowable iron and manganese loads. Because WQS are met, TMDLs for iron, manganese and aluminum are not necessary. Although TMDLs for iron and manganese are not necessary, the measured loads are considered at the next downstream point, LTDR01.

Table C9. TMDL Calculations at Point LTDR02				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	<0.5	NA	NA	NA
Fe	0.62	0.9	0.62	0.9
Mn	0.09	0.1	0.09	0.1
Acidity	0.00	0.0	0.00	0.0
Alkalinity	160.40	241.6		

Table C10. Calculation of Load Reduction Necessary at Point LTDR02				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	NA	0.9	0.1	0.0
Allowable Load	NA	0.9	0.1	0.0
Load Reduction	0.0	0.0	0.0	0.0
% Reduction Segment	0	0.0	0	0

TMDL Calculation – Sampling Point LTDR01, mouth of Little Deer Creek

The TMDL for sampling point LTDR01 consists of a load allocation of the area between sample points LTDR04, LTDR03, LTDR02, and LTDR01. The load allocation for this stream segment was computed using water-quality sample data collected at point LTDR01. The average flow (6.12 MGD), measured at point LTDR01, is used for these computations.

This segment was included on the 1996 PA Section 303(d) list for metals impairments from AMD. In 1997 a new assessment was completed on the segment and metals remained a cause of impairment. Sample data at point LTDR01 shows pH ranging between 7.4 and 8.4; pH is not addressed as part of this TMDL

All values for aluminum are below the method detection limit. Water quality analysis determined that the measured iron and manganese loads are equal to the allowable iron and manganese loads. Because WQS are met, TMDLs for metals are not necessary.

Table C11. TMDL Calculations at Point LTDR01				
	Measured Sample Data		Allowable	
Parameter	Conc. (mg/l)	Load (lbs/day)	LTA Conc. (mg/l)	Load (lbs/day)
Al	<0.5	NA	NA	NA
Fe	0.56	28.6	0.56	28.6
Mn	0.07	3.7	0.07	3.7
Acidity	0.00	0.0	0.00	0.0
Alkalinity	156.24	7,970.1		

The calculated load reductions for all the loads that enter point LTDR01 must be accounted for in the calculated reductions at sample point LTDR01 shown is Table C12. A comparison of measured loads between points LTDR04, LTDR03, LTDR02 and LTDR01 shows that there is additional iron load entering the segment and a loss in manganese load. The total segment iron load is the sum of the upstream loads and the additional loading entering the segment. For loss of manganese loading, the percent of load lost within the segment is calculated and applied to the upstream loads to determine the amount of load that is tracked through the segment.

Table C12. Calculation of Load Reduction Necessary at Point LTDR01				
	Al (lbs/day)	Fe (lbs/day)	Mn (lbs/day)	Acidity (lbs/day)
Existing Load	NA	28.6	3.7	0.0
Difference in Existing Loads	-	6.4	-5.2	0.0
Load tracked from upstream	-	16.1	5.4	0.0
% Load lost	-	-	58	-
% Load tracked	-	-	42	-
Total Load tracked between points	-	22.5	2.3	0.0
Allowable Load at LTDR01	NA	28.6	3.7	0.0
Load Reduction at LTDR01	0.0	0.0	0.0	0.0
% Reduction required at LTDR01	0	0	0	0

Margin of Safety

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

- Effluent variability plays a major role in determining the average value that will meet water-quality criteria over the long-term. The value that provides this variability in our analysis is the standard deviation of the dataset. The simulation results are based on this variability and the existing stream conditions (an uncontrolled system). The general assumption can be made that a controlled system (one that is controlling and stabilizing the pollution load)

would be less variable than an uncontrolled system. This implicitly builds in a margin of safety.
- An additional MOS is provided because that the calculations were done with a daily Fe average instead of the 30-day average

Seasonal Variation

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

Critical Conditions

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

Attachment D

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

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

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

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

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

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

Attachment E
Water Quality Data Used In TMDL Calculations

Monitoring point	Sampling date	Flow	Lab pH	Alkalinity	Acidity	Iron	Manganese	Aluminum
		gpm		mg/L	mg/L	mg/L	mg/L	mg/L
LTDR01	4/29/2003	4460	8.4	255.0	0.0	<0.3	0.068	<0.5
Latitude:	6/18/2003	10010	7.4	104.8	0.0	0.56	0.078	<0.5
40-33-27	8/6/2003	2446	8.3	136.0	0.0	<0.3	<0.05	<0.5
Longitude	8/19/2003	1192	8.3	152.0	0.0	<0.3	<0.05	<0.5
79-50-20	10/6/2003	3130	8.1	133.4	0.0	<0.3	0.073	<0.5
Mouth of Little Deer Creek	Average	4247.60000	8.10000	156.24000	0.00000	0.56000	0.07300	NA
	St Dev	3430.81081	0.40620	57.76875	0.00000	NA	0.00500	NA
LTDR02	4/29/2003	90	7.5	193.4	0.0	<0.3	<0.05	<0.5
Latitude	6/18/2003	130	7.3	100.6	0.0	0.619	0.094	<0.5
40-33-42	8/6/2003	222	8.3	126.4	0.0	<0.3	<0.05	<0.5
Longitude	8/19/2003	113	8.2	142.6	0.0	<0.3	<0.05	<0.5
79-49-52	10/6/2003	72	7.7	239.0	0.0	<0.3	<0.05	<0.5
Mouth of Unnamed Trib 42290	Average	125.40000	7.80000	160.40000	0.00000	0.61900	0.09400	NA
	St Dev	58.33352	0.43589	55.48838	0.00000	NA	NA	NA
LTDR03	4/29/2003	220	7.7	123.2	0.0	<0.3	<0.05	<0.5
Latitude	6/18/2003	743	7.2	134.0	0.0	<0.3	<0.05	<0.5
40-34-56	8/6/2003	73	7.7	146.0	0.0	<0.3	<0.05	<0.5
Longitude	8/19/2003	63	7.6	151.2	0.0	<0.3	<0.05	<0.5
79-49-18	10/6/2003	380	7.8	148.6	0.0	<0.3	<0.05	<0.5
Mouth of Unnamed Trib 42291	Average	295.80000	7.60000	140.60000	0.00000	NA	NA	NA
	St Dev	281.36222	0.23452	11.74564	0.00000	NA	NA	NA

Monitoring point	Sampling date	Flow	Lab pH	Alkalinity	Acidity	Iron	Manganese	Aluminum
		gpm		mg/L	mg/L	mg/L	mg/L	mg/L
LTDR04	4/29/2003	4070	8.3	334.4	0.0	0.402	0.245	<0.5
Latitude	6/18/2003	11000	7.2	93.6	0.0	0.935	0.140	0.501
40-34-26	8/6/2003	1529	8.1	114.2	0.0	<0.3	0.159	<0.5
Longitude	8/19/2003	1152	8.1	124.8	0.0	<0.3	0.124	<0.5
79-49-22	10/6/2003	2000	8.2	114.8	0.0	<0.3	0.255	<0.5
Little Deer Crk upstream of	Average	3950.20000	7.98000	156.36000	0.00000	0.66850	0.18460	0.50100
Unnamed Trib 42291	St Dev	4099.06833	0.44385	100.17209	0.00000	0.37689	0.06108	NA
LTDR05	4/29/2003	35	8.4	152.4	0.0	<0.3	<0.05	<0.5
Latitude	6/18/2003	152	7.8	149.8	0.0	0.754	<0.05	0.707
40-35-22	8/6/2003	2860	7.8	105.8	0.0	1.15	0.463	<0.5
Longitude	8/19/2003	520	8.0	110.2	0.0	2.9	0.946	1.600
79-49-46	10/6/2003	360	8.1	172.6	0.0	<0.3	<0.05	<0.5
Mouth of Unnamed Trib 42292	Average	785.40000	8.02000	138.16000	0.00000	1.60133	0.70450	1.15350
	St Dev	1174.69817	0.24900	28.95389	0.00000	1.14197	0.34153	0.63145
LTDR06	4/29/2003	150	8.3	137.4	0.0	<0.3	<0.05	<0.5
Latitude	6/18/2003	973	7.6	134.2	0.0	0.991	0.090	0.770
40-35-24	8/6/2003	113	8.3	176.0	0.0	1.23	0.067	1.100
Longitude	8/19/2003	202	8.3	174.8	0.0	0.955	0.052	0.953
79-49-39	10/6/2003	1215	7.8	102.2	0.0	1.14	0.523	<0.5
Mouth of Unnamed Trib 42293	Average	530.60000	8.06000	144.92000	0.00000	1.07900	0.18300	0.94100
	St Dev	522.33734	0.33615	31.04532	0.00000	0.12864	0.22720	0.16533

Monitoring point	Sampling date	Flow	Lab pH	Alkalinity	Acidity	Iron	Manganese	Aluminum
		gpm		mg/L	mg/L	mg/L	mg/L	mg/L
LTDR07	4/29/2003	1150	7.8	88.8	0.0	1.15	0.600	<0.5
Latitude	6/18/2003	9162	7.1	84.4	0.0	0.582	0.170	<0.5
40-35-25	8/6/2003	2391	7.8	100.6	0.0	1.09	0.480	<0.5
Longitude	8/19/2003	485	7.8	94.6	0.0	1.16	1.060	<0.5
79-49-39	10/6/2003	1215	7.8	102.2	0.0	1.14	0.523	<0.5
Little Deer Crk upstream of	Average	2880.60000	7.66000	94.12000	0.00000	1.02440	0.56660	NA
Unnamed Tribs 42293 and 42292	St Dev	3577.84129	0.31305	7.58762	0.00000	0.24877	0.32064	NA

WQN 801	
Allegheny River	
Hulton Hwy Br - Oakmont	
Date	**TDS (mg/L)**
1/2/1992	164
2/4/1992	160
3/4/1992	288
4/6/1992	120
5/4/1992	120
6/3/1992	225
7/6/1992	234
8/13/1992	154
9/1/1992	203
10/6/1992	147
11/10/1992	108
12/1/1992	110
1/4/1993	110
2/9/1993	180
3/9/1993	190
4/5/1993	116
5/6/1993	177
6/1/1993	281
7/1/1993	280
8/3/1993	297
9/2/1993	276
10/4/1993	270
11/3/1993	164
12/8/1993	126
1/11/1994	192
2/16/1994	220
3/7/1994	170
4/18/1994	108
5/10/1994	154
6/2/1994	192
7/20/1994	174
8/4/1994	202
9/7/1994	168
10/6/1994	180
11/21/1994	166
12/8/1994	102
1/18/1995	104
2/14/1995	208
3/13/1995	128
4/11/1995	172
5/15/1995	174
6/14/1995	208
7/27/1995	246
9/13/1995	234
10/12/1995	238
11/6/1995	168
12/18/1995	180
1/17/1996	214
2/15/1996	152
3/13/1996	154
4/18/1996	178
5/20/1996	88
6/26/1996	200
7/18/1996	280
8/20/1996	278
9/11/1996	303
10/9/1996	14
11/20/1996	2
12/17/1996	141
1/13/1997	151
2/20/1997	144
3/18/1997	0
4/22/1997	98
5/22/1997	126
6/23/1997	186
7/23/1997	152
8/5/1997	262
10/6/1997	162
10/30/1997	218
12/30/1997	154
1/14/1998	112
2/19/1998	642
3/19/1998	128
4/13/1998	112
5/7/1998	148
6/18/1998	272
7/15/1998	166
8/13/1998	243
10/19/1998	258
12/16/1998	238
1/19/1999	298
3/18/2018	158
5/6/1999	172
7/26/1999	158
9/2/1999	214
11/15/1999	202
1/27/2000	154
6/19/2000	150
8/10/2000	148
10/10/2000	188
12/28/2000	114
1/10/2001	176
3/22/2001	150
5/10/2001	224
7/23/2001	264
9/6/2001	244
11/1/2001	158
2/7/2002	92
4/10/2002	210
6/5/2002	174
8/1/2002	198
Average	182.28
St Dev	76.96

Attachment F

Comment and Response

Comments/Responses on the Little Deer Creek Watershed TMDL

A 60-day public comment period was open on the Little Deer Creek Watershed Draft TMDL from November 6, 2004 until January 5, 2005. During this time, no comments were received.