



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029
3/14/2007

Ms. Cathy Curran Myers
Deputy Secretary for Water Management
Pennsylvania Department of Environmental Protection
Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105

Dear Ms. Myers:

The U.S. Environmental Protection Agency (EPA) is pleased to approve the Total Maximum Daily Load (TMDL) Report for the *Brewer Run Watershed, Indiana County*, dated January 8, 2007, submitted by the Pennsylvania Department of Environmental Protection (PADEP) and received by EPA for review and approval on February 15, 2007. The TMDLs were established and submitted in accordance with Sections 303(d)(1)(c) and 303(d)(2) of the Clean Water Act. The TMDLs were established to address impairment of water quality as identified in Pennsylvania's 1996 Section 303(d) lists of impaired waters requiring TMDLs for metals and pH associated with abandoned mine drainage. A rationale of our approval is enclosed.

As you know, any new or revised National Pollutant Discharge Elimination System permits with applicable effluent limits must be consistent with the TMDL's wasteload allocation pursuant to 40 CFR §122.44(d)(1)(VII)(B). Any such permit should be submitted to EPA for review consistent with our letter dated October 1, 1998.

If you have further questions, please call me or have your staff contact Ms. Mary F. Beck at (215) 814-3429.

Sincerely,

Signed

Jon M. Capacasa, Director
Water Protection Division

Enclosure

cc: Glenn Rider, DEP
Bill Brown, DEP
Ken Bowman, DEP SWRO
Donald Barnes, Cambria DMO



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**Decision Rationale
Total Maximum Daily Loads
Brewer Run Watershed
For Acid Mine Drainage Affected Segments
Indiana County, Pennsylvania**

Signed

**Jon M. Capacasa, Director
Water Protection Division**

Date: 3/14/2007



Decision Rationale
Total Maximum Daily Loads
Brewer Run Watershed
For Acid Mine Drainage Affected Segments

I. Introduction

The Clean Water Act (CWA) requires that Total Maximum Daily Loads (TMDLs) be developed for those waterbodies identified as impaired by the state where technology-based and other controls will not provide for attainment of water quality standards. A TMDL is a determination of the amount of a pollutant from point, nonpoint, and natural background sources, including a margin of safety (MOS), that may be discharged to a waterbody without exceeding water quality standards.

The Pennsylvania Department of Environmental Protection (PADEP) Bureau of Watershed Management submitted the *Brewer Run Watershed TMDL, Indiana County* (TMDL Report) dated January 8, 2007, to the U.S. Environmental Protection Agency (EPA) which was received for final Agency review on February 15, 2007. This report includes the TMDLs for the three primary metals associated with acid mine drainage (AMD) (i.e., iron, manganese, and aluminum) and addresses one segment on Pennsylvania's 1996 Section 303(d) list of impaired waters.

EPA's rationale is based on the TMDL Report and information contained in the attachments to the report. EPA's review determined that the TMDL meets the following eight regulatory requirements pursuant to 40 CFR Part 130:

1. The TMDLs are designed to implement the applicable water quality standards.
2. The TMDLs include a total allowable load as well as individual wasteload allocations (WLAs) and load allocations (LAs).
3. The TMDLs consider the impacts of background pollutant contributions.
4. The TMDLs consider critical environmental conditions.
5. The TMDLs consider seasonal environmental variations.
6. The TMDLs include a MOS.
7. There is reasonable assurance that the proposed TMDLs can be met.
8. The TMDLs have been subject to public participation.

II. Summary

Table 1 presents the 1996, 1998, 2002, and 2004 Section 303(d) listing information for the impaired segment first listed in 1996.¹

¹Pennsylvania's 1996, 1998, 2002, and 2004 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*.

Table 1. 303(d) Sublist for the Brewer Run Watershed, Indiana County, Pennsylvania

Table 1. 303(d) Sub-List								
State Water Plan (SWP) Subbasin: 17D Mahoning Creek								
Year	Miles	Segment ID Assessment ID	DEP Stream Code	Stream Name	Designated Use	Data Source	Source	EPA 305(b) Cause Code
1996	1.7	5283	47591	Brewer Run	HQ-CWF	305(b) Report	RE	Metals
1998	1.75	5283	47591	Brewer Run	HQ-CWF	SWMP	AMD	Metals
2002	1.8	5283	47591	Brewer Run	HQ-CWF	SWMP	AMD	Metals
2004	1.8	5283	47591	Brewer Run	HQ-CWF	SWMP	AMD	Metals

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

See Attachment E of the TMDL Report, *Excerpts Justifying Changes Between the 1996, 1998, 2002, and 2004 Section 303(d) Lists*. The use designations for the stream segments in this TMDL can be found in PA Title 25 Chapter 93.9s. Section IV, Table 3 shows the TMDLs for the Brewer Run Watershed.

In 1997, PADEP began utilizing the Statewide Surface Waters Assessment Protocol to assess Pennsylvania’s waters. This protocol is a modification of EPA’s 1989 Rapid Bioassessment Protocol II and provides for a more consistent approach to conducting biological assessments than previously used methods. The biological assessments are used to determine which waters are impaired and should be included on the State’s Section 303(d) list.

The TMDLs in this report were developed using a statistical procedure to ensure that water quality criteria are met 99% of the time as required by Pennsylvania’s water quality standards at Pennsylvania Code Title 25, Chapter 96.3c. Table 3 of the TMDL Report lists the TMDLs for the Brewer Run Watershed, addressing metals and pH in the stream segments listed as PADEP stream code 47591.

TMDLs are defined as the summation of the point source WLAs plus the summation of the nonpoint source LAs plus a MOS and are often shown as follows:

$$\text{TMDL} = \sum \text{WLAs} + \sum \text{LAs} + \text{MOS}$$

The TMDL is a written plan and analysis established to ensure that a waterbody will attain and maintain applicable water quality standards. The TMDL is a scientifically-based strategy which considers current and foreseeable conditions, utilizes the best available data, and

accounts for uncertainty with the inclusion of a MOS value. Since conditions, available data, and the understanding of natural processes can change more than anticipated by the MOS, there exists the option of refining the TMDL for resubmittal to EPA.

III. Background

The Brewer Run Watershed is located in Western Pennsylvania, occupying a northeastern portion of Indiana County in Canoe Township. The watershed area is 1.95 square miles and land uses within the watershed include abandoned mine lands, forestlands, and rural residential properties with small communities scattered throughout the area. The headwaters for Brewer Run begin approximately 0.45 miles southwest of the village of Roseboro. From this point, the stream flows in a generally southern direction for approximately 2.8 miles, until it joins with Little Mahoning Creek. Through the course of its flow, it picks up one unnamed tributary from the northeast and another from the north-northwest.

The entire watershed has been extensively mined since the turn of the century. The underground mining focused on the Upper Freeport coal seam. The surface mining operations were completed on the Clarion, Lower Kittanning, Middle Kittanning, Upper Kittanning, Lower Freeport and Upper Freeport coal seams. These past mining operations have resulted in significant scarring of the land within the watershed. Evidence of the past mining includes open pits, both dry and flooded, as well as spoil piles. The Mining Inspector for the area has indicated that substandard post-mining discharges are present within the watershed. There are currently no active mining operations within the watershed and no established NPDES discharge points.

Some flooded pits remain from past mining within the watershed. Although the Bureau of Abandoned Mine Reclamation has not identified any AMD dischargers, the Mine Inspector for the area has indicated that substandard post-mining discharges do exist.

PADEP treats each segment on the Section 303(d) list as a separate TMDL and expresses each TMDL as a long-term average loading. (See the *Brewer Run Watershed TMDL Report*, Attachment C, for the TMDL calculations.)

The Surface Mining Control and Reclamation Act of 1977 (SMCRA, Public Law 95-87) and its subsequent revisions were enacted to establish a nationwide program to, among other things, protect the beneficial uses of land or water resources, protect public health and safety from the adverse effects of current surface coal mining operations, and promote the reclamation of mined areas left without adequate reclamation prior to August 3, 1977. SMCRA requires a surface mining 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.

Brewer Run was on the 1996 Section 303(d) list of impaired waters and counts toward the tenth year (2007) TMDL milestone commitment under the requirements of the 1997 TMDL lawsuit settlement agreement. Tenth year milestones include the development of TMDLs for 20% of the waters listed on Pennsylvania's 1996 Section 303(d) list of impaired waters by the effects of AMD (80 waters since 2005) and the remaining waters listed as impaired by non-AMD impacts. Delisted waters may count for 20% of the requirement.

Computational Procedure

The TMDLs were developed using a statistical procedure to ensure that water quality criteria are met 99% of the time as required by Pennsylvania's water quality standards. A two-step approach was used for the TMDL analysis of impaired stream segments.

The first step used a statistical method for determining the allowable instream concentration at the point of interest necessary to meet water quality standards. An allowable long-term average instream concentration was determined at each sample point for metals and acidity. The 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, and the simulation was run assuming the data set was log normally distributed. Using @Risk², each pollutant source was evaluated separately by performing 5000 iterations of the model where each iteration was independent of all other iterations. This procedure was used to determine the required percent reduction that would allow the water quality criteria to be met instream at least 99% of the time. A second simulation that multiplied the percent reduction by the sampled value was run to ensure 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.

The second step was a mass balance of the loads as they passed through the watershed. Loads at these points were computed based on average annual flow. Once the allowable concentration and load for each pollutant was determined, mass-balance accounting was performed starting at the top of the watershed and working downstream in sequence. This mass balance or load tracking through the watershed utilized the change in measured loads from sample location to sample location as a guide for expected changes in the allowable loads.

The existing and allowable long-term average loads were computed using the mean concentration from @RISK multiplied by the average flow. The loads were computed based on average annual flow and should not be taken out of the context for which they are intended. They are intended to depict how the pollutants affect the watershed and where the sources and sinks are located spatially in the watershed. A critical flow was not identified, and the reductions specified in this TMDL apply at all flow conditions.

²@Risk – Risk Analysis and Simulation Add-in for Microsoft Excel, Palisade Corporation, Newfield, NY, 1990-1997.

IV. Discussions of Regulatory Requirements

EPA has determined that these TMDLs are consistent with statutory and regulatory requirements and EPA policy and guidance.

1. *The TMDLs are designed to implement the applicable water quality standards.*

Water quality standards are state regulations that define the water quality goals of a waterbody. Standards are comprised of three components: (1) designated uses, (2) criteria necessary to protect those uses, and (3) antidegradation provisions that prevent the degradation of water quality. Brewer Run has been designated by Pennsylvania as a high quality-cold water fishery with criteria to protect the aquatic life use, and the designation can be found at Pennsylvania Title 25 § 93.9s. Criteria in Table 2 apply to all waters in the State but high quality waters are deserving of a higher level of protection shown in Table 3.

Table 2. Applicable Water Quality Criteria

Parameter	Criterion Value (mg/l)	Duration	Total Recoverable/ Dissolved
Aluminum (Al)	0.75	Maximum	Total Recoverable
Iron (Fe)	1.50 0.30	30-day Average Maximum	Total Recoverable Dissolved
Manganese (Mn)	1.00	Maximum	Total Recoverable
pH	6.0 - 9.0	Inclusive	N/A

The criteria in Table 3 is developed from water quality network (WQN) data. The subject watershed, Brewer Run, is matched to a high quality reference watershed as explained *Brewer Run Watershed TMDL Report, Attachment D, Use of reference streams for High Quality waters.* The 95th percentile confidence limit on the median is used as the applicable water quality criteria for the @RISK model.

Table 3. Reference McLaughlin Creek Criteria

Parameter	Criterion Value (mg/l)
Aluminum (Al)	0.200
Iron (Fe)	0.247
Manganese (Mn)	0.029
Area	8 mi ²
Alkalinity	51

Pennsylvania Title 25 §96.3c requires that water quality criteria be achieved at least 99% of the time, and TMDLs expressed as long-term average concentrations are expected to meet these requirements. That is, the statistical Monte Carlo simulation used to develop TMDL WLAs and LAs for each parameter resulted in a determination that any required percent pollutant reduction would assure that the water quality criteria would be met instream at least 99% of the time. The Monte Carlo analysis performed 5000 iterations of the model where each iteration was independent of all other iterations and the data set was assumed to be log normally distributed.

EPA finds that these TMDLs will attain and maintain the applicable narrative and numeric water quality standards.

The pH values shown in Table 2 are used as the endpoints for AMD TMDLs. In the case of freestone streams with little or no buffering capacity, the allowable TMDL endpoint for pH may be the natural background water quality, and these values can be as low as 5.4 (Pennsylvania Fish and Boat Commission). However, PADEP chose to set the pH standard between 6.0 to 9.0, inclusive, which is presumed to be met when the net alkalinity is maintained above zero. This presumption is based on the relationship between net alkalinity and pH, on which PADEP based its methodology to addressing pH in the watershed (see the *Brewer Run Watershed TMDL Report*, Attachment B). A summary of the methodology is presented as follows:

The parameter of pH, a measurement of hydrogen ion acidity presented as a negative logarithm of effective hydrogen ion concentration, is not conducive to standard statistics. Additionally, pH does not measure latent acidity that can be produced from the hydrolysis of metals. PADEP has been using an alternate approach to address the stream impairments noted on the Section 303(d) list due to pH. Because the concentration of acidity in a stream is partially dependent upon metals, it is extremely difficult to predict the exact pH values which would result from treatment of AMD. 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 able to measure the reduction of acidity. When acidity in a stream is neutralized or is restored to natural levels, pH will be acceptable (≥ 6.0). 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 used to calculate the required 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. EPA finds this approach to addressing pH to be reasonable.

For high quality streams the reference stream alkalinity is used as the criterion instead of the measured alkalinity. For Brewer Run, the reference stream alkalinity is greater than the measured alkalinity at each sampling point.

2. The TMDLs include a total allowable load as well as individual WLAs and LAs.

For purposes of these TMDLs only, point sources are identified as permitted discharge points or discharges having responsible parties, and nonpoint sources are identified as any

pollution sources that are not point sources. Abandoned mine lands were treated in the allocations as nonpoint sources. As such, the discharges associated with these land uses were assigned LAs (as opposed to WLAs). The decision to assign LAs to abandoned mine lands does not reflect any determination by EPA as to whether there are unpermitted point source discharges within these land uses. In addition, by approving these TMDLs with mine drainage discharges treated as LAs, EPA is not determining that these discharges are exempt from NPDES permitting requirements. There are no permitted dischargers and no WLAs were allocated.

Once PADEP determined the allowable concentration and load for each pollutant, a mass balance accounting was performed starting at the top of the watershed and working downstream in sequence. Load tracking through the watershed utilizes the change in measured loads from sample location to sample location as a guide for expected changes in the allowable loads.

PADEP used two basic rules for the load tracking between two ends of a stream segment: (1) if the measured upstream loads are less than the downstream loads, it is indicative that there is an increase in load between the points being evaluated, and no instream processes are assumed, (2) if the sum of the measured loads from the upstream points is greater than the measured load at the downstream point, it is indicative that there is a loss of instream load between the points, and the ratio of the decrease shall be applied to the allowable load being tracked from the upstream point.

Tracking loads through the watershed provides a picture of how the pollutants are affecting the watershed based on the available information. The analysis is performed to insure that water quality standards will be met at all points in the stream. EPA finds this approach reasonable.

Table 3 presents a summary of the allowable loads, LAs, and WLAs for the Brewer Run Watershed.

Table 4. TMDL Component Summary for the Brewer Run Watershed

Parameter (lbs/day)	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction (%)
4 - Headwaters of Brewer Run						
Aluminum	ND	NA	0.00	NA	NA	NA
Iron	0.88	0.05	0.00	0.05	0.83	95
Manganese	0.24	0.00	0.00	0.00	0.24	99
Acidity	4.30	3.24	0.00	3.24	1.06	25
3 - Brewer Run downstream of Unnamed Tributary 47593						
Aluminum	ND	NA	0.00	NA	NA	NA
Iron	1.69	0.17	0.00	0.17	0.69	80
Manganese	0.66	0.01	NA	0.01	0.41	98
Acidity	ND	NA	0.00	NA	NA	NA

Parameter (lbs/day)	Existing Load (lbs/day)	TMDL Allowable Load (lbs/day)	WLA (lbs/day)	LA (lbs/day)	Load Reduction (lbs/day)	Percent Reduction (%)
2 - Brewer Run downstream of Unnamed Tributary 47592						
Aluminum	ND	NA	0.00	NA	NA	NA
Iron	2.20	0.21	0.00	0.21	0.47	69
Manganese	7.97	0.49	0.00	0.49	6.83	93
Acidity	ND	NA	0.00	NA	NA	NA
1 - Mouth of Brewer Run						
Aluminum	1.72	0.23	0.00	0.20	1.49	87
Iron	5.10	0.35	0.00	0.35	2.76	89
Manganese	8.00	0.08	0.00	0.08	0.44	85
Acidity	ND	NA	0.00	NA	NA	NA

ND = not detected

NA = not applicable, meets water quality standards, no TMDL necessary

* Percent reduction after upstream reductions are made

PADEP allocated only to nonpoint sources as there are no permitted dischargers in the watershed. Where there are active mining operations, Federal regulations require that point source permitted effluent limitations be water quality-based subsequent to TMDL development and approval.³ In addition, PA Title 25, Chapter 96, Section 96.4d requires that WLAs serve as the basis for determination of permit limits for point source discharges regulated under Chapter 92 (relating to NPDES permitting, monitoring, and compliance). Therefore, no new mining may be permitted within the watershed without reallocation of the TMDL. Additionally, no required reductions of permit limits are necessary at this time, as all necessary reductions have been assigned to nonpoint sources.

3. The TMDLs consider the impacts of background pollutant contributions.

The TMDLs were developed using instream data, which account for existing background conditions.

4. The TMDLs consider critical environmental conditions.

The reductions specified in these TMDLs apply at all flow conditions. A critical flow condition was not identified from the available data.

5. The TMDLs consider seasonal environmental variations.

³It should be noted that technology-based permit limits may be converted to water quality-based limits according to EPA's *Technical Support Document For Water Quality-based Toxics Control*, March 1991, recommendations.

The data set included data points from all seasons, thereby accounting for seasonal variation implicitly.

6. The TMDLs include a MOS.

The CWA and Federal regulations require TMDLs to include a MOS to take into account any lack of knowledge concerning the relationship between effluent limitations and water quality. EPA guidance suggests two approaches to satisfy the MOS requirement. First, it can be met implicitly by using conservative model assumptions to develop the allocations. Alternately, it can be met explicitly by allocating a portion of the allowable load to the MOS.

PADEP used an implicit MOS in these TMDLs by assuming that the treated instream concentration variability was the same as the untreated stream's concentration variability. This is a more conservative assumption than the general assumption that a treated discharge has less variability than an untreated discharge. By retaining variability in the treated discharge, a lower average concentration is required to meet water quality criteria 99% of the time than if the variability of the treated discharge is reduced.

7. There is reasonable assurance that the proposed TMDLs can be met.

Brewer Run flows to Little Mahoning Creek, which does have a watershed association; however, the Department is not aware of any projects in-place to address the extensive abandoned mine lands (AMLs) within the Brewer Run Watershed. The scope of the problems associated with these extensive AMLs, including open pits and spoil piles would need to be addressed either by the Bureau of Abandoned Mine Reclamation (BAMR), or through other programs within District Mining Operations (DMO), such as remining and Government Financed Construction Contracts (GFCCs). Any post-mining discharges of substandard quality might then be addressed through the Growing Greener Program.

The *Recommendations* section of the TMDL Report further highlights what can be done in the Brewer Run Watershed to eliminate or treat pollutant sources. Aside from PADEP's primary efforts to improve water quality in the Brewer Run Watershed through reclamation of abandoned mine lands and through the NPDES permit program, additional opportunities for reasonable assurance exist. PADEP expects that activities such as research conducted by its Bureau of Abandoned Mine Reclamation, funding from EPA's § 319 grant program, and Pennsylvania's Growing Greener program will help remedy abandoned mine drainage impacts. PADEP also has in place an initiative that aims to maximize reclamation of Pennsylvania's abandoned mineral extraction lands. Through Reclaim PA, Pennsylvania's goal is to accomplish complete reclamation of abandoned mine lands and plugging of orphaned wells. Pennsylvania strives to achieve this objective through legislative and policy land management efforts and activities described in the TMDL Report.

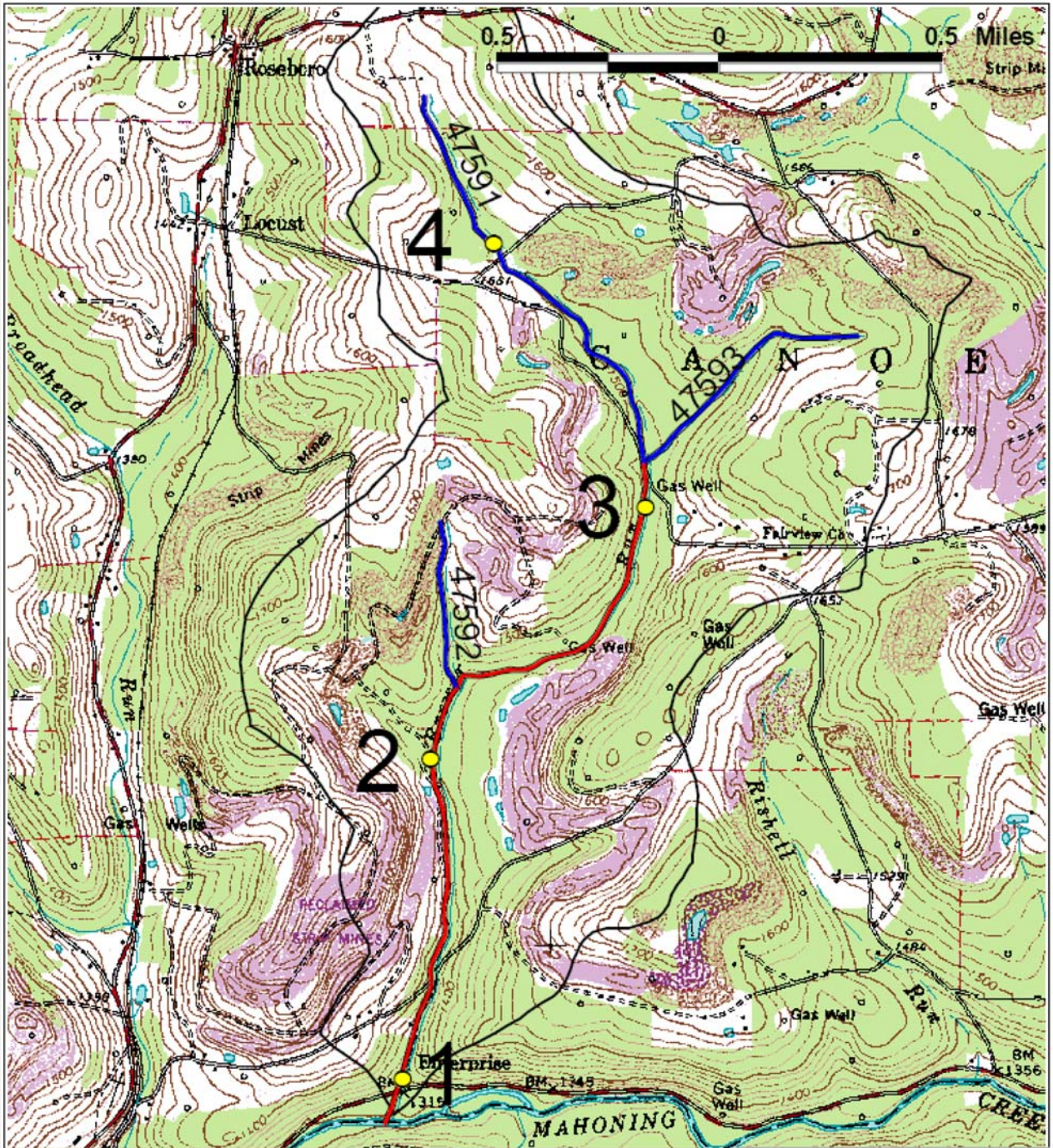
8. The TMDLs have been subject to public participation.

Public notice of the draft TMDL was published in the *Pennsylvania Bulletin* on November 11, 2006, and the *Indiana Gazette*, Indiana, PA, to foster public comment on the calculated allowable loads. The public comment period was open from November 11, 2006, through January 4, 2007. A public meeting was held on November 21, 2006 in the Cambria District Mining Office in Ebensburg, Cambria County, PA, to discuss the proposed TMDL. No comments were received.

Although not specifically stated in the TMDL Report, PADEP routinely posts the approved TMDL Reports on their web site: www.dep.state.pa.us/watermanagement_apps/tmdl/.

Attachment A

Brewer Run Watershed Map



BREWER RUN WATERSHED



Legend

- Sample Point
- Watershed Boundary
- Streams**
- Nonattaining
- Unassessed

N

