

Total Maximum Daily Load (TMDL) Development

- pH (H^+ Ion Mass) -

For

Sugar Creek Watershed

(Hopkins County, Kentucky)

Kentucky Department for Environmental Protection

Division of Water

Frankfort, Kentucky

December 2003

Total Maximum Daily Load (TMDL) Development

- pH (H^+ Ion Mass) -

For

Sugar Creek Watershed

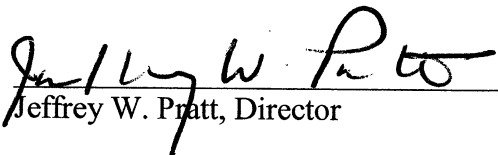
(Hopkins County, Kentucky)

Kentucky Department for Environmental Protection

Division of Water

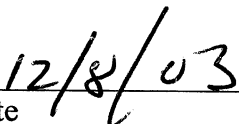
Frankfort, Kentucky

This report has been approved for release:



Jeffrey W. Pratt, Director

Division of Water



Date

**Total Maximum Daily Load (TMDL) Development
- pH (H⁺ Ion Mass) -**

**For
Hopkins Creek Watershed
(Hopkins County, Kentucky)**

**Kentucky Department for Environmental Protection
Division of Water**

Frankfort, Kentucky

List of Contributors

Dr. Lindell Ormsbee, Supervisor

Emily Zechman, Data Analysis and Report Preparation

The Natural Resources and Environmental Protection Cabinet does not discriminate on the basis of race, color, natural origin, sex, age, religion, or disability and provides on request, reasonable accommodations including auxiliary aids and services necessary to afford an individual with a disability an equal opportunity to participate in all services, programs, and activities.

Printed on Recycled Paper

Table of Contents

	Page
List of Contributors.....	ii
Table of Contents.....	iii
List of Figures and Tables.....	iv
TMDL Fact Sheet.....	v
Introduction.....	1
Problem Definition.....	7
Target Identification.....	8
Source Assessment.....	8
Model Development.....	10
TMDL Development.....	14
Permitting.....	18
Implementation/Remediation Strategies.....	20
Literature Cited.....	22
Appendix A: Mining Permits Numbering System.....	23

Sugar Creek, Kentucky

TMDL Fact Sheet

Project Name:	Sugar Creek
Location:	Hopkins County, Kentucky
Scope/Size:	Sugar Creek, watershed 4350 acres (6.80 mi ²) The listed segment was from river mile 0.0 to 5.3. The TMDL is for the subbasin that extends from river mile 2.4 to 5.3. Data indicate that the segment from river mile 0.0 to 2.4 can be delisted.
Land Type:	Forest, agricultural, barren/spoil
Type of Activity:	Acid Mine Drainage (AMD) caused by Strip/Abandoned Mines
Pollutant(s):	H ⁺ Ion mass, Sulfuric Acid
TMDL Issues:	Non-point sources
Water Quality Standard/Target:	pH shall not be less than six (6.0) or more than nine (9.0) and shall not fluctuate more than one and zero-tenths (1.0) pH unit over a 24-hour period. This standard is found within regulation 401 KAR 5:031.
Data Sources:	KPDES Permit Historical Sampling Data, Murray State University Sampling Data
Control Measures:	Kentucky non-point source TMDL implementation plan, Kentucky Watershed Framework
Summary:	Sugar Creek was determined as not supporting the designated uses of primary and secondary contact recreation (swimming and wading), and warm water aquatic habitat (aquatic life). Therefore, the creek was placed on the 1998 and 2002 303(d) list for Total Maximum Daily Load (TMDL) development. The creek segment is characterized by a depressed pH, the result of acid mine drainage from strip and abandoned mining sites. The period of lowest pH is generally at low-flow conditions; however, the period of greatest hydrogen ion

to pounds/day) because the units for pH do not allow for the computation of a quantitatively useful load or reduction amount.

	Incremental Contributing Area (mi ²)	3-Year Incremental Flow Rate (cfs)	Incremental TMDL for a pH of 6.0 (lbs/day)	3-Year Incremental Load (lbs/day)	Incremental Reduction Needed (lbs/day)
Subbasin 2	3.96	90	0.55	0.56	0.01
Reduction Needed for Sugar Creek Subbasin 2 is 0.01 lbs H ⁺ Ions/day					

New Permitting in the Sugar Creek Watershed

Permitting Other Than in Subbasin 2:

Permitting for locations in the Sugar Creek Watershed other than in Subbasin 2 would require no special considerations related to 303(d). As shown by the values listed for Site S1 in Table 4, all pH values were equal to or greater than 6.0. Remediation of the abandoned mine areas in Subbasin 2 should result in improved water quality at Site S1.

New Permits in Subbasin 2:

New permits (except for new remaining permits) for discharges to streams in Subbasin 2 of the Sugar Creek watershed could be allowed anywhere in Subbasin 2, contingent upon the end-of-pipe pH being permitted at a range of 7.0 to 9.0 standard units. Water quality standards state that for meeting the designated uses of aquatic life and swimming, the pH value should not be less than 6.0, nor greater than 9.0. This range of 6.0 to 9.0 for pH is generally the value assigned for end-of-pipe effluent limits. However, because a stream impairment exists (low pH), new discharges can not cause or contribute to an existing impairment. A pH of 7.0 represents a neutral state between an acidic and a non-acidic condition. As such, a discharge having a pH of 7.0 to 9.0 standard units will not cause or contribute to the existing impairment. The discharge will not cause an impairment because the effluent discharge has a pH greater than 6.0 standard units. The discharge will not contribute to the existing impairment because a pH of 7.0 represents a neutral condition with respect to acidity and effectively represents a background condition. The

did in improving the low pH condition for the subbasin. There are currently no active remining permits in the Sugar Creek watershed.

Distribution of Load:

Because there were no point source discharges during the study period, the existing Hydrogen Ion load for the watershed was defined entirely as a load allocation and that is what is reflected in the TMDL table. Because new permits (pH 7.0 to 9.0) would not cause or contribute to the existing impairment and remining permits would be exempt from the TMDL requirements, no load has been provided for the waste load allocation category. Therefore, the table below allocates all of the load to the load allocation category. New permits having a minimum pH effluent limit of 7.0, and new remining permits with modified effluent limits for pH essentially represent no net change in conditions in the subwatershed with respect to pH.

Waste Load and Load Allocation for Subbasin 2 in the Sugar Creek Watershed

	Incremental Contributing Area (mi ²)	3-Year Incremental Flow Rate (cfs)	Incremental TMDL for a pH of 6.0 (lbs/day)	Waste Load Allocation (lbs/day)	Load Allocation (lbs/day)
Subbasin 2	3.96	90	0.55	0.00	0.55

Implementation/

Remediation Strategies:

Remediation of pH impaired streams as a result of current mining operations is the responsibility of the mine operator. The Kentucky Division of Field Services of the Kentucky Department of Surface Mining Reclamation and Enforcement (DSMRE) is responsible for enforcing the Surface Mining Control and Reclamation Act of 1977 (SMCRA). No governmental entity bears the responsibility to remediate pH impaired streams as a result of pre-law mining operations or mining operations associated with forfeited reclamation bonds. The Kentucky Division of Abandoned Mine Lands (KDAML), also a part of DSMRE, is charged with performing reclamation to address the impacts from pre-law mine sites in accordance with priorities established in SMCRA. SMCRA sets environmental problems as third in priority in the list of

However the bulk of these funds were used to support priority 1 (extreme danger of adverse effects to public health, safety, welfare, and property) and priority 2 (adverse effects to public health, safety, and welfare) projects. Based on the cost of current remediation efforts, it would appear that a significant increase in federal funding to the AML projects, particularly priority 3 projects, would be required in order for the AML program to play a significant part in meeting the TMDL implementation requirement associated with pH impaired streams in the state of Kentucky.

Just recently (June 2003), 319 funding (specifically Clean Water Action Plan funds) has been awarded to the KDAML. This grant is the Homestead Refuse Reclamation Project and includes reclamation of a portion of the upper Pleasant Run watershed. The project involves a 92-acre area. The total cost of the reclamation project is \$1.26 Million, of which 60% is federal funds and 40% is supplied by the KDAML. The reclamation activities will be very similar to what was described above for the Brier Creek reclamation effort.

