

**Piper Creek in Missouri
Draft Total Maximum Daily Load**

SUMMARY OF COMMENTS AND RESPONSES

Prepared by the Environmental Protection Agency (EPA), Region 7
Water, Wetlands and Pesticides Division
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INTRODUCTION

The United States Environmental Protection Agency (EPA) public noticed a draft Total Maximum Daily Load (TMDL) for Piper Creek (water body identification MO_1444) from September 15 to October 15, 2010. EPA is establishing this TMDL to meet the obligations of the 2001 Consent Decree, *American Canoe Association, et al. v. EPA*, Consolidated Case No. 98-482-CV-W, (Consent Decree). This document summarizes and paraphrases comments received, EPA's response to comments, and changes made to the final TMDL where appropriate. Included is a list of all commentors.

RESPONSE TO COMMENTS (EPA responses are bolded)

1. Comment:

a. The Bolivar Community Watershed Group, who currently has a 319 watershed management plan, comments that there has been confusion regarding the impairment area designation from Town Branch at Highway 83 to its confluence with Piper Creek and continuing to Piper Creek's confluence with Pomme de Terre River.

b. The group also had a question about impaired water bodies and how to designate a specific segment and/or length.

1. Response:

a. **The EPA commends the work by water resource organizations in the Piper Creek area for implementing a 319 project to address the issues facing the watershed. EPA agrees that Piper Creek's designation is confusing because of its unusual water body identification number (WBID) in Missouri's Table H. However, the loading allocation in the TMDL includes the entire impaired water.**

The water body is named "Town Branch" in Missouri water quality standards (WQS) Table H (10 Code of State Regulations (CSR) 20-7.031) but is referred to as "Piper Creek (Town Branch)" in the 2008 303(d) List. A WBID is usually assigned to only one segment of a classified stream. However, WBID #1444 includes a Town Branch segment and a Piper Creek segment. Town Branch is the receiving stream for the Bolivar WWTP and is a tributary of Piper Creek.

Throughout the TMDL the name Piper Creek is used in reference to both water bodies. The entire length of the combined Piper Creek (Town Branch) WBID 1444 is addressed in the TMDL. The TMDL is modeled so that the load is derived from the entire

drainage area for the impaired water body through use of a load duration curve. The flow used to calculate the loads is calculated at the confluence of Piper Creek with the Pomme de Terre River and so covers loads from the entire watershed.

b. Designating the length of a water body segment and deciding whether the segment is impaired are beyond the scope of this specific TMDL public notice.

However, it is helpful to understand the process whereby a water body may be listed as impaired by the state or EPA. Federal regulations at 40 CFR part 131 describe the requirements for states in establishing water quality standards, which include the designation of beneficial uses. Designated uses are defined as “those uses specified in water quality standards for each water body or segment whether or not they are being attained” (40 CFR 131.3(f)). States then adopt criteria to protect those uses. It is the evaluation of water quality data against the criteria that results in identifying water quality limited segments for the purpose of the 303(d) list of impaired waters. As part of EPA’s review of Missouri’s 303(d) list, EPA evaluates existing and readily available data and information provided by the Missouri Department of Natural Resources (MDNR) and any additional information provided by the public during Missouri’s public comment process to determine the adequacy of the state’s response. Depending on the results of EPA’s review, EPA may identify additional water quality limited segments still requiring TMDLs in Missouri, as provided for in 40 CFR 130.7(d)(2).

2. Comment:

The commentor suggests changing the first paragraph of section 2.1 to add the information that Town Branch’s watershed contains approximately 3,800 acres.

In a similar request another commentor provided information to section 2.2, Physiographic Location, Geology and Soils: Please, add a qualifying sentence that local physical evidence indicates that Karst Topography underlies this watershed and sinkholes can serve as a direct channel to groundwater.

2. Response:

EPA appreciates the commentors’ information. The data used in the draft TMDL were the best available when writing the TMDL. Information in the TMDL discussing watershed area, geology and soils was taken from the Missouri Department of Conservation’s online information covering the Pomme de Terre Watershed, Natural Resources Conservation Service online and Purdue Research Foundation’s 2009 study entitled, “Hydrologic Soil Group.” All geographic and soil information in the TMDL is supported by references. As more data is made available and analyzed, MDNR may consider submitting a revised or modified TMDL for this water at any time based on the newly obtained data.

3. Comment:

A commentor suggests that the Total Phosphorus target of 0.007 mg/L is too low and is not attainable in Town Branch which is the receiving portion of Piper Creek because the city of Bolivar has a population of 10,000 and Polk County is the number one cattle producing county in

the state. The commentor suggests further review of the data from which the reference target was set.

A similar comment is that nutrient criteria should be set at levels that protect fisheries and mussels only because it is unrealistic to expect an urban influenced stream to achieve pristine conditions.

In another similar comment, the commentor says that the proposed wasteload allocations (WLAs) in Table 13 on page 38 appear to be based on a stream in “pristine” condition and not of a stream receiving discharge from point and nonpoint sources. The cost to achieve the TMDL’s effluent limits would be significant. The plant improvements would require the installation of selector basins and other extremely expensive operation costs that would result in user rates well above 2% of the medium household income level.

3. Response:

Designated beneficial uses and any associated water criteria for each water body are determined by the state (40 CFR 131.10(a) and 131.11(a)(1)). While the listing and designated uses of this water body are beyond the scope of this specific TMDL public notice, uses could be modified under certain circumstances (40 CFR 131) and the water’s listing can be addressed during the next review of Missouri’s 303(d) Impaired Waters review (CWA 303(d)(1)). TMDLs shall be established for all pollutants preventing or expected to prevent attainment of WQS for the water body’s use (40 CFR 130.7(c)(1)(ii)). The state of Missouri has determined there is an impairment to the warm-water aquatic life and natural biological aquatic communities designated beneficial uses for an 8-mile length of Piper Creek (including Town Branch), that is identified as segment MO_1444 (10 CSR 20-7.031(1)(C) and Table H), on the EPA-approved 2008 Missouri 303(d) List. The draft TMDL was written to attain WQS for the entire watershed of Piper Creek (including Town Branch) segment MO_1444. Please refer to Response #1 above for a detailed explanation of how criteria for a specific water body are determined. The recommended EPA level III Ecoregion 39 reference TP concentration (0.007 mg/L [milligram per liter]) was derived from 8,166 TP values from 560 stream stations on 258 streams in the Ozark Highlands ecoregion (EPA, 2000). Please refer to Response 10b below for more discussion about TP targets in the TMDL.

4. Comment:

A Commentor suggests consistently using either cubic meters per second or cubic feet per second in the TMDL for clarity.

4. Response:

EPA thanks the commentor. As is appropriate, changes have been made in the final TMDL that clarify consistency when referring to the rate of flow.

5. Comment:

Milligrams per liter (mg/L) should be used in the TMDL instead of pounds per day (lbs/day) to make it easier for stakeholders.

5. Response:

TMDLs and associated load and WLAs are expressed in terms of daily time increments, per the Anacostia River TMDL Ruling, *Friends of the Earth, Inc. v. EPA, et al.*, No. 05-5015 (D.C. April 25, 2006). Also, mg/L concentrations are also given in the draft TMDL. The new WLAs for the city of Bolivar WWTF are found in Table 13 where both pounds per day and mg/L are provided at design flow. WLAs for the other permitted facilities in the watershed remain equal to existing permit limits which are given in both lbs/day and mg/L in Table 14.

6. Comment:

The pollutant listing is incorrect. Multiple sediment testing performed by MDNR in 2004 was primarily non-volatile suspended solids, not organic sediment. The pollutant listing appears to be unjustified based on conflicting field testing and study conclusions. Additional field testing should be performed to either validate organic sediment as a pollutant or it should be removed as a pollutant.

6. Response (pollutant names are not abbreviated in this response to facilitate clarity):

TMDLs are written to address the current water body impairment per 40 CFR 130.7. The target of Piper Creek's TMDL is *Total Suspended Solids* which addresses Piper's current 303(d) list impairment, *volatile suspended solids* (which is also known as organic sediment). Total Suspended Solids includes the *non-volatile suspended solids* (which is also known as inorganic sediment) about which the commentor is concerned. This TMDL already covers any potential impairment from non-volatile suspended solids, as well as volatile suspended solids, because of its Total Suspended Solids target.

The TMDL is being written at this time to satisfy the requirements of the Consent Decree. A TMDL is being developed for this water under the requirements found at 40 CFR 130.7 (and specifically 40 CFR 130.7(c)(1)) requiring states to establish TMDLs for waters still requiring TMDLs in accordance with the state's priority ranking. The data used in the draft TMDL were the best available when writing the TMDL. Should more data be made available, MDNR may then consider submitting a revised or modified TMDL for this water at any time based on the newly obtained data.

Although the listing of this water body as impaired by any particular pollutant is beyond the scope of this specific TMDL public notice, it can be addressed during the next Missouri 303(d) review of impaired waters. Please refer to Response 1a above for more information.

7. Comment:

New sludge holding and digestion tanks have been added to the wastewater treatment plant (WWTP) in the city of Bolivar. This change reduces potential solids being discharged from the final clarifiers to the receiving stream by providing ample sludge wasting and digestion capacity at the plant. New testing should be performed that would impact the TMDL.

7. Response:

The data used in the draft TMDL were the best available when writing the TMDL. MDNR will work with permitted facilities identified in the TMDL as per EPA regulations; the state incorporates the TMDL into its current water quality management plan for implementation (40 CFR 130.7(c)(1)). Missouri has the authority to monitor and access state waters to ensure protection of the designated beneficial uses. Missouri may submit, and EPA may approve, a revised or modified TMDL for this water at any time.

8. Comment:

Sampling data in the TMDL suggests that the plant is actually increasing the naturally low DO levels in Piper Creek. (Referring to Tables 3 through 6 which show the lowest DO level below the plant at 5.70 mg/L and a sample above the plant shows a 2.77 mg/L at approximately the same time.)

8. Response:

Analysis of the monitoring data presented in Tables 3-6 should consider the locations of the sampling points relative to the WWTP. Please refer to Figure A-2 when reading the following description of the Sample Locations: Site 1 is on Town Branch, a tributary to Piper Creek, and is *upstream* of the Bolivar WWTP outfall; Site 2 is on Town Branch, 0.33 mile *downstream* of the Bolivar WWTP outfall; Site 3 is on Piper Creek, 1.2 miles *upstream of the Town Branch confluence* and Site 4 is on Piper Creek, 0.44 mile *downstream of the Town Branch confluence*. Now turning to Tables 3 through 6, we see that immediately downstream (1/3 mile) of the WWTP discharge at Site 2 the DO is lower relative to what is observed at the upstream station at Site 1. This trend is consistent during both sampling days and times in July and August, 2009; percentage decrease in DO ranged from 4% to 28%. This decrease in DO is directly attributable to the WWTP discharge and is discussed beginning on page 11 of the TMDL.

The commentor's interpretation that DO increased from upstream to downstream of the plant is a misreading of the data in Tables 3 through 6. From Table 6, the 2.77 mg/L DO was observed at 7:05 AM at Site 3 (As discussed in the paragraph above, Site 3 is on Piper Creek and is not directly upstream of the WWTP discharge, but is upstream of the confluence of Town Branch and Piper Creek). The 5.7 mg/L DO was observed at Site 2, which is 0.33 miles directly downstream of the WWTP, 1.25 hours earlier than the measurement at Site 3. The increase in DO from Site 3 to Site 4 along Piper Creek would have been higher than what is indicated in Tables 3 through 6, if not for a drop in DO from Sites 1 to 2 along Town Branch because of the WWTP discharge. The near field impacts of the WWTP discharge is clear from the observations shown in Table 3 through 6 (more than 100% increase in TN and more than 1000% increase in TP just downstream of the plant relative to the upstream condition).

9. Comment:

Placing extremely stringent effluent limits on total nitrogen and total phosphorus would not appear to be warranted by the DO data collected at sampling locations 1 and 2 because the plant isn't releasing common contributors to low DO such as nitrogen and phosphorus.

9. Response:

Tables 3-6 from the TMDL (summarized below) shows that downstream of the WWTP at sampling station 2 (0.33 mile downstream of WWTP), the Total Nitrogen (TKN+NO₃+NO₂, NH₃ was below detection limit)¹ and Total Phosphorous (TP) were significantly higher than those observed upstream of the WWTP at sampling station 1.

Sampling Date	Time	TKN+NO ₂ +NO ₃ (mg/L)	TP (mg/L)	Time	TKN+NO ₂ +NO ₃ (mg/L)	TP (mg/L)	TKN+NO ₂ +NO ₃ (mg/L)	TP (mg/L)
	Station 1 (U/S of WWTP)			Station 2 (0.33 mi D/S of WWTP)			% change from Site 1 to Site 2	
July 15, 2009	6:15 AM	1.691	0.059	7:25 AM	2.682	0.840	59%	1324%
	1:00 PM	2.072	0.042	1:50 PM	3.140	1.230	52%	2829%
July 16, 2009	5:20 AM	1.842	0.035	6:15 AM	4.506	1.365	145%	3800%
	1:00 PM	2.065	0.035	2:20 PM	4.879	1.910	136%	5357%
August 19, 2009	5:20 AM	4.594	0.024	6:15 AM	13.00	0.630	183%	2525%
	1:00 PM	3.284	0.024	1:30 PM	8.019	0.694	144%	2792%
August 20, 2009	5:15 AM	2.945	0.021	5:50 AM	7.147	0.550	143%	2519%
	1:00 PM	2.607	0.019	1:45 PM	9.046	0.670	247%	3426%

10. Comment:

(This comment summarizes several technical comments about the reference approach used in the draft TMDL. Comment number 10 is sub-segmented to be more responsive to each technical aspect of the commentors' concerns.)

Significant technical errors are present in the WLA as presented in Table 13 on page 38 of the draft TMDL. The development of the TMDL relied heavily on the reference approach as discussed in Appendix C of the draft TMDL. In reviewing Appendix C, many streams are dominated by major springs such as Meramec Spring, Current River, Jacks Fork, Welch Spring, Pulltite Spring, Round Spring and Alley Spring. Several errors arise from including these spring fed systems as a reference condition (Comment number 10 is continued below in 10a, 10b and 10c which are not bolded. Responses are bolded.)

10. Response:

Missouri does not have a numeric criterion for TN and TP in freshwater streams; therefore, targets and loading capacities (LCs) are based on EPA-recommended level III Ecoregion 39 (Ozark Highlands) reference concentrations (EPA, 2000) and water quality observations at locations throughout the ecoregion where Piper Creek is located. Recommended reference TN and TP concentrations for level III Ecoregion 39 are 0.289 mg/L and 0.007 mg/L for TN and TP, respectively (EPA, 2000). For the Piper Creek TMDL, the recommended reference TN and TP concentrations are used directly in developing LCs for TN and TP. Appendix D of the TMDL provides discussion about using the EPA-recommended reference nutrient concentrations to set targets for

¹ Total Nitrogen (TN) is composed of Total Kjeldahl Nitrogen (TKN), Nitrate (NO₃) and Nitrogen Dioxide (NO₂).

nutrient LCs. The details of the derivation of the level III Ecoregion 39 TN and TP concentrations are provided in EPA (2000) publication.

The stations listed in Appendix C are not reference sites (reference condition defined as associated with minimally impacted conditions and protective of designated uses). However, Total Suspended Solids (TSS) and nutrient data from those sites are used to develop a pooled dataset for the region where Piper Creek is located (referred to as an ecoregion or an Ecological Drainage Unit (EDU)). The distribution of this pooled dataset is adjusted such that the median is equal to the lower 25th percentile of the unadjusted dataset (for TSS) or the EPA-recommended ecoregion 39 nutrient concentrations (for TN or TP). Using the adjusted dataset, a load-flow relationship is subsequently derived. Allowable daily loads are then calculated for all flow conditions by multiplying flow by either the EPA-recommended ecoregion reference concentration or the concentration established using the regional load-flow relationship, whichever concentration is higher.

EPA believes that the methodology described in Appendix C & D of the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA.

Comment 10a:

Piper Creek is heavily influenced by surface water and the temperature regime is much different than that of the reference sites. The importance of water temperature is clearly highlighted on page 4 of the draft TMDL but this fact has clearly been ignored by including the spring dominated streams in the Ecoregion references.

Response 10a:

The QUAL2K model used in simulating the dynamics of DO and algal processes in Piper Creek and in developing allowable CBOD/BOD² load allocations includes routines that mechanistically simulates water temperature based on an energy balance.

Comment 10b:

Spring fed streams as opposed to surface water dominated streams have different pollutant pathways. Nutrient and TSS concentrations are dramatically different for the two systems. For example, the selected Regional Control was Dry Fork #1 located in Polk County as indicated in Appendix A of the draft TMDL. Page 28 of the draft TMDL states the "recommended TN and TP ecoregion criteria are used directly in developing LCs for TN and TP." When we compare the ecoregion TP (0.007 mg/l) to the Regional Control, we find the Regional Control violates the selected loading capacities for TP. The 3118/2004 sampling of the Regional Control indicated a TP of 0.02 mg/l or roughly 2.9 times higher than the WLA shown in Table 13 on page 38 of the draft TMDL. It is not surprising the Regional Reference has a higher TP concentration than the ecoregion due to the inclusion of the spring fed systems previously discussed. The reference approach should be re-evaluated to correct the sample bias that results by including the spring dominated systems.

² Carbonaceous Biological Oxygen Demand/ Biological Oxygen Demand (CBOD/BOD)

Response 10b:

The recommended EPA level III Ecoregion 39 reference TP concentration was derived from 8,166 TP values from 560 stream stations on 258 streams in the Ozark Highlands ecoregion (EPA, 2000). It is not surprising that a single measurement of TP on Dry Fork during the spring of 2004 can be higher than the calculated reference TP. A single measurement is not indicative of a long-term condition. EPA believes that the methodology described in Appendix C & D of the TMDL is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA.

Comment 10c:

The systems evaluated in the ecoregion are much larger than Piper Creek. Reviewing the sampling for the ecoregion, only one flow value was close to the flows reported in Piper Creek. USGS Gage 7064555 sampled on 9/21/1981 had a reported flow of 9.8 cubic feet per second (cfs) and TP of 0.02 mg/L. All of the other data points had much larger flows than Piper and Town Branch. The one and only data point within the ecoregion seems to indicate a higher TP should be used (0.02 mg/l versus the reported 0.007 mg/l). The method to take into account the size of the stream appears flawed as it produces much lower concentrations than the data suggests. The Regional Reference reported flow rate was 0.02 cfs on 09/25/2003 and 11.2 cfs on 03/18/2004. The reported TP concentration was 0.02 mg/l, again much higher than the calculated ecoregion values.

Response10c:

As explained above and described in detail in the TMDL, the allowable daily loads were calculated for all flow conditions by multiplying daily flow by either the EPA-recommended Level III Ecoregion 39 reference concentration or the concentration established using the regional load-flow relationship derived from data of the stations listed in Appendix E, whichever concentration is higher. The methodology described in Appendix C and D is technically defensible. MDNR has used the methodology in developing several TMDLs that were subsequently approved by EPA.

Reference for responses to comment 10:

EPA, 2000. *Ambient Water Quality Criteria Recommendations. Rivers and Streams in Nutrient Ecoregion XI.* EPA 822-B-00-020.

11. Comment:

The draft TMDL does not reduce any future WLA for any future permitted facilities in the watershed. The Bolivar WWTP is the only permitted facility that is being proposed with reduced WLA. Even though the Bolivar WWTP accounts for the majority of the flow into Town Branch, the other permitted facilities should also receive proportional reductions in their WLA.

11. Response:

The other permitted facilities in the watershed each discharge an insignificant volume of effluent compared to the city of Bolivar WWTP, and they are unlikely to discharge during the critical low flow periods. At lower flows the stream is dominated by

the Bolivar WWTP's point source flow. Reducing the discharge from all of the other permitted facilities combined would have negligible impact at low flow.

LIST OF COMMENTORS

1. Ronda Riden, Southern Utilities Company in Bolivar, Bolivar, Missouri
2. Sam Kirby, Bolivar Community Watershed Improvement Group, Bolivar, Missouri
3. Ronald L. Mersch, city of Bolivar, Bolivar, Missouri

END SUMMARY OF COMMENT AND RESPONSES