



EPA Region 7 TMDL Review

TMDL ID:MO_589

State: MO

Document Name: HICKORY CREEK, TRIB. TO

Basin(s): GRAND-THOMPSON RIVER BASIN

HUC(s): 10280102

Water body(ies): HICKORY CREEK, HICKORY CREEK, TRIB. TO, HICKORY CREEK, TRIBUTARY TO

Tributary(ies):

Pollutant(s): NITROGEN, PHOSPHORUS, TOTAL SUSPENDED SOLIDS, UNKNOWN

Submittal Date:6/10/2010

Approved:Yes

Submittal Letter

State submittal letter indicates final Total Maximum Daily Load(s) (TMDL) for specific pollutant(s)/water(s) were adopted by the state, and submitted to EPA for approval under section 303(d) of the Clean Water Act [40 CFR § 130.7(c)(1)]. Include date submitted letter was received by EPA, date of receipt of any revisions, and the date of original approval if submittal is a phase II TMDL.

This TMDL document was formally submitted by the Missouri Department of Natural Resources (MDNR). The United States Environmental Protection Agency (EPA) received this document by mail on June 10, 2010. Revisions to this document were received by email on October 8 and 25, 2010.

Water Quality Standards Attainment

The water body's loading capacity (LC) for the applicable pollutant is identified and the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources is described. TMDL and associated allocations are set at levels adequate to result in attainment of applicable water quality standards (WQS) [40 CFR § 130.7(c)(1)]. A statement that WQS will be attained is made.

The Tributary to Hickory Creek TMDL was developed to address the unknown pollutant impairment of the Tributary to Hickory Creek segment MO_0589. A TMDL is needed for the Tributary to Hickory Creek because it is not meeting the narrative WQS. Total suspended solids (TSS) and total phosphorus (TP) measurements in Tributary to Hickory Creek have shown elevated levels of each linked to the impaired beneficial use of the water body. Tributary to Hickory Creek is influenced by habitat degradation from sediment deposition and increases in nutrient concentrations above ecoregion values.

Water quality monitoring has not revealed an exceedance of a specific numeric WQS; however, elevated levels of TSS and TP have been identified as potential contributors to impairment. These parameters are being used as surrogate water quality targets that if met are protective of aquatic life use and should result in WQS attainment. Both total nitrogen (TN) and TP are selected as targets because both nutrients are generally elevated by point and nonpoint sources. In the EPA-approved 2008 Missouri 303(d) List, Tributary to Hickory Creek is listed as impaired by unknown pollutants. The TMDLs for TSS, TN and TP were determined using load duration curves (LDCs).

The number one pollutant entering Missouri's waters is sediment, with about 59 million tons of soil eroding from Missouri's land each year. Sedimentation occurs when wind or water runoff carries soil particles from an area and transports them to a stream. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants, covers fish spawning areas and food supplies and clogs the gills of fish. Other pollutants like nitrogen, phosphorus, pathogens and heavy metals are often attached to soil particles and move into streams with the sediment.

The major water quality problems in the Tributary to Hickory Creek watershed are excessive nutrients and increased rates of sediment deposition due to stream bank erosion and sheet erosion from agricultural lands, loss of stream length and stream channel heterogeneity due to channelization and changes in basin hydrology that have increased flood flows and prolonged low flow conditions. The conditions that appear to apply to Tributary to Hickory Creek are sediment deposition and increases in nutrient (i.e., phosphorus) concentrations above ecoregion values.

To address nutrient levels, the EPA nutrient ecoregion reference concentrations were used. For the Level III 40, the Central Irregular Plains ecoregion where Tributary to Hickory Creek is located, the reference concentration for TN is 0.855 milligrams per liter (mg/L) and for TP is 0.092 mg/L. The LC for TN and TP is defined by LDCs set at the ecoregion reference concentrations. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. As such, the ecoregion concentration will not be the target at all flows. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the ecoregion targets are met.

There are many quantitative indicators of sediment, such as TSS, turbidity and bedload sediment, which are appropriate to describe sediment in rivers and streams. Because fine particle size sediment and suspended particles of organic matter are derived from similar loading conditions, TSS will be used to represent both. TSS was selected as one of the numeric targets for this TMDL because it enables the use of the highest quality data available. The LC for TSS is defined by a LDC set at the 25th percentile of TSS measurements (10 mg/L) available in the Central Plains/Grand/Chariton ecological drainage unit (EDU).

The LCs for TSS, TN and TP at the 50 percent flow exceedance are 0.01 ton per day, 1.00 pound per day (lb/day) and 0.11 lb/day, respectively. These reductions in nutrients and sediment protects the warm water aquatic life use of the stream and the TMDLs should result in WQS attainment.

Numeric Target(s)

Submittal describes applicable WQS, including beneficial uses, applicable numeric and/or narrative criteria. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, site specific if possible, was developed from a narrative criterion and a description of the process used to derive the target is included in the submittal.

All water bodies in Missouri are protected by the general narrative criteria contained in Missouri's WQS CSR 20-7.031(3) pertaining to the protection of aquatic life. These criteria are also called narrative criteria, since they do not contain specific numeric limits. The narrative criteria not being met in Tributary to Hickory Creek are (3) (A), (C), (D) and (G):

- A) Waters shall be free from substances in sufficient amounts to cause the formation of putrescent, unsightly, or harmful bottom deposits or prevent full maintenance of beneficial uses.
- C) Waters shall be free from substances in sufficient amounts to cause unsightly color or turbidity, offensive odor, or prevent full maintenance of beneficial uses.
- D) Waters shall be free from substances or conditions in sufficient amounts to result in toxicity to human, animal, or aquatic life.
- G) Waters shall be free from physical, chemical or hydrologic changes that would impair the natural biological community.

The designated beneficial uses of the Tributary to Hickory Creek are:

- Livestock and Wildlife Watering,
- Protection of Warm Water Aquatic Life,
- Protection of Human Health (Fish Consumption) and
- Whole Body Contact Recreation - Category B.

The use that is impaired is general criteria pertaining to protection of warm water aquatic life.

In the absence of Missouri numeric standards for nutrients in freshwater streams, ambient water quality criteria recommendations provided by the EPA nutrient Ecoregion 40 reference concentrations were used. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. As such, the ecoregion concentration will not be the target at all flows. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the

ecoregion targets are met. Reference conditions for TN and TP in level III Ecoregion 40 streams are as follows: TN = 0.855 mg/L and TP = 0.092 mg/L.

A concentration of TSS was selected to represent the numeric target for this TMDL because it enables the use of the highest quality available data. To address TSS the 25th percentile of all available TSS measurements available in the geographic area were targeted. The TSS target is 10 mg/L.

The LCs for TSS, TN and TP at the 50 percent flow exceedance are 0.01 ton per day, 1.00 lb/day and 0.11 lb/day, respectively.

Pollutant(s) of concern

An explanation and analytical basis for expressing the TMDL through surrogate measures (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae) is provided, if applicable. For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and margin of safety (MOS) that do not exceed the LC. If submittal is a phase II TMDL there are refined relationships linking the load to WQS attainment. If there is an increase in the TMDL there is a refined relationship specified to validate the increase in TMDL (either load allocation (LA) or waste load allocation (WLA)). This section will compare and validate the change in targeted load between the versions.

To address the unknown pollutants, this TMDL targets sediment and nutrients. The major water quality problems are excess nutrients and increased rates of sediment deposition. Excessive sedimentation clouds the water, which reduces the amount of sunlight reaching aquatic plants, covers fish spawning areas and food supplies and clogs the gills of fish. Other pollutants like nitrogen, phosphorus, pathogens and heavy metals are often attached to soil particles and move into streams with the sediment. The conditions that appear to apply to Tributary to Hickory Creek are sediment deposition and increases in nutrient (i.e., phosphorus) concentrations above ecoregion values.

To address nutrient levels, the EPA nutrient Ecoregion 40 reference concentrations were used. These concentrations establish a link with the impairment and are used to define this TMDL as numeric nutrient values. For the ecoregion where the Tributary to Hickory Creek is located, the reference concentration for TN is 0.855 mg/L and for TP is 0.092 mg/L. The LC for TN and TP is defined by LDCs set at the ecoregion reference concentrations. The TMDL uses a method to target specific concentrations at differing flows which will result in an annual average equal to the ecoregion target. These differing concentrations are calculated based on the range of current concentrations and a ratio adjustment such that the ecoregion targets are met.

A TMDL establishing an allocation for suspended solids was developed. In cases where sufficient pollutant data for the impaired stream is not available a reference approach is used. In this approach, the target or LC for pollutant loading is the 25th percentile of all data available within the geographic area in which the water body is located; the reference concentration for TSS is 10 mg/L. An established link between TSS and sediment was used to define this TMDL as a numeric value.

The sum of the WLA, LA and MOS for all pollutants are set to not exceed the LC. Reductions in concentration for all pollutants should ensure the narrative WQS are met.

Source Analysis

Important assumptions made in developing the TMDL, such as assumed distribution of land use in the watershed, population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources, are described. Point, nonpoint and background sources of pollutants of concern are described, including magnitude and location of the sources. Submittal demonstrates all significant sources have been considered. If this is a phase II TMDL any new sources or removed sources will be specified and explained.

There are no permitted or regulated entities in the Tributary to Hickory Creek watershed but the presence of lower density livestock populations could be contributing to the nutrient and sediment loads. The cattle are most likely located on the approximately 615 acres of grassland/pastureland in the watershed and runoff from these areas can be potential sources of nutrients, sediment from erosion and oxygen-consuming substances. Animals grazing in pasture areas deposit manure directly upon the land surface and, even though a pasture may be relatively large and animal densities low, the manure will often be concentrated near the feeding and watering areas in the field. These areas can quickly become barren of plant cover, increasing the possibility of erosion and contaminated runoff during a storm event. Grassland makes up 61 percent of the watershed land use. The density of cattle in the Tributary to Hickory Creek watershed (156 cattle per square mile) suggests they are not a

potentially significant source of pollutants unless they are directly accessing the stream.

Illicit straight pipe discharges of household waste are potential point sources in agricultural areas. These are discharges straight into streams or land areas and are different than illicitly connected sewers. There is no specific information on the number of illicit straight pipe discharges of household wastes in the Tributary to Hickory Creek watershed.

Failing septic systems are sources of nutrients that can reach nearby streams through both surface runoff and ground water flows. The exact number of onsite wastewater systems in the Tributary to Hickory Creek watershed is unknown. An estimate was made based on approximately 11 people in the rural watershed area. With 2.5 persons per household this gives 4 systems potentially in the entire watershed, which may be contributing to the water quality problems in Tributary to Hickory Creek.

Since approximately 3.6 percent of the Tributary to Hickory Creek watershed is classified as urban, it is unlikely urban storm water runoff is a significant source of substances and conditions contributing to the pollutants of concern.

Lands used for agricultural purposes can be a source of nutrients and oxygen-consuming substances. Accumulation of nitrogen and phosphorus on cropland occurs from decomposition of residual crop material, fertilization with chemical and manure fertilizers, atmospheric deposition, wildlife excreta, and irrigation water. The land use/land cover data indicates that approximately 9.7 percent of the watershed consists of cropland with 4.5 percent in the riparian corridor.

Other types of land use in Tributary to Hickory Creek includes forest and woodland (25.1 percent) and open water (0.6 percent).

Riparian areas can be sources of natural background material that could possibly contribute to the impairment. Only 4.5 percent of the riparian corridor for the classified segment is noted as cropland. About 90 percent is in grassland and woodland which should be a fairly good buffer. In general, riparian conditions should not be considered as causing or contributing to water quality problems in Tributary to Hickory Creek.

In the absence of a national pollutant discharge elimination system (NPDES) permit, the discharges associated with sources were applied to the LA, as opposed to the WLA for purposes of this TMDL. The decision to allocate these sources to the LA does not reflect any determination by EPA as to whether these discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDLs with some sources treated as LAs, EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL are found to be, or become, NPDES-regulated discharges, their loads must be considered as part of the calculated sum of the WLAs in this TMDL. WLA in addition to that allocated here is not available.

Any concentrated animal feeding operation (CAFO) that does not obtain an NPDES permit must operate as a no discharge operation. Any discharge from an unpermitted CAFO is a violation of Section 301. It is EPA's position that all CAFOs should obtain an NPDES permit because it provides clarity of compliance requirements, authorization to discharge when the discharges are the result of large precipitation events (e.g., in excess of 25-year and 24-hour frequency/duration) or are from a man-made conveyance.

Animal feeding operations (AFOs) and unpermitted CAFOs are considered under the LA because there is currently not enough detailed information to know whether these facilities are required to obtain NPDES permits. This TMDL does not reflect a determination by EPA that such facility does not meet the definition of a CAFO nor that the facility does not need to obtain a permit. To the contrary, a CAFO that discharges or proposes to discharge has a duty to obtain a permit. If it is determined that any such operation is an AFO or CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL as approved.

All known sources have been considered.

Allocation - Loading Capacity

Submittal identifies appropriate WLA for point, and load allocations for nonpoint sources. If no point sources are present the WLA is stated as zero. If no nonpoint sources are present, the LA is stated as zero [40 CFR § 130.2 (i)]. If this is a phase II TMDL the change in LC will be documented in this section.

The LCs for TSS, TN and TP at the 50 percent flow exceedance are 0.01 ton per day, 1.00 lb/day and 0.11 lb/day, respectively. For TSS, TN and TP: the LAs are set equal to the LCs, the WLAs are zero, the MOS is implicit and the sum of the WLA and LA do not exceed the LC.

WLA Comment

Submittal lists individual WLAs for each identified point source [40 CFR § 130.2(h)]. If a WLA is not assigned it must be shown that the discharge does not cause or contribute to WQS excursions, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLAs. Any such exceptions must be explained to a satisfactory degree. If a WLA of zero is assigned to any facility it must be stated as such [40 CFR § 130.2(i)]. If this is a phase II TMDL any differences in phase I and phase II WLAs will be documented in this section.

At the present time, there are no site specific Missouri State Operating Permits (MSOPs) that have an established design flow in the Tributary to Hickory Creek watershed. Therefore, no portion of the TMDL LC will be allocated to point sources and WLAs are set at zero for the Tributary to Hickory Creek (water body ID_0589).

LA Comment

Includes all nonpoint sources loads, natural background, and potential for future growth. If no nonpoint sources are identified the LA must be given as zero [40 CFR § 130.2(g)]. If this is a phase II TMDL any differences in phase I and phase II LAs will be documented in this section.

The LAs for the Tributary to Hickory Creek TMDL are for all nonpoint sources of TSS, TN and TP. Because there are no point sources in the watershed, no WLAs were assigned and the TMDL LC and LA for each flow will be equal.

As an example, at the 50 percent flow exceedance, the LA for TSS, TN and TP are 0.01 ton per day, 1.00 lb/day and 0.11 lb/day, respectively.

Margin of Safety

Submittal describes explicit and/or implicit MOS for each pollutant [40 CFR § 130.7(c)(1)]. If the MOS is implicit, the conservative assumptions in the analysis for the MOS are described. If the MOS is explicit, the loadings set aside for the MOS are identified and a rationale for selecting the value for the MOS is provided. If this is a phase II TMDL any differences in MOS will be documented in this section.

An implicit MOS was incorporated into the TMDL based on conservative assumptions used in the development of the LDCs. The use of regional targets in lieu of national or state wide targets serves to ensure that implementation will result in either pristine or minimally impacted stream systems. The 25th percentile of TSS values is considered a surrogate for establishing a reference population of the pristine systems. In the case of sediment, the approach used was to target the 25th percentile of all concentration data available in the EDU in which Tributary to Hickory Creek is located. The use of these refined and/or EDU specific data ensures that all geological and landscape conditions are addressed in the TMDL.

TN and TP are conservative because they are based on the 25th percentile of all TN and TP data gathered from sub-ecoregion 40 of Aggregate Nutrient Ecoregion IX, where data are not directly influenced by permitted dischargers. In the case of nutrients the targets are the median calculated from the four seasonal 25th percentile values. Localized nutrient data was adjusted to ecoregion values and established reference conditions. As a result, high concentrations seen during the periods of spring runoff and winter flow from snowmelt (or low concentrations seen during low flow conditions in both summer and fall) do not affect the annual reference targets.

Seasonal Variation and Critical Conditions

Submittal describes the method for accounting for seasonal variation and critical conditions in the TMDL(s) [40 CFR § 130.7(c)(1)]. Critical conditions are factors such as flow or temperature which may lead to the excursion of WQS. If this is a phase II TMDL any differences in conditions will be documented in this section.

The impairment of Tributary to Hickory Creek is by unknown pollutants and unknown sources. Although the critical condition is difficult to determine, it appears to be during low flow conditions, because of no flow during the fall. The TMDL LDC represents flow under all possible stream conditions and seasons, and avoids the constraints associated with using a single-flow critical condition. The results obtained using the LDC method are more robust and reliable over all flows and seasons when compared with those obtained under critical low-

flow conditions. Using a LDC for TMDL development during these conditions will be protective.

Public Participation

Submittal describes required public notice and public comment opportunity, and explains how the public comments were considered in the final TMDL(s) [40 CFR § 130.7(c)(1)(ii)].

This water quality limited segment of the Tributary to Hickory Creek is included on the EPA-approved 2008 Missouri 303(d) List. The public notice period for the draft Tributary to Hickory Creek TMDL was from April 13 to May 28, 2010. The public notice, the TMDL Information Sheet and the TMDL document were posted on the MDNR Website, making them available to anyone with Internet access. The public notice announcement was also sent to a variety of interest groups. One comment was received and the TMDL was edited accordingly.

Monitoring Plan for TMDL(s) Under Phased Approach

The TMDL identifies a monitoring plan that describes the additional data to be collected to determine if the load reductions required by the TMDL lead to attainment of WQS, and a schedule for considering revisions to the TMDL(s) (where phased approach is used) [40 CFR § 130.7].

MDNR will routinely examine physical habitat, water quality, and invertebrate and fish community data collected by other state and federal agencies. One example of such data is that generated by the Resource Assessment and Monitoring Program administered by the Missouri Department of Conservation. This program randomly samples streams across Missouri on a five- to six-year rotating schedule.

Reasonable Assurance

Reasonable assurance only applies when less stringent WLAs are assigned based on the assumption of nonpoint source reductions in the LA will be met [40 CFR § 130.2(i)]. This section can also contain statements made by the state concerning the state's authority to control pollutant loads.

Reasonable assurances are not required within this TMDL because there are no regulated or permitted point sources and the WLA is zero.

MDNR has the authority to issue and enforce state operating permits. Inclusion of effluent limits into a state operating permit and requiring that effluent and instream monitoring be reported to MDNR should provide reasonable assurance that instream WQS will be met. Section 301(b)(1)(C) requires that point source permits have effluent limits as stringent as necessary to meet WQS. However, for WLAs to serve that purpose, they must themselves be stringent enough so that (in conjunction with the water body's other loadings) they meet WQS. This generally occurs when the TMDL's combined nonpoint source LAs and point source WLAs do not exceed the WQS-based LC and there is reasonable assurance that the TMDL's allocations can be achieved. Discussion of reduction efforts relating to nonpoint sources can be found in the implementation section of the TMDL.

Biological data were collected on four other, similarly sized, intermittent streams within this EDU to evaluate criteria and identify reference metrics associated with intermittent streams. Tributary to Hickory Creek compared favorably to all four of these streams in habitat assessment, biological assessment and macroinvertebrate community analysis. Suspended sediment data were gathered (see Section 1 of the TMDL). These data show that sediment levels were relatively high and two phosphorus results were high when compared to ecoregion or regional targets. MDNR recommends investigating methods to reduce sediment runoff to this stream. Reducing sediment loading to the water body would address both the sediment and the phosphorus issues, as phosphorus adheres to soil particles.