UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 7
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

OCT 2 6 2010

Mr. John Madras
Director, Water Protection Program
Water Protection and Soil Conservation Division
Missouri Department of Natural Resources
1101 Riverside Drive
Jefferson City, Missouri 65101

Re: Approval of Marmaton River TMDLs

Dear Mr. Madras:

This letter responds to the Missouri Department of Natural Resources (MDNR) submission of a Total Maximum Daily Load (TMDL) document which contains a low dissolved oxygen TMDL for Marmaton River segment 1308. The document was originally received by the United States Environmental Protection Agency (EPA), Region 7, on October 4, 2010. Revisions were made to the original submittal and the final version was resubmitted on October 18, 2010.

Marmaton River was identified on the EPA-approved 2008 Missouri § 303(d) List as impaired for low dissolved oxygen. This submission fulfills the Clean Water Act statutory requirement to develop TMDLs for impairments listed on a state's § 303(d) List. The specific impairments (water body segment and pollutants) are:

Water Body Name	WBID	Pollutants
Marmaton River	MO_1308	low dissolved oxygen

EPA has completed its review of the TMDL document with supporting documentation and information. By this letter, EPA approves the submitted TMDL. Enclosed with this letter is the EPA Region 7 TMDL Decision Document summarizing the rationale for EPA's approval of the TMDL. EPA believes the separate elements of the TMDL document, described in the enclosed form adequately address the pollutants of concern, taking into consideration seasonal variation and a margin of safety. Although EPA does not approve the monitoring plan submitted by the state, EPA acknowledges the state's efforts. EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDL document and determine if future revisions are necessary or appropriate to meet applicable water quality standards.

EPA is currently in consultation under Section 7 of the Endangered Species Act with the United States Fish and Wildlife Service regarding this TMDL. While we are approving this TMDL at the present time, we may decide that changes to the TMDL document are warranted based upon the results of the consultation when it is completed.

We appreciate the thoughtful effort that MDNR has put into this TMDL. We will continue to cooperate with and assist, as appropriate, in future efforts by MDNR to develop TMDLs.

Sincerely,

Mary Jo Minday for

William A. Spratlin
Director
Water, Wetlands and Pesticides Division

Enclosures

cc: Mr. John Hoke
Missouri Department of Natural Resources

Mr. Gerald Babao
American Canoe Association

Mr. Paul Sanford
American Canoe Association

Mr. Scott Dye
Sierra Club

Mr. John Simpson
KS Natural Resource Council

EPA Region 7 TMDL Review

TMDL ID: MO_1308 **State:** MO

Document Name: MARMATON RIVER

Basin(s): OSAGE-MARMATON RIVER BASIN
HUC(s): 10290102, 10290103, 10290104, 10290105
Water body(ies): MARMATON RIVER
Tributary(ies): DRYWOOD CREEK, LITTLE DRYWOOD CREEK, TRIBUTARY TO LITTLE DRYWOOD CREEK
Pollutant(s): CBOD, LOW DISSOLVED OXYGEN, TOTAL NITROGEN, TOTAL PHOSPHORUS, TOTAL SUSPENDED SOLIDS

Submittal Date: 10/4/2010 **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 October 4, 2010. Revisions to this document were received by email on October 18, 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 Marmaton River TMDL was developed to address the low dissolved oxygen (DO) impairment of the Marmaton River segment MO_1308. A TMDL is needed for the Marmaton River because it is not meeting the WQS criterion for DO. Low DO is an issue because concentrations have been measured at less than the criterion of the daily minimum of 5 milligrams per liter (mg/L). DO in streams may be affected by several factors including water temperature, the amount of decaying organic matter in the stream, turbulence at the air-water interface and the amount of photosynthesis occurring in plants within the stream. Organic matter can come from wastewater effluent as well as agricultural and urban runoff. Nitrogen and phosphorus can also contribute to low DO problems because they can accelerate algae growth in streams. Algae growth in streams is most frequently assessed based on the amount of chlorophyll a in the water. The algae consume DO during respiration at night and have the

potential to remove large amounts of DO from the stream. The breakdown of dead, decaying algae also removes oxygen from water.

Pollutants which result in oxygen concentrations below saturation are fine particle size bottom sediment, high nutrient levels (nitrogen and phosphorus) and suspended particles of organic matter. Because these three pollutants vary to a large extent based on anthropogenic influences, they are appropriate targets for a TMDL written to address an impairment of low DO.

Organic matter can accumulate on the bottom of streams, where the rate at which it decays and consumes oxygen is measured as sediment oxygen demand (SOD). SOD is a combination of all of the oxygen-consuming processes that occur at or just below the sediment/water interface. The processes that occur within this area of the stream bed can account for a large fraction of the oxygen consumption in a stream. Most of the SOD at the surface of the sediment is due to the biological decomposition of organic material and the bacterially facilitated nitrification of ammonia. SOD can also be affected by water depth, current velocity and temperature. The TMDL indicates that a 60 percent reduction is needed in SOD, which can be done through reductions in total suspended solids (TSS) and nutrients to meet the DO criterion of a daily minimum of 5 mg/L.

To address nutrient levels, the EPA nutrient ecoregion reference concentrations were used. For the ecoregion where Marmaton River is located, the reference concentration for total nitrogen (TN) is 0.855 mg/L, for total phosphorus (TP) is 0.092 mg/L and for chlorophyll a is 2.8 micrograms per liter (ug/L). This TMDL will not specifically target chlorophyll a, but will use a linkage between nutrient concentrations and chlorophyll a response to achieve the ecoregion reference concentrations.

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, including permit conditions and monitoring data.

The TMDLs for TN, TP and TSS were determined using load duration curves (LDCs). These reductions in nutrients and sediment protects the warm water aquatic life use of the stream and the TMDLs should result in WQS attainment. The LC for TN and TP is defined by a LDC set at the ecoregion reference concentrations. The LC for TSS is defined by a LDC set at the 25th percentile of all TSS measurements available in the ecological drainage unit (EDU). The LCs for TN, TP and TSS at the 50 percent flow exceedance for the Missouri portion of the watershed are 437.2 pounds per day (lbs/day), 46.2 lbs/day and 9,208.2 lbs/day, respectively. The LCs for TN, TP and TSS at the 50 percent flow exceedance for the entire watershed are 862.8 lbs/day, 91.0 lbs/day and 18,233 lbs/day, respectively. The Missouri portion is 47.3 percent of the total watershed.

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.

The water quality criterion for DO for all Missouri streams, except cold water fisheries, is a daily minimum of 5 mg/L (10 CSR 20-7.031 Table A).

The designated beneficial uses of the Marmaton River are:
- Irrigation,
- 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 Protection of Warm Water Aquatic Life.

DO is affected by several factors including water temperature, the amount of decaying organic matter in the stream, turbulence at the air-water interface and the amount of photosynthesis occurring in plants within the stream. Organic matter can also accumulate on the bottom of streams, where the rate at which it decays and consumes oxygen is measured as SOD. SOD is a combination of all of the oxygen-consuming processes that occur at or just below the sediment/water interface and account for a large fraction of the oxygen consumption in a stream.

Nitrogen and phosphorus can also contribute to low DO problems because they can accelerate algae growth in streams. Algae growth in streams is most frequently assessed based on the amount of chlorophyll a in the water. The algae consume DO during respiration and have the potential to remove large amounts of DO from the stream, particularly at night when DO is not produced through photosynthesis. The breakdown of dead, decaying algae also removes oxygen from water.

To address nutrient levels, the EPA nutrient ecoregion reference concentrations were targeted. To address TSS the 25th percentile of all TSS measurements available in the EDU were targeted. The TMDL LDCs represent flow under all possible stream conditions. The advantage of a LDC approach is that it avoids the constraints associated with using a single-flow critical condition and is applicable under all flow conditions. The LCs for TN, TP and TSS at the 50 percent flow exceedance for the entire watershed are 862.8 lbs/day, 91.0 lbs/day and 18,233 lbs/day, respectively. The LCs for TN, TP and TSS at the 50 percent flow exceedance for the Missouri portion of the watershed are 437.2 lbs/day, 46.2 lbs/day and 9,208.2 lbs/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.

The data available suggests that high nutrient loads are contributing to excessive algal growths in the Marmaton River. The excessive algal growths, in turn, are causing low DO to occur late at night when the algae are consuming but not producing oxygen. Large amounts of algae

may also be contributing to low DO when the plants die and decay. To address nutrient levels, the EPA nutrient ecoregion reference concentrations were used. For the Central Irregular Plains Ecoregion, where the Marmaton River 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. An established link between nutrient concentrations and chlorophyll a response was used to achieve the ecoregion reference concentrations and define this TMDL as a numeric value.

Another essential component of developing a TMDL is establishing a relationship between the source loadings and resulting water quality. For this TMDL, the relationship between the source loadings of SOD and nutrients on DO is generated by the water quality model QUAL2K. The processes employed in QUAL2K address nutrient cycles, algal growth and DO dynamics. The results of the model indicate that a 60 percent reduction in SOD is required to meet the DO criterion of a daily minimum of 5 mg/L.

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 Central Plains/Osage/South Grand EDU in which the water body is located. 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 DO criterion of a daily minimum of 5 mg/L is 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 a number of permitted facilities within the Missouri portion of the Marmaton River watershed (see Table 3, page 10 of the TMDL).

The Nevada Wastewater Treatment Plant (WWTP) discharges to Little Drywood Creek and has the largest non-storm water design flow of 1.75 million gallons per day (MGD). The total design flow for all facilities is 2.08 MGD. The Nevada WWTP accounts for 84 percent of the total non-storm water design flows. The Nevada WWTP discharges just upstream of where Little Drywood Creek joins the impaired Marmaton River. The current permit expired in August of 2009. Following the proposed facility expansion, a new permit is expected to include an increase in design flow to 2.0 MGD, increasing the facility to 86 percent of the total non-storm water design flows.

The remaining non-storm water design flow (0.325 MGD) is contributed by three small WWTPs and one soybean biodiesel facility.

It is unlikely that the general permits for land application (listed in Table 3, page 10 of the

TMDL), will contribute to the DO problem because these permits are no-discharge and contain restrictions
designed to minimize the impact of land application to surface waters. Storm water permits (listed in Table 3, page 10 of the TMDL) may contribute nutrients at high flow, but are not expected to contribute nutrients at low flow. These permits are not considered to contribute to the low DO impairment during low flow conditions. There are other types of general permits within the Marmaton River watershed. These facilities' permits are designed to minimize their impact to surface waters and discharge from these facilities is unlikely to contain nutrients or oxygen-demanding substances that could contribute to the low DO impairment.

The eleven municipalities located within or partially within the Missouri portion of the Marmaton River watershed, all have populations under 10,000 and are not required to obtain storm water permits that are issued for municipal separate storm sewer systems (MS4). There are no permitted MS4s within the watershed.

There are three permitted concentrated animal feeding operations (CAFOs) in the Missouri portion of the Marmaton watershed, one is a poultry facility and two are swine facilities. Land use and agricultural statistics indicate that livestock production is common in rural Barton and Vernon Counties. Animal feeding operations (AFOs), where animals are maintained or fed under confined conditions but which maintain fewer than 300 animal units are not legally defined as CAFOs under state regulations. Facilities defined as CAFOs but maintaining fewer than 1,000 animal units are not required to obtain a Missouri State Operating Permit. Since these operations are not regulated by MDNR there is no data available on their numbers or locations. It is possible that there are unregulated AFOs within the Marmaton River watershed. Unregulated operations that do not properly manage livestock and the waste that they produce, may potentially be acting as point source contributors to the low DO impairment.

There are eight permitted municipal wastewater dischargers within the Kansas portion of the Marmaton watershed. Fort Scott WWTP was identified on the EPA approved 2008 Missouri 303(d) List as the source of the low DO impairment for the two miles downstream of the Kansas-Missouri state line. The other facilities are small with low design flows. All Kansas facilities are listed in Table 5, page 14 of the TMDL document. There are also seven certified or permitted livestock facilities located in the Kansas portion of the watershed. The total number of animal units attributed to these facilities is 1,483 (listed in Table 6, page 16 of the TMDL document).

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 Marmaton River watershed.

There are a number of surface water impoundments affecting a portion of the watershed. The total land area regulated by impoundments is 134 square miles, or 11.7 percent of the watershed. Proposed impoundments would increase this to 28 percent of the watershed (67 percent of the watershed in Kansas).

The 2005 land use land cover data indicates there are nearly 160,000 acres of cropland in the Marmaton River watershed, with roughly two-thirds of this area in Missouri. Land used for agricultural purposes can be a source of nutrients and oxygen-consuming substances in the river. Accumulation of nitrogen and phosphorus on cropland occurs primarily from

decomposition of residual crop material and fertilization with chemical and manure fertilizers. Nutrients and organic materials from crop fields are transported to adjacent streams during precipitation events through the processes of subsurface flow, surface runoff and soil erosion. These processes can be compounded by tilling of farm fields and by applying fertilizers prior to precipitation events or at rates exceeding the assimilative capacity of the soil.

Greater than 89 percent of the soils in the Marmaton River watershed in Missouri are characterized as having slow or very slow infiltration rates, and roughly 30 percent of the land area is considered highly erodible or potentially highly erodible. Furthermore, greater than 99 percent of the watershed produces runoff under relatively low potential conditions.

There are approximately 49,478 cattle in the Missouri portion of the watershed. The majority of the cattle being raised in this area are in cow/calf grazing operations. These cattle are therefore most likely located on the approximately 159,911 acres of grassland/pastureland on the Missouri side of the Marmaton River watershed, and runoff from these areas can also be a potential source of nutrients and oxygen-consuming substances. For example, 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 become barren of plant cover, increasing the possibility of erosion and contaminated runoff during a storm event. When pasture land is not fenced off from the stream, cattle or other livestock may contribute nutrients directly to the stream while walking in or adjacent to the water body. The potential for cattle grazing to impact water quality takes on additional significance in light of the fact that grassland comprises nearly 47 percent of the Missouri portion of the Marmaton River watershed.

Pecans are a major crop in Vernon County. Vernon County is home to 30 percent of all pecan farms in the state, and roughly 71 percent of all acreage is devoted to growing pecans. This is significant because pecan trees in Missouri require deep, well drained soils with adequate moisture and are largely grown in the floodplains of major rivers. Given the concentration of orchards in the vicinity, it is reasonable to assume that some are located in the wide alluvial valleys of the Marmaton River. In addition to requiring fertilization, pecan orchards can also be subject to livestock grazing, a management strategy designed to minimize ground cover. Both practices can be a source of nutrients to the Marmaton River, particularly during periods of flooding.

An additional potential source of nutrients from agricultural lands may come from the application of animal manure to cropland and livestock pastures. Too much manure applied at the wrong times can result in excess nutrients and organic matter reaching nearby streams. While poultry production in Missouri is concentrated in the southwest corner of the state, waste generated from these facilities is applied to crop and pasture land as far north as Vernon County. Permitted swine and poultry operations within the watershed apply manure to 1,098 acres of their own land, and have spreading agreements to land apply to an additional 490 acres. These additional acres may be in the watershed, and it is not known exactly how many acres in the watershed receive land applied animal waste.

In the Kansas portion of the Marmaton River watershed, there are approximately 63,493 cattle with a density of 104 cattle per square mile. There are also approximately 398,523 hogs and pigs, 1,303 sheep and lambs and 5,362 poultry layers in Barton and Vernon Counties, Missouri, and at least 842 hogs and pigs, 621 sheep and lambs and 2,185 poultry layers in the

three counties in Kansas. There is no data available to estimate the number of these other livestock that might be located in the Marmaton River watershed.

Permitted CAFOs identified in this TMDL are part of the assigned WLA. 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.

Any CAFO that does not obtain an NPDES permit must operate as a no discharge facility. 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.

The primary land uses for the entire watershed are grassland (57 percent), cropland (21 percent) and forest and woodland (12 percent) with open water as (1.2 percent) and urban (2.2 percent). Roughly 8 percent of the watershed in Missouri is classified as wetland. The majority of these are riparian and floodplain wetlands associated with Drywood Creek, Little Drywood Creek and along the Marmaton River downstream of these two tributaries.

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 Marmaton River watershed is unknown. An estimate was made based on approximately 12,235 persons in the entire rural watershed area and 7,038 persons in the Missouri portion. Based on 2.5 persons per household there may be approximately 4,894 systems in the entire watershed and 2,815 of those in Missouri.

Storm water runoff from urban areas can be a significant source of nutrients and oxygen consuming substances. Lawn fertilization can lead to high nutrient loads, and pet wastes can contribute both nutrient loads and oxygen-consuming substances. Phosphorus loads from residential areas can be comparable to or higher than loading rates from agricultural areas. Warmer storm runoff from urban areas such as parking lots and buildings can lead to higher water temperatures that lower the DO saturation capacity of streams. Excessive discharge of suspended solids from urban areas can also lead to streambed siltation problems. About 2.2 percent of the entire Marmaton River watershed is classified as urban, 2.8 percent in Missouri and 1.7 percent in Kansas. Urban storm water runoff could be considered a potentially significant source of substances and conditions contributing to the low DO problem. Fort Scott, Kansas, accounts for 72 percent of the urban land area on the Kansas side of the watershed. The Marmaton River runs through Fort Scott upstream of Missouri's impaired segment, where it may receive runoff and storm sewer discharges from the city. Nevada, Missouri, is adjacent to the confluence of Little Drywood Creek and the Marmaton River and accounts for 71 percent of the urban land area on the Missouri side. The tributaries act as potential conveyances for storm water and pollutants from the city directly to both of these impaired water bodies.

Riparian areas can be sources of natural background material that could possibly contribute to the low DO problem. Leaf fall from vegetation near the water's edge, aquatic plants and drainage from organically rich areas like wetlands are all natural sources of materials that consume oxygen and increase sediment. The riparian area of the Marmaton River in both states is comprised of 76.6 percent wetlands or forests. Cropland and pastureland make up only 6.5 percent and 8.2 percent, respectively.

In the absence of an 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.

All known sources of low DO 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 TN, TP and TSS at the 50 percent flow exceedance, for the Missouri portion of the watershed, are 437.2 lbs/day, 46.2 lbs/day and 9,208.2 lbs/day, respectively. For TN, TP and TSS, the MOS is implicit and the sum of the WLA and LA do not exceed the LC. It is assumed that point and nonpoint source loads from the Kansas portion of the watershed do not cause or contribute to the impairment and that all applicable WQS are met at the state line.

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.

The TN sum WLA for the Nevada WWTP is 14.3 lbs/day at all flow conditions. All other permits have a WLA at 50 percent flow exceedance of 41.0 lbs/day.

The TP sum WLA for the Nevada WWTP is 1.6 lbs/day at all flow conditions. All other permits have a WLA at 50 percent flow exceedance of 4.3 lbs/day.

The TSS sum WLA for the Nevada WWTP is 250.9 lbs/day at all flow conditions. All other permits have a WLA at 50 percent flow exceedance of 857.3 lbs/day.

Because there are no permitted MS4s within the watershed, no WLA were necessary for this type of permit.

CAFOs are not expected to impact low DO during critical periods of low flow and have not been assigned WLA.

Point source loads contributed by the Kansas portion of the watershed are not considered to cause or contribute to the impairment, and it is assumed that all applicable WQS are met at the state line. Although the entire watershed is considered, this TMDL does not set WLAs for point sources in Kansas. Because WLAs are set only for Missouri, the WLAs in Tables 12, 14 and 16 (located within the TMDL document, page 29) are the same as those for the entire watershed.

The CBOD5 WLA for the city of Nevada's WWTP (at a design flow of 2.05 MGD for the Little Drywood subbasin) is set at 7.75 mg/L. The WLA for CBOD5 was derived from the QUAL2K modeling that resulted in meeting the DO criterion of a daily minimum of 5 mg/L.

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 Marmaton River TMDL are for all nonpoint sources of TN, TP and TSS. The LAs were calculated based on the total of all headwater and lateral inflow loads used in the QUAL2K model for the allocation scenario model run. The LAs are intended to allow the DO target to be met at all locations within the stream under a variety of flow conditions. Because the Missouri portion of the Marmaton River watershed accounts for 47.3 percent of the entire watershed area, Marmaton River stream flow, TMDL values and nonpoint source LAs were reduced proportionally from the allocations for the entire watershed. TMDL LAs for the Missouri portion of the Marmaton River watershed can be found in Tables 12, 14 and 16 within the TMDL document.

Nonpoint source loads contributed by the Kansas portion of the watershed are not considered to cause or contribute to the impairment, and it is assumed that all applicable WQS are met at the state line. Although the entire watershed is considered, this TMDL does not set LAs for nonpoint sources in Kansas.

As an example, at the 50 percent flow exceedance for the Missouri portion of the watershed, the LA for TN is 382 lbs/day, for TP is 40.3 lbs/day and for TSS 8,100 lbs/day.

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 applied to the QUAL2K model and used in the development of the TMDL LDCs. Among the conservative approaches used was to calculate WLA by targeting the 25th percentile of TSS concentrations in the Central Plains/Osage/South Grand geographic region in which the Marmaton River is located, and to establish WLA under critical low flow conditions.

The use of ecoregion nutrient targets in lieu of national or state-wide nutrient targets helps ensure that implementation will result in minimally impacted stream systems. TN and TP targets are conservative because they are based on the 25th percentile of all TN and TP data gathered from reference streams (not directly influenced by permitted dischargers) in the Central Irregular Plains Ecoregion 40. The 25th percentile is considered a surrogate for establishing a reference population of minimally impacted waters. As such these targets assume that Marmaton River must meet a reference condition in order to attain WQS. The targets are the median calculated from the four seasonal 25th percentile values.

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 critical condition would be during low flow conditions. Using QUAL2K for TMDL development
during these conditions will be protective year round, since the TMDL LDC represents flow under all possible stream conditions and seasons, and avoids the constraints associated with using a single-flow critical condition. Low DO can also occur due to increased nutrients and organic sediments being carried into the water body through storm water runoff. These conditions are more likely to occur during seasonal periods having significant precipitation. LDCs represent the allowable pollutant load under different flow conditions and across all seasons. Seasonal variation has been implicitly taken into account within the TMDL calculations.

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 Marmaton River is included on the 2008 Missouri 303(d) List. EPA regulations require that TMDLs be subject to public review (40 CFR 130.7). The initial public notice period for the draft Marmaton River and Little Drywood Creek TMDL was from February 4 to April 2, 2010. Eight comments were received during this comment period which resulted in substantial changes to the TMDL. Before finalizing the revised Marmaton River TMDL, the public was notified of an additional 45-day comment period running from July 8 to August 22, 2010. Three comments were received during this comment period which resulted in minor revisions to the TMDL. Public notices to comment on the draft Marmaton River TMDL were distributed via mail and email to major stakeholders in the watershed or other potentially impacted parties. Since the Marmaton River originates in Kansas and flows into Missouri, a public notice announcement was also sent to the Kansas Department of Health and Environment, Bureau of Water. The public notice, the TMDL Information Sheet and TMDL document were posted on MDNR's Website, making them available to anyone with Internet access. There were also four public meetings in 2005 and 2006 where ten major issues and concerns were identified and prioritized.

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].

Post-TMDL monitoring will be scheduled to be conducted by MDNR approximately three years after the TMDL is approved, or in a reasonable period of time following any TMDL based compliance schedule outlined in the permit, and the application of any new effluent limits. MDNR routinely examines physical habitat, water quality, invertebrate community and fish community data collected by other state and federal agencies in order to assess the effectiveness of TMDL implementation. 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 all permitted point sources have received a WLA that is set to meet WQS.

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.

In November 2005, the Marais des Cygnes, Marmaton and Little Osage Rivers Watershed Committee was formed through the efforts of the Osage Valley Resource Conservation and Development Council. The aim of this committee was to facilitate a cooperative effort between residents within the Marais des Cygnes, Little Osage and Marmaton River watersheds to develop a comprehensive watershed management plan. Four public meetings were held in February and March 2005, and July 2006 to obtain public input during plan development. Through this process, the following 10 issues and concerns were identified and prioritized:

- Erosion and soil loss
- Solid waste management
- Water quality and quantity
- Public information
- Quarries and other mines
- Farmland conversion to residential land use
- Habitat loss - aquatic and upland
- Agricultural systems - CAFOs or AFOs
- Grazing and cropping systems
- Private and Public Interaction
- Residential and Urban

The Marais des Cygnes, Marmaton and Little Osage Rivers Watershed Management Action Plan was signed in August 2006. Currently, there are no Section 319 Nonpoint Source projects under way in Missouri to implement that section of the watershed management plan relating to the Marmaton River. However, in recent years there have been a number of nonpoint source best management practices (BMPs) funded through cost-share and other programs and implemented in both Missouri and Kansas. Examples of practices recently put into place in the Marmaton River watershed include establishment of permanent vegetative cover, construction of terraces and grass-lined waterways to reduce soil erosion, establishment of field borders, nutrient management, fencing to keep livestock away from streams and inclusion of land in both the Conservation Reserve and Wetland Reserve Programs.

Along with expanding the BMPs noted, other agricultural practices that could be implemented include improved irrigation and water management, establishment of riparian buffers and filter strips, implementation of enhanced cropping techniques (such as no-till agriculture) and additional enhanced grazing practices that prevent or mitigate livestock-caused damage to streams and riparian areas. Further efforts may also be warranted to address the management of animal waste from feeding operations both inside and outside of the watershed in particular the application of waste as fertilizer on crop and pasture lands. Although the Missouri CAFO Nutrient Management Technical Standard adopted in March 2009 requires the development and implementation of field-specific Nutrient Management Plans, this regulation is specific only to on-site application of waste from Class I CAFOs with Missouri State Operating Permits.

In an effort to more effectively implement land use BMPs, MDNR may work with the Natural Resources Conservation Service and the local Soil and Water Conservation District to further encourage area farmers to implement and target these practices on their land. An additional approach may also be to work directly with the Marais des Cygnes, Marmaton and Little Osage Rivers Watershed Committee and the Osage Valley Resource Conservation and Development Council to assist in securing funding, through Section 319 Nonpoint Source grants and other sources, to implement pollution control strategies outlined in the current Watershed Management Action Plan.