UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7
11201 Renner Boulevard
Lenexa, Kansas 66219

08 JAN 2016

Dr. Susan Mosier
Interim Secretary
Kansas Department of Health and Environment
1000 S.W. Jackson, Suite 540
Topeka, Kansas 66612-1368

RE: Approval of TMDL document for Short Creek and Shoal Creek

Dear Dr. Mosier:

This letter responds to the submission from the Kansas Department of Health and Environment, originally received by the U.S. Environmental Protection Agency, Region 7, on June 26, 2014, for a Total Maximum Daily Load document which contained TMDLs for total phosphorus. Short Creek and Shoal Creek and an unnamed tributary were identified on the 2014 Kansas Section 303(d) list as impaired. 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 segments and causes) are:

Water Body Name	WBID	Cause
Short Creek	KS-NE-07-570_881	Total Phosphorus
Shoal Creek	KS-NE-07-212_2	Total Phosphorus
Unnamed Stream	KS-NE-07-212_886	Total Phosphorus

The EPA has completed its review of the TMDL document with supporting documentation and information. By this letter, the EPA approves the submitted TMDLs. Enclosed with this letter is the Region 7 TMDL Decision Document which summarizes the rationale for the EPA's approval of the TMDL document. The EPA believes the separate elements of the TMDLs described in the enclosed document adequately address the causes of concern, taking into consideration seasonal variation and a margin of safety.

Although the EPA does not approve the monitoring or implementation plans submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDLs and determine if future revisions are necessary or appropriate to meet applicable water quality standards. The EPA recognizes that technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in the TMDLs. Therefore, the implementation plan in this TMDL document provides information regarding implementation efforts to achieve the loading reductions identified.

The EPA is currently in consultation under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service regarding this TMDL document. While we are approving the 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.

The EPA appreciates the thoughtful effort that the KDHE has put into the TMDL document. We will continue to cooperate with and assist, as appropriate, in future efforts by the KDHE to develop TMDLs.

Sincerely,

Karen A. Flournoy
Director
Water, Wetlands and Pesticides Division

Enclosure

cc: Mr. John Mitchell, Director, Division of Environment, KDHE
Mr. Tom Stiles, Chief, Watershed Planning, Monitoring and Assessment Section, KDHE

EPA Region 7 TMDL Review

TMDL ID: KS-NE-07-570_881 **State:** KS
Document Name: SHORT CR

Basin(s): SPRING RIVER BASIN
HUC(s): 11070207
Water body(ies): SHOAL CR, SHORT CR, UNNAMED STREAM
Tributary(ies):
Cause(s): PHOSPHORUS, TOTAL

Submittal Date: 6/26/2015 **Approved:** Yes

Submittal Letter and Total Maximum Daily Load Revisions

The state submittal letter indicates final TMDL(s) for specific pollutant(s) and water(s) were adopted by the state, and submitted to the 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 the EPA, date of receipt of any revisions and the date of original approval if submittal is a revised TMDL document.

The Kansas Department of Health and Environment formally submitted the TMDL document to the U.S. Environmental Protection Agency Region 7 in an email attachment dated June 24, 2015. In response to the EPA comments, the KDHE submitted a revised TMDL document on September 16, 2015, and a final TMDL document on October 5, 2015.

Water Quality Standards Attainment

The targeted pollutant is validated and identified through assessment and data. The water body's loading capacity 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. The TMDL(s) and associated allocations are set at levels adequate to result in attainment of applicable water quality standards [40 CFR § 130.7(c)(1)]. A statement that the WQS will be attained is made.

Based on the total phosphorous data collected at stream monitoring stations SC212 and SC570, Short and Shoal Creeks are impaired for the designated uses of special aquatic life, expected aquatic life, contact recreation and domestic water supply.

Since there is a large variability in ambient stream phosphorus concentrations, median values are appropriate for the assessment of long-term conditions. Per the KDHE's 303(d) listing methodology, the creeks' impairment cause of total phosphorus was determined by median TP concentrations exceeding 0.201 milligrams per liter for KDHE stream monitoring stations.

The overall TP concentration average for the period of record (1990-2014) in Shoal Creek at SC212 is 0.275 mg/L, and the median concentration is 0.247 mg/L. Seasonal TP averages range from a low of 0.251 mg/L in the Spring season to a high of 0.308 mg/L in the Summer-Fall season. Seasonal median concentrations range from a low of 0.214 mg/L in the Winter, to 0.240 mg/L in the Spring, to a high of 0.291 mg/L in the Summer-Fall season. Seasonal TP concentrations are plotted in Figure 5 of the TMDL document.

The TMDL document uses estimated stream flows at selected percent exceedances provided by a U.S. Geological Survey Scientific Investigations Report. Long term flow conditions were estimated in the TMDL document by utilizing a watershed ratio calculation with the USGS gage 0718800 on the Spring River and are displayed in Table 2 of the TMDL document. Empire Lake is downstream of Short Creek and is fed directly by Shoal Creek as seen in Figures 1a and 1b of the TMDL document. Empire Lake is where Shoal Creek and the Spring River meet; water discharges over the Empire Dam Falls into the Spring River. Empire Lake was created to provide

source water storage, and to serve as a cooling lake for the Riverton Power station.

Flow duration curves derived from the watershed ratio calculation covering the period of record 1990-2014 are illustrated for Shoal Creek at SC212, Short Creek at SC570 and the Spring River at SC213 in Figure 2 of the TMDL document. Annual flow averages for Shoal Creek are detailed in Figure 3 of the TMDL document. Extremely dry years within the watershed were observed in 1991, 1996, 1997, 2000, 2003 and 2006. Based on annual flow averages, the wetter years include 1990, 1992, 1994, 1995, 1999, 2007, 2008, 2009 and 2013. Monthly flow averages and medians for Shoal Creek are detailed in Figure 4 of the TMDL document. Higher flows within the watershed are observed in the months of March, April, May and June whereas lower median flows are observed in August, September, October and November. The flow conditions for each sampling year correspond to the other stations within the watershed since the long term flow conditions were based on the area ratio for each subwatershed.

Phosphorus concentration averages during three ranges of flow exceedance are the highest during the low (75-99 percent flow exceedance) and normal (25-74 percent flow exceedance) flow conditions with respective TP averages of 0.399 mg/L and 0.228 mg/L in Shoal Creek. The TP average is the lowest during the high flow condition (0-24 percent flow exceedance) with a concentration of 0.218 mg/L. Total phosphorus concentrations in Shoal Creek per ranges of flow exceedances are detailed in Figure 6 of the TMDL document.

The highest average TP concentrations in Shoal Creek are observed during the low flow condition during the spring season and the lowest average TP concentrations are observed during the winter high flow condition. The higher TP concentrations during the low flow condition are indicative of wastewater loading, which in this case is primarily a result of TP loading from the larger facilities in Missouri, including the city of Joplin's wastewater treatment facility, the city of Monett's WWTF and the Neosho-Shoal Creek WWTF.

The overall TP concentration average in Short Creek is 0.485 mg/L at SC570, and the median concentration is 0.322 mg/L. Seasonal TP averages range from a low of 0.401 mg/L in the Spring season to a high of 0.648 mg/L in the Winter season. Seasonal median concentrations range from a low of 0.271 mg/L in the Summer-Fall season, to 0.322 mg/L in the Spring, to a high of 0.369 mg/L in the Winter. Seasonal TP concentrations are plotted in Figure 8 of the TMDL document.

Phosphorus concentration averages based on the three defined flow conditions are the highest during the normal (25-74 percent flow exceedance) and high (0-24 percent flow exceedance) flow conditions with respective TP averages of 0.637 mg/L and 0.557 mg/L in Short Creek. The TP average is the lowest during the low flow condition (75-99 percent flow exceedance) with a concentration of 0.175 mg/L. Total phosphorus concentrations per ranges of flow exceedances are detailed in Figure 9 of the TMDL document.

Seasonal TP concentrations in Short Creek based on the flow conditions are further detailed in Table 4 and Figure 10 of the TMDL document. The highest average TP concentrations are observed during normal flow of the winter season and the lowest average TP concentrations are observed during the low flows of the winter season. In Short Creek, TP concentrations are generally lower during the low flow condition and higher during the normal and high flow condition as seen in Figures 9 and 10 of the TMDL document.

There are three mechanisms in place driving current phosphorus concentrations in Shoal Creek and Short Creek which in-turn influence concentrations in the Spring River downstream. The first factor is the effect of loads derived from portions of the watershed in Missouri, which includes significant point source loading from the Joplin WWTF. The second function is nonpoint source loading adjacent to Shoal Creek and Short Creek. The final function is wet weather storm water sources that dominate loading during runoff events, which includes the wet weather storm water and nonpoint source runoff from Galena and Joplin in the aftermath of rainfall.

Average and median TP concentrations in streams throughout the Spring River watershed are provided in Table 6 of the TMDL document (copied below). Total phosphorus concentrations on Center Creek in Missouri at the KDHE sampling station SC210 average 0.141 mg/L. The highest TP concentrations in the watershed are observed in Missouri at the KDHE sampling station SC211 on Turkey Creek, where the TP concentration average is 0.97 mg/L. The lowest TP concentrations in the watershed are associated with the Spring River tributaries of Willow Creek and Brush Creek, where TP concentrations average 0.079 mg/L and 0.070 mg/L respectively.

Average and Median TP Concentrations for the Spring River Watershed Sampling Stations

Station	Stream	TP Average (mg/L)	TP Median (mg/L)
SC210	Center Cr	0.141	0.120
SC211	Turkey Cr	0.970	0.770
SC569	Shawnee Cr	0.131	0.113
SC570	Short C	0.485	0.322
SC212	Shoal Cr	0.275	0.247
SC747	Willow Cr	0.079	0.069
SC746	Brush Cr	0.070	0.057
SC213	Spring R	0.199	0.181

The ultimate endpoint of the TMDL document is to achieve the Kansas Water Quality Standards by eliminating the impairment to special aquatic life, expected aquatic life, contact recreation and domestic water supply caused by excessive phosphorus and objectionable amounts of algae as described in the narrative criteria pertaining to nutrients. There are no numeric phosphorus criteria currently in Kansas.

The TMDL document established two milestones or phases and stages to achieve the ultimate endpoint. The first milestone will be a reduction of the current median TP concentration to 0.140 mg/L, based on the approximate average TP value of the pooled data from the sampling stations within Kansas Ecoregion 40d that have the lowest TP concentration average. The second milestone will be a reduction of the TP median to 0.110 mg/L, reaching the median of the pooled data from the sampling stations within Ecoregion 40d that have the lowest TP concentration average. Table 12 of the TMDL document (copied below), details the reductions necessary in the current TP median concentrations to reach these milestones.

TP concentration reductions necessary to meet TMDL endpoints

	Current TP Median (mg/L)	Stage I TMDL (mg/L)	Stage I Concentration Reduction (percent)	Stage II TMDL (mg/L)	Stage II Concentration Reduction (percent)
SC212 Shoal Cr	0.247	0.140	43.3	0.110	55.5%
SC570 Short Cr	0.322	0.140	56.5	0.110	65.8%

Using the load duration method, based on flow duration and exceedances, the TMDL document calculates the Phase I and Phase II TP loading capacities of Shoal Creek and Short Creek. For example, at their 50 percent flow exceedances the Phase I loading capacities for Shoal and Short Creeks are 163.78 pounds per day and 3.83 lb/day, respectively. The Phase II TP loading capacities of Shoal and Short Creek, also at their 50 percent flow exceedances, are 128.68 lb/day and 3.01 lb/day, respectively. Additional loading capacities are tabulated below.

TP Load Capacity and Load Allocations for Shoal Creek and Short Creek under the two stages of the TMDL

Stage One

	Percent Flow	Load Capacity (lbs/day)	WLA (lbs/day)	LA (lbs/day)	MOS (lbs/day)
Shoal Cr SC212	75%	72.94	0	65.65	7.29
Shoal Cr SC212	50%	163.78	0	147.40	16.38
Shoal Cr SC212	10%	892.69	0	803.42	89.27
Short Cr SC570	75%	1.7	0	1.53	0.17
Short Cr SC570	50%	3.83	0	3.45	0.38
Short Cr SC570	10%	20.85	0	18.77	2.09

Stage Two

	Percent Flow	Load Capacity (lbs/day)	WLA (lbs/day)	LA (lbs/day)	MOS (lbs/day)
Shoal Cr SC212	75%	57.31	0	51.58	5.73
Shoal Cr SC212	50%	128.68	0	115.81	12.87
Shoal Cr SC212	10%	701.4	0	631.26	70.14
Short Cr SC570	75%	1.34	0	1.21	0.13
Short Cr SC570	50%	3.01	0	2.71	0.30
Short Cr SC570	10%	16.38	0	14.74	1.64

By meeting the documented endpoints and loading capacities, the TMDLs should attain water quality standards for Shoal Creek and Short Creek. Furthermore, the reduction ensures nutrients in the Spring River watershed are adequately supporting all designated uses as waters leave the state towards Oklahoma. Additionally all designated uses in Empire Lake will continue to be supported and protected by the TMDLs.

Designated Use(s), Applicable Water Quality Standard(s) and Numeric Target(s)

The submittal describes applicable water quality standards, including beneficial uses, applicable numeric and/or narrative criteria, and a numeric target. If the TMDL(s) 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.

Designated Uses for Shoal Creek (segment 2), Short Creek (segment 881) and an unnamed tributary (segment 886) identified in the TMDL document include the following:

- Special Aquatic Life (segments 2 and 886);
- Expected Aquatic Life (881);
- Primary Contact Recreation B (segment 2);
- Secondary Contact Recreation b (segments 881 and 886);
- Domestic Water Supply (segments 2, 881 and 886);
- Food Procurement (segments 2, 881 and 886);
- Groundwater Recharge (segment 2, 881 and 886);
- Industrial Water Supply Use (segments 2, 881 and 886);

- Irrigation Use (segments 2, 881 and 886); and
- Livestock Watering Use (segments 2, 881 and 886).

Empire Lake, a water body downstream of Shoal and Short Creeks, is designated for Expected Aquatic Life; Primary Contact Recreation B; Domestic Water Supply; Food Procurement; Groundwater Recharge; Industrial Water Supply; Irrigation and Livestock Watering.

The state of Kansas does not have a numeric criteria for total phosphorus, but instead has narrative criteria for nutrients. The TMDL states the water quality standards: "Nutrients- Narratives: The introduction of plant nutrients into surface waters designated for domestic water supply use shall be controlled to prevent interference with the production of drinking water (K.A.R. 28-16-28e(c)(3)(D))."

"The introduction of plant nutrients into streams, lakes, or wetlands from artificial sources shall be controlled to prevent the accelerated succession or replacement of aquatic biota or the production of undesirable quantities or kinds of aquatic life (K.A.R. 28-16-28e(c)(2)(A))."

"The introduction of plant nutrients into surface waters designated for primary or secondary contact recreational use shall be controlled to prevent the development of objectionable concentrations of algae or algal by-products or nuisance growths of submersed, floating or emergent vegetation (K.A.R 28-26-28e(c)(7)(A))."

The ultimate endpoint for this TMDL will be to achieve the Kansas Water Quality Standards by eliminating the impairment to aquatic life, domestic water supply or recreation caused by excessive phosphorus and objectionable amounts of algae as described in the narrative criteria pertaining to nutrients. There are no existing numeric phosphorus criteria currently in Kansas.

The Aquatic Life Use Support Index and sestonic chlorophyll concentrations will serve to establish the condition of the prevailing biological community in Short Creek and Shoal Creek. Sestonic chlorophyll *a* concentration provides an indication of planktonic algae floating in the water column of the stream. The KDHE has not yet sampled sestonic chorophyll at SC213 or SC570, but has sampled sestonic chlorophyll at SC212 six times during 2003. The highest chlorophyll concentration during that sampling year was 6.6 µg/L.

The ALUS Index, as described in the Kansas' 2014 303(d) Listing Methodology, was designed to assess the response of macroinvertebrate communities to a wide variety of stressors including various toxics, low dissolved oxygen and sedimentation. High ALUS Index scores are indicative of high quality biological communities. The Index consists of five categorizations of biotic condition:

1. Macroinertebrate Biotic Index: A statistical measure that evaluates the effects of nutrient and oxygen demanding substance on macroinvertebrates based on the relative abundance of certain indicator taxa.
2. Ephermeroptera, Plecoptera and Trichoptera: abundance as a percentage of the total abundance of macroinvertebrates.
3. Kansas Biotic Index for Nutrients: Mathematically equivalent to the MBI, however the tolerance values are species specific and restricted to aquatic insect orders.
4. EPT Percent of Count: The percentage of organisms in a sample consisting of individuals belonging to the EPT orders.
5. Shannon's Evenness: A measure of diversity that describes how evenly distributed the numbers of individuals are among the taxa in a sample.

Once measured, each of the metrics are assigned a score according to Table 10 of the TMDL document (copied below), and then the scores are tallied and a support category is assigned according to Table 11 of the TMDL document (copied below).

ALUS Metrics with Scoring Ranges

MBI	KBI-N	EPT	EPT percent CNT	SHN EVN	Score
<= 4.18	<= 2.52	>= 16	>= 65	>= 0.849	4
4.19-4.38	2.53-2.64	14-15	56-64	0.826-0.848	3
4.39-4.57	2.65-2.75	12-13	48-55	0.802-0.825	2
4.58-4.88	2.76-2.87	10-11	38-47	0.767-0.801	1
>= 4.89	>= 2.88	< = 9	<= 37	<= 0.766	0

ALUS Index Score Ranges, Interpretation of Biotic Condition and Support

ALUS Index Score	Biotic Condition	Support Category
17-20	Very Good	Supporting
14-16	Good	
7-13	Fair	Partially Supporting
4-6	Poor	Non-supporting
1-3	Very Poor	

Thus, the numeric endpoints for the TMDL document, indicating attainment of water quality standards, are:

1. An ALUS Index score greater than or equal to 14.
2. A sestonic chlorophyll *a* concentration less than 5 µg/L at SC212 and SC570.

Achievement of these biological endpoints indicate any loads of phosphorus are within the loading capacity of the streams, water quality standards are attained and full support of the designated uses of the streams have been restored. All uses are considered and protected by the TMDL document. The endpoints will be evaluated periodically as phosphorus levels decline over time. The biological endpoints have to initially be maintained over three consecutive years to constitute full support of the designated uses. After water quality standards are attained, simultaneous digression of these endpoints more than once every three years, on average, constitutes a resumption of impaired conditions.

Pollutant(s) of Concern

A statement that the relationship is either directly related to a numeric water quality standard, or established using surrogates and translations to a narrative WQS is included. An explanation and analytical basis for expressing the TMDL(s) through surrogate measures, or by translating a narrative water quality standard to a numeric target is provided (e.g., parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae). For each identified pollutant, the submittal describes analytical basis for conclusions, allocations and a margin of safety that do not exceed the loading capacity. If the submittal is a revised TMDL document, there are refined relationships linking the load to water quality standard attainment. If there is an increase in the TMDL(s), there is a refined relationship specified to validate that increase (either load allocation or wasteload allocation). This section will compare and validate the change in targeted load between the versions.

A link has been established between the numeric total phosphorus target in the TMDL document and narrative criteria for nutrients in Kansas water quality standards. The current EPA suggested stream TP concentration benchmarks for aggregate Ecoregion IX streams is 0.037 milligrams per liter. A similar EPA benchmark for Level III Ecoregion 40 streams based on the 25th percentile of data for 146 streams sampled is 0.092 mg/L. Analyses for data collected from 1990-2014 restricted to the Kansas stations in Ecoregion 40d (Central Irregular Plains, Cherokee Plains) from eight stations with the lowest TP concentration average indicate the average concentration of the pooled data set is about 0.140 mg/L, and the median concentration is 0.110 mg/L. The

KDHE sampling stations located in Kansas Ecoregion 40d are detailed in Table 9 of the TMDL document (copied below).

Kansas Ecoregion 40d Stations with the Lowest TP Concentration Averages

Ecoregion 40d Station	Average (mg/L)	Median (mg/L)
SC110	0.052	0.036
SC746	0.070	0.057
SC747	0.079	0.069
SC605	0.118	0.080
SC569	0.131	0.113
SC565	0.143	0.100
SC209	0.147	0.150
SC568	0.171	0.135

The narrative criteria of the Kansas WQS are based on the indications of the prevailing biological community. Once the concentrations at Stations SC212 and SC570 approach the Phase I target of a median TP concentration of 0.140 mg/L, an intensive assessment of macroinvertebrate diversity will be made to determine compliance with narrative nutrient criteria. The Aquatic Life Use Support Index and sestonic chlorophyll concentrations will serve to establish whether or not the biological community of Shoal Creek and Short Creek reflects recovery, renewed diversity and minimal disruption from the impacts described in the narrative criteria for nutrients on aquatic life, recreation and domestic water supply.

Excessive primary productivity may also be indicated by extreme fluctuations in dissolved oxygen or pH as the chemical reactions of photosynthesis and respiration alter the ambient levels of oxygen or acid-base balance of the stream. Higher pH values tend to occur during periods of high algal photosynthesis. Levels of pH exceeded the criterion of 8.5 at SC212 on Shoal Creek during two sampling events. Otherwise, pH is steady at all temperatures above 8 degrees Celsius. The average pH at SC212 is 7.94, which is within the range of pH criteria for Kansas waters (6.5 to 8.5). Levels of pH exceeded the criterion of 8.5 at SC570 on Short Creek during one sampling event and there is a slight rise in pH with elevated temperature that are likely attributed to greater primary productivity during this condition. The average pH at SC570 is 7.25, which is within the range of the pH criteria for Kansas waters. On the Spring River at SC213, pH exceeded the criterion six times and averaged 7.87.

Presuming the first stage of reducing phosphorus levels in the TMDL watershed improves water quality but does not attain the biological indicators, a second stage of implementation will commence according to the TMDL document. In time, median phosphorus concentrations should approach the median value (0.110 mg/L) of the TP data for the eight stations within KS Ecoregion 40d that have the lowest TP concentrations.

If all numeric endpoints for this TMDL are met, then attainment of Kansas WQS will be met by eliminating impacts to aquatic life, domestic water supply or recreation associated with excessive TP and objectionable amounts of algae. All endpoints must be maintained over three consecutive years to be considered as fully supportive of designated uses.

The TMDL document effectively links the success of the TP TMDLs to improvement in the biological conditions in Shoal and Short Creeks, thereby meeting WQS and restoring full support of all designated uses of the creeks.

Source Analysis

Important assumptions made in developing the TMDL document, 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. The submittal demonstrates all significant sources have been considered. If this is a revised TMDL document any new sources or removed sources will be specified and explained.

In the absence of a national pollutant discharge elimination system permit, the discharges associated with sources were applied to the load allocation, as opposed to the wasteload allocation for purposes of this TMDL document. The decision to allocate these sources to the LA does not reflect any determination by the EPA as to whether these

discharges are, in fact, unpermitted point source discharges within this watershed. In addition, by establishing these TMDL(s) with some sources treated as LAs, the EPA is not determining that these discharges are exempt from NPDES permitting requirements. If sources of the allocated pollutant in this TMDL document 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 document. Any WLA in addition to that allocated here is not available.

There are no National Pollutant Discharge Elimination System facilities within the Shoal Creek watershed in Kansas. There is one permitted NPDES facility within the Short Creek watershed in Kansas. The facility is a permanent ready-mix concrete batch plant (O'Brien Ready Mix), which generates water from washing trucks that is collected in a three cell concrete basin. There is no potential for the facility to contribute to the nutrient impairment based on their operations and due to the fact that there have been no reported discharges from the facility. Within the larger Spring River watershed above SC213, there are four NPDES permitted facilities that discharge into the Spring River. Two of the facilities, the city of Galena and the Cherokee County S.D #1, operate lagoon systems that discharge total phosphorus to the Spring River. The City of Galena currently monitors TP concentrations in their effluent, with an average TP concentration of 1.9 milligrams per liter. The Cherokee County S.D. #1 does not currently monitor TP. The two industrial facilities, Jayhawk Fine Chemical Corporation and Empire District Electric Riverton Plant, do not monitor TP in their effluent and have no potential to contribute to the TP loads in the Spring River based on their current operations. The Kansas NPDES facilities in the watershed are detailed in Table 14 of the TMDL document (copied in part below).

NPDES facilities in the Spring River watershed

Facility Name	NPDES Permit Number	Downstream Sampling Station	Design Flow	Permit Expiration Date
JAYHAWK FINE CHEMICAL CORP.	KS0092568	SC213	0.072	11/30/2018
O'BRIEN READY MIX - GALENA PLANT	KSG110201	SC570	0.00	9/30/2017
EMPIRE DISTRICT ELECTRIC-RIVERTON PLT	KS0079812	SC213	97.72	12/31/2018
GALENA, CITY OF	KS0048135	SC213	0.42	12/31/2018
CHEROKEE CO. S.D. #1	KS0091057	SC213	0.22	3/31/2018

For the point sources in Missouri, Kansas has no authority to set wasteload allocations and therefore the TMDL document did not assess wastewater monitoring data associated with the Missouri NPDES facilities. However, a general list of point source facilities in Missouri is provided in the TMDL document in Tables 15a and 15b (copied in part below). The facilities that discharge nutrients contribute to TP loading to the streams entering Kansas. Based on the design flows of these facilities and the resulting water quality observed downstream of these facilities, TP loading is attributable to the Joplin Shoal Creek wastewater treatment facility, the Joplin Turkey Creek WWTF, the Monett WWTF, the Neosho-Shoal Creek WWTF and the Center Creek WWTF. According to the Missouri Department of Natural Resources, there is a Tyson Foods poultry slaughtering and processing plant in the Shoal Creek watershed that discharges the first 88,000 gallons per day of storm water to the Monett WWTF. These facilities contribute to the TP loads and concentrations in Shoal Creek, Turkey Creek, Center Creek and the Spring River. The PCS Phosphate Joplin Plant and the Farmland Industries facility discharge to Short Creek, and likely contribute TP loads during discharging events contributing to the impairment of Short Creek. The Hillbilly Pumping and Hauling facility has two permits dealing with food wastes and biosolids, and storm water runoff from this facility may contribute to the TP loading in Short Creek.

NPDES Facilities in Missouri

Facility	Permit Identification	Type	Design Flow (MGD*)
Eagle-Picher Technologies, LLC	MO0002348	Storm Water	3.500
Eaton Hydraulic	MO0002411	Mechanical Plant	0.600
Joplin Shoal Creek	MO0023256	Mechanical Plant	6.500
Carl Junction WWTF	MO0025186	Land Application	1.270
Center Creek WWTF	MO0040185	Mechanical Plant	4.800
Farmland Industries - GYP	MO0053627	No Discharge	1.000
TAMKO Building Products Inc. WWTF	MO0093998	Storm Water	0.000
American Fibrex	MO0102253	Storm Water	0.000
Joplin Turkey Creek WWTF	MO0103349	Mechanical Plant	15.000
Joplin Municipal Landfill	MO0108731	Storm Water	0.000
Southern Star Central Gas Pipeline, Inc	MO0108766	Storm Water	0.012
PCS Phosphate Joplin Plant	MO0128155	Lagoon	0.042
Hillbilly Pumping and Hauling, Inc.	MOG821008	Land Application	0.000
Hillbilly Pumping and Hauling Inc.	MOG822182	Storm Water	0.000

MGD = million gallons per day

Domestic Discharging WWTFs in Missouri

Facility Name	Permit ID	Design Flow (MGD)
Monett WWTF	MO0021440	6
Diamond WWTF	MO0042013	No discharge
City of Purdy WWTF	MO0043222	No discharge
Pierce City WWTF	MO0099155	0.2
Neosho-Shoal Creek WWTF	MO0104906	3
Granby WWTF	MO0107581	0.22
John Sim LLC WWTF	MO0110299	0.01
Park Place MHP – Joplin WWTF	MO0116491	0.0078
Highway 60 RV Park WWTF	MO0120561	0.0033
Camp Barnabas WWTF	MO0125164	0.012
Butterfield WWTF	MO0126292	0.0604
Monett Municipal Airport WWTF	MO0132284	0.0011
Shoal Creek RV Campground WWTF	MO0134287	0.0125
Raines MHP WWTF*	MO0131695	0.0054
Timberlost Mobile Home Park*	MOG823002	0.007899

Livestock and Waste Management Systems: There are no state permitted animal feeding operations in the Shoal Creek or Short Creek watersheds in Kansas. According to the 2007 Agriculture Census, there are 730 farms with 290,000 acres of farmland in Cherokee County. Additionally, there are 32,000 head of cattle in Cherokee County according to the 2012 Kansas Farm Facts.

Any concentrated animal feeding operation 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 of the Clean Water Act. It is the 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.

There are no permitted CAFOs identified in the TMDL document. Any AFOs and unpermitted CAFOs are considered under the load allocation because we do not have enough detailed information at this time to know whether these facilities are required to obtain NPDES permits. This TMDL document does not reflect a

determination by the 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 a CAFO that discharges, any future wasteload allocations assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL document as approved.

Population Density: According to the 2010 Census Block information, the Shoal Creek watershed in Kansas has 929 people, with a population density of 92 people/square mile. The Short Creek watershed has 3,129 people, with a population density of about 527 people/square mile in Kansas. There are approximately 3,085 people residing within the city limits of Galena, which has a city boundary that is primarily all within the Short Creek watershed. Population changes from the 2000 to 2010 census show that the population of Galena has decreased 6.15 percent, going from 3,287 to 3,085 people over the ten year period.

On-Site Waste Systems: The Spreadsheet Tool for Estimating Pollutant Loads was utilized to identify the number of septic systems within the 12-digit Hydrologic Unit Code that contains the Shoal Creek and Short Creek watersheds in Kansas. According to STEPL, there were 59 septic systems within the HUC12 encompassing the Shoal Creek watershed and 206 septic systems within the HUC12 encompassing the Short Creek watershed. The STEPL model estimates the failure rate of 0.93 percent for these systems. Failing on-site septic systems do not likely contribute to the total phosphorus impairment within the TMDL watershed containing Short Creek and Shoal Creek.

Land Use: Land use within the Short Creek watershed in Kansas is dominated by grassland (46.47 percent) according to the 2001 National Land Cover Dataset. Developed areas and forest comprise about 28.36 percent and 17.38 percent of the watershed, respectively. The land use percentages and acres within the watershed are in Table 16 of the TMDL document (copied below) and are further illustrated in the land use map in Figure 28 of the TMDL document. Runoff from the cropland and developed areas could contribute significant sources of total phosphorus loading.

Land use acres and percentages in the Short Creek Watershed

Land Use	Acres	Percent
Grassland	1771.63	46.47
Developed	1081.3	28.36
Forest	662.75	17.38
Barren	155.46	4.08
Cropland	113.65	2.98
Wetland	14.23	0.37
Open Water	13.57	0.36

Land use within the Shoal Creek watershed in Kansas is dominated by forest (48.16 percent) according to the 2001 NLCD. Grassland and developed areas comprise about 35.47 percent and 6.52 percent of the watershed respectively. The land use percentages and acres within the watershed are in Table 17 of the TMDL document (copied below) and are further illustrated in the land use map in Figure 29 of the TMDL document.

Land use acres and percentages in the Shoal Creek Watershed

Land Use	Acres	Percent
Forest	3,132.93	48.16
Grassland	2,307.17	35.47
Developed	423.89	6.52
Barren	307.80	4.73
Wetland	173.03	2.66
Open Water	117.65	1.81
Cropland	42.48	0.65

The land use in the Spring River watershed that encompasses Short and Shoal Creek watersheds is detailed in Table 18 and Figure 30 of the TMDL document. Land use in the Spring River watershed in Kansas is dominated by grassland (38.62 percent) and forest (28.68 percent).

Land use acres and percentages in the Spring River Watershed

Land Use	Acres	Percent
Grassland	14,983.57	38.62
Forest	11,124.59	28.68
Developed	4875.77	12.57
Cropland	4575.76	11.79
Wetland	1369.50	3.53
Open Water	1128.65	2.91
Barren	737.01	1.90

In summary nonpoint sources identified in the TMDL document include:

- Overused grazing land adjacent to the streams.
- Sites where drainage runs through or adjacent to livestock areas.
- Sites where livestock have full access to the stream as a primary water supply.
- Degraded riparian areas and denuded riparian vegetation along the stream.
- Unbuffered cropland adjacent to the stream.
- Highly erodible land areas in the watershed.
- Total row crop acreage and gully locations.
- Residential areas of Galena, Kansas and Joplin, Missouri.

The Shoal Creek and Short Creek watershed soils in Kansas have a mean soil permeability of 2.46 and 1.88 inches per hour, respectively, ranging from 0.01 to 4.0 inches per hour. About 11 percent of the soils have low permeability values of less than 1.71 inches per hour, which result in runoff even during low rainfall intensity events. However, a majority of the soils in the watershed have very high permeability values which result in runoff possibly only during high rainfall intensity events. Nevertheless, as the watershed soil profile becomes saturated, rainfall runoff occurs and potentially picks up and delivers sediment and nutrients to watershed streams.

Total phosphorus is typically linked to sediment or total suspended solids because of the propensity of those solids to adsorb phosphorus. The relationship between TP and TSS is indicative of the influence of nonpoint sources on water quality. When runoff causes high TSS concentrations, phosphorus typically rises as well. The TMDL document shows that when TSS levels on Shoal Creek are low there is a poor correlation with phosphorus. The notable lack of relation between the two is typically indicative of the dominant influence of WWTF discharge with elevated phosphorus and low TSS content within Shoal Creek. The TP and TSS relationship at SC213 is charted in Figure 16 of the TMDL document, and it indicates that there is linkage between the two for the samples with TSS concentrations higher than 50 mg/L.

Background phosphorus is present over the landscape, in the soil profile as well as terrestrial and aquatic biota. Wildlife can contribute phosphorus loadings, particularly if they congregate to a density that exceeds the assimilative capacity of the land or water.

All known sources have been considered.

Allocation - Loading Capacity

The submittal identifies appropriate loading capacities, wasteload allocations for point sources 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 revised TMDL document the change in loading capacity will be documented in this section. All TMDLs must give a daily number. Establishing TMDL "daily" loads consistent with the U.S. Court of Appeals for the D.C. circuit decision in Friends of the Earth, Inc. v. EPA, et al., No. 05-5015, (April 25, 2006).

The loading capacity is calculated as LC = sum of wasteload allocation + sum of load allocation + margin of safety. Daily total phosphorus loads are computed by multiplying the Phase I and Phase II concentrations, 0.140 milligrams per liter and 0.110 mg/L, respectively, by flow exceedances along the flow duration curve and a unit conversion factor. The established TMDL capacities (load duration curves) for Phase I and II for all flow exceedances relative to observed loads in Short Creek as measured at SC570 and in Shoal Creek as measured at SC212 are detailed in the TMDL document Figures 31 and 32, respectively. The TP LC for Shoal Creek and Short Creek under the two stages of the TMDL are in Table 20 of the TMDL document. An example at the 50 percent flow exceedance is provided in the following table.

Segment	Phase I lb/day	Phase II lb/day
Shoal (SC212)	163.78	128.68
Short (SC570)	3.83	3.01

*lb/day = pounds per day

Wasteload Allocation Comment

The submittal lists individual wasteload allocations 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 a water quality standard excursion, the source is contained in a general permit addressed by the TMDL, or extenuating circumstances exist which prevent assignment of individual WLA. 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 revised TMDL document, any differences between the original TMDL(s) WLA and the revised WLA will be documented in this section.

The are no Kansas National Pollutant Discharge Elimination System facilities in the Short Creek or Shoal Creek watersheds within Kansas that have any potential to contribute to the TP impairment. The O'Brien Ready Mix Galena Plant facility is a permanent ready-mix concrete batch plant in the Short Creek watershed, which generates water from washing trucks that is collected in a three cell concrete basin. This facility has been assigned a wasteload allocation of zero since this facility has no reported discharges and has no potential for

contributing to the TP impairment in the watershed. The total WLA in the Kansas portion of the watershed is zero.

Kansas has no authority to set wasteload allocations associated with the NPDES permitted facilities in Missouri. The city of Joplin's wastewater treatment plant discharge is a significant contributor to the phosphorus loads crossing the stateline into Kansas. Additionally, all facilities discharging nutrients in Missouri to streams draining to the Spring River watershed contribute to the loads entering Kansas.

Load Allocation Comment

All nonpoint source loads, natural background and potential for future growth are included. If no nonpoint sources are identified, the load allocation must be given as zero [40 CFR § 130.2(g)]. If this is a revised TMDL document, any differences between the original TMDL(s) LA and the revised LA will be documented in this section.

The load allocation for nonpoint sources and a 10 percent margin of safety comprises the loading capacity for Short Creek and Shoal Creek in Kansas. During times of low flow, nonpoint sources are assumed to be very minimal. The load allocation grows proportionately with flow and increases as wet weather ensues. Additionally, all loads from Missouri, both originating from point sources and nonpoint sources, are accounted for in the load allocation of these streams in Kansas. The load allocations for Short Creek and Shoal Creek are detailed in Table 20 of the TMDL document. For example, at the 50 percent flow exceedance, during Phase I the load allocations are 147.4 pounds per day and 3.45 lb/day for Shoal Creek and Short Creek, respectively.

Margin of Safety

The submittal describes explicit and/or implicit margins of safety 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 revised TMDL document, any differences in the MOS will be documented in this section.

The margin of safety provides some hedge against the uncertainty of variable total phosphorus loads. Therefore, the MOS will be 10 percent of the original calculated total phosphorus load allocation, which has been subtracted from the assigned load allocation to compensate for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality. The explicit MOS at the 50 percent flow exceedance for example during Phase I is 16.38 pounds per day for Shoal Creek and 0.38 lb/day for Short Creek.

Seasonal Variation and Critical Conditions

The 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 the WQS. If this is a revised TMDL document, any differences in conditions will be documented in this section.

Seasonal variability has been accounted for in this TMDL document. A three season approach was utilized to include: the Spring season consisting of the months of April, May and June; the Summer-Fall season consisting of the months of July, August, September and October, and the Winter season that includes January, February, March, November and December.

The load duration curve method used in the TMDL document represents flow under all conditions. Because the wasteload allocations, load allocations and TMDLs are applicable at all flow conditions, they are also applicable and protective over all seasons. The advantage of the load duration curve method is that all flow conditions are considered and the constraints associated with using a single-flow critical condition are avoided. Seasonal variation is accounted for in the TMDL document since the endpoints account for all flow conditions throughout the year.

Public Participation

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

Public Notice: An active internet website is established at http://www.kdheks.gov/tmdl/planning_mgmt.htm to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Neosho Basin. This TMDL was posted to the website on April 22, 2015.

Public Hearing: A public Hearing on this TMDL document was held in Frontenac on May 19, 2015, to receive public comments. The comment period was held open from May 7th through June 5th and no comments were

received regarding these TMDLs.

Basin Advisory Committee: The Neosho River Basin Advisory Committee met to discuss the TMDLs in the basin on March 6, 2014, in Marion.

Milestone Evaluation: In 2022, evaluation will be made as to the degree of implementation that occurred within the watershed. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Monitoring Plan for TMDL(s) Under a 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 water quality standards, and a schedule for considering revisions to the TMDL(s) (where a phased approach is used) [40 CFR § 130.7]. If this is a revised TMDL document, monitoring to support the revision will be documented in this section. Although the EPA does not approve the monitoring plan submitted by the state, the EPA acknowledges the state's efforts. The EPA understands that the state may use the monitoring plan to gauge the effectiveness of the TMDLs and determine if future revisions are necessary or appropriate to meet applicable water quality standards.

Future stream sampling will continue to occur quarterly at sampling stations SC212 and SC213. Sampling will continue to occur quarterly every four years at sampling station SC570. The monitoring will include sestonic chlorophyll sampling at SC212, SC570 and SC213. Monitoring of levels of TP during runoff events will help direct abatement efforts toward important nonpoint sources. Runoff event sampling is conducted ad hoc when conditions are favorable to capture representative runoff samples. The KDHE monitors the U.S. Geological Survey's stream gage network and local rainfall to assess runoff sampling potential. Dissolved oxygen and pH will be assessed for indications of heightened primary productivity.

Commencing in 2017, macroinvertebrate sampling will occur at SC212 and SC570. The streams will be evaluated after Phase I implementation. If the biological endpoints are achieved over 2019-2023, the conditions described by the narrative nutrient criteria will be viewed as attained and Shoal Creek at SC212 and Short Creek at SC570 will be moved to Category 2 on the 2024 Integrated Report. If they are not, Phase II of this TMDL document will be implemented.

Once the water quality standards are attained, the adjusted ambient phosphorus concentrations on Shoal Creek and Short Creek will be the basis for establishing numeric phosphorus criteria through the triennial water quality standards process to protect the restored biological and chemical integrity of the rivers.

Reasonable Assurance

Reasonable assurance only applies when less stringent wasteload allocation are assigned based on the assumption that nonpoint source reductions in the load allocation 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. States are not required under Section 303(d) of the Clean Water Act to develop TMDL implementation plans and the EPA does not approve or disapprove them. However, this TMDL document provides information regarding how point and nonpoint sources can or should be controlled to ensure implementation efforts achieve the loading reductions identified in this TMDL document. The EPA recognizes that technical guidance and support are critical to determining the feasibility of and achieving the goals outlined in this TMDL document. Therefore, the discussion of reduction efforts relating to point and nonpoint sources can be found in the implementation section of the TMDL document, and are briefly described below.

The states have 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 the state should provide reasonable assurance that instream water quality standards 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 wasteload allocations 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 load allocations and point source WLAs do not exceed the WQS-based loading capacity 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 document.

The following authorities may be used to direct activities in the watershed to reduce pollution:

1. K.S.A. 65-164 and 165 empowers the Secretary of the KDHE to regulate the discharge of sewage into the

waters of the state.
2. K.S.A. 65-117d empowers the Secretary of the KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
3. K.S.A. 2-1915 empowers the Kansas Department of Agriculture, Division of Conservation to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
4. K.S.A. 75-5657 empowers the Kansas Department of Agriculture, Division of Conservation to provide financial assistance for local project work plans developed to control nonpoint source pollution.
5. K.S.A. 82a-901, et. seq. empowers the Kansas Water Office to develop a state water plan directing the protection and maintenance of surface water quality for the waters of the state.
6. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the Kansas Water Plan, including selected Watershed Restoration and Protection Strategies.
7. The Kansas Water Plan and the Neosho Basin Plan provide the guidance to state agencies to coordinate programs intent on protecting water quality and to target those programs to geographic areas of the state for high priority implementation.

The State Water Plan annually generates $16-18 million and is the primary funding mechanism for implementing water quality protection and pollution reduction activities in the state through the Kansas Water Plan. The state water planning process, overseen by the Kansas Water Office, coordinates and directs programs and funding toward watershed and water resources of highest priority. Typically, the state allocates at least 50 percent of the fund to programs supporting water quality protection. This watershed and its TMDLs are located within a high priority area and should receive support for pollution abatement practices that lower the loading of sediment and nutrients.

Nutrient control has been proven effective through conservation tillage, contour farming and use of grass waterways and buffer strips. In addition, the proper implementation of comprehensive livestock waste management plans has proven effective at reducing nutrient runoff associated with livestock facilities. Table 19 of the TMDL document includes anticipated implementation actions. The city of Joplin's Turkey Creek wastewater treatment facility in Missouri will likely be implementing upgrades to reduce total phosphorus loading. This will ultimately further reduce loads and concentrations reaching the Spring River.