



EPA Region 7 TMDL Review

TMDL ID: KS-VE-02-LM025001
Document Name: ELK CITY LAKE

State: KS

Basin(s): VERDIGRIS BASIN
HUC(s): 11070104
Water body(ies): ELK CITY LAKE
Tributary(ies):

Pollutant(s): EUTROPHICATION, SEDIMENT/SILTATION, TOTAL NITROGEN,
TOTAL PHOSPHORUS

Submittal Date: 3/13/2009

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 was formally submitted by the Kansas Department of Health and Environment (KDHE) to the United States Environmental Protection Agency (EPA) in a letter format received on March 13, 2009. Revisions addressing EPA comments were received by email May 11, 2009.

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 LC is 42,192 lbs/yr, or 219.6 lbs/day total phosphorus (TP), and 400,524 lbs/yr, or 2,940.8 lbs/day total nitrogen (TN). Siltation is linked through sediment that is allocated through established loads of Total Suspended Solids (TSS). The LC for TSS is 76,030 lbs/yr, or 472.84 lbs/day.

Eutrophication is a result of increased TN and TP nutrient loadings into the water body. In eutrophication impairments, chlorophyll *a* (chl_a) concentrations are used as a surrogate measure to measure algal growth and as a parameter for WQS. The submittal recognizes a numeric target for summer chl_a concentrations to be established below 10 micrograms per liter (µg/L) with reductions focused on TN and TP. The chl_a target of 10 µg/L is a statewide goal for Federal lakes and lakes serving as public water supplies. This target was set to ensure long-term protection of the Primary Contact Recreation use within the lake. Siltation is a result of suspended sediment into the water body and serves as a result of overland runoff. To assist with the improvement of water column quality and the siltation impairment, the desired endpoint should result in an increase of the average transparency of the lake to 0.70 meters, as measured by the Secchi disk depth within the main basin of Elk City Lake.

Reductions of 45 percent TP, 44 percent TN, and 83 percent sediment, is needed to achieve full support of all designated uses.

EPA agrees that attainment of the LCs should result in the attainment of WQS.

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.

Elk City Lake's eutrophication impairment is addressed through a narrative nutrient WQS. This KS WQS state that:

- 1) "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));
- 2) "The introduction of plant nutrients into surface waters designated for primary or secondary contact recreation 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 aquatic vegetations." (K.A.R. 28-17-28E(C)(7)(A)); and
- 3) The KS WQS also states that suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat or other factors related to the survival and propagation of aquatic or semi-aquatic or terrestrial wildlife. (K.A.R. 28-16-28E(c)(2)(B)).

Designated beneficial uses indicated in the submittal were Primary Contact Recreation (A); Expected Aquatic Life Support; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply; Irrigation Use; and Livestock Watering Use. The submittal states that all uses are impaired by eutrophication.

Numeric criteria for phosphorous and nitrogen are derived through the use of the BATHTUB water quality model and the Clean Air Status and Trends Network (CASTNET). BATHTUB is an empirical receiving water quality model that was developed by the United States Corp of Engineers used to address TMDL-related issues associated with morphometrically complex lakes and reservoirs. CASTNET, was utilized to estimate the atmospheric total nitrogen concentration for the model. This was done by averaging results obtained from the Konza Prairie (KS) and Cherokee nation (OK) CASTNET stations. The target chla concentration of 10 µg/L was established to achieve the required phosphorous and nitrogen concentrations in the lake.

To address the siltation component of this TMDL, "Brown" scores derived from the 1998-2002 statewide lake monitoring (Carney, 2003), were utilized as a guidance to set the 0.7 meters Secchi depth target as the TMDL and management goals for the restoration of the water quality in Elk City Lake. Kansas does not have numeric water quality criteria from inorganic turbidity associated with soil/sediment particles.

Eutrophication is a result of increased TN and TP nutrient loadings into the water body. In eutrophication impairments, chla concentrations are used as a surrogate measure to measure algal growth and as a parameter for WQS. The submittal recognizes a numeric target for summer chla concentrations to be established below 10 µg/L with reductions focused on TN and TP. The chla target of 10 µg/L is a statewide goal for Federal lakes and lakes serving as public water supplies. This target was set to ensure long-term protection of the Primary Contact Recreation use within the lake. Siltation is a result of suspended sediment into the water body and serves as a result of overland runoff. To assist with the improvement of water column quality and the siltation impairment, the desired endpoint should result in an increase of the average transparency of the lake to 0.70 meters, as measured by the Secchi disk depth within the main basin of Elk City Lake.

Reductions of 45 percent TP, 44 percent TN, and 83 percent sediment, is needed to achieve full support of all designated uses.

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 submittal uses a chl_a target of 10 µg/L as a surrogate numeric criterion for the narrative standards dealing with eutrophication. A Secchi depth of 0.70 meters is needed to fully support the restoration of the water quality of Elk City Lake. A reduction of 45 percent for both phosphorous and nitrogen, as well as a 83 percent reduction of total sediment is also required to achieve full support of the designated uses of this watershed.

Numeric criteria for phosphorous and nitrogen are derived through the use of the BATHTUB water quality model and CASTNET. BATHTUB is an empirical receiving water quality that was developed by the United States Corp of Engineers used to address TMDL-related issues associated with morphometrically complex lakes and reservoirs. CASTNET was utilized to estimate the atmospheric total nitrogen concentration for the model. This was done by averaging results obtained from the Konza Prairie (KS) and Cherokee nation (OK) CASTNET stations. The target chl_a concentration of 10 µg/L was established to achieve the required phosphorous and nitrogen concentrations in the lake.

The submittal demonstrates an established link of eutrophication to chl_a in reference to phosphorous, nitrogen. Allocations for sediment are linked and indicated throughout this submittal as TSS and siltation.

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.

Land distribution for Elk City Lake's watershed is 75 percent grassland/pasture, 10 percent forest, and 9 percent cropland. Other land use includes 3.5 percent developed, 1.6 percent open water, and less than one percent wetlands. There are thirteen certified or permitted confined animal feedlot operations located throughout the watershed. All of the permitted livestock facilities have waste management systems designed to minimize runoff entering their facility and detain runoff emanating from their operations. These systems are designed to retain a 25-year, 24-hour rainfall/runoff event, in addition to two weeks of normal wastewater from their operations. In addition, there are eight National Pollution Discharge Elimination Systems (NPDES)-permitted facilities, with two that are non-overflowing facilities which are prohibited from discharging, and two are quarry operations that have minimal discharge. The other four facilities are discharging municipal wastewater treatment facilities.

Animal wastes are the result of both confined and unconfined feeding sites. Presumptions are that animal wastes are a potential nutrient source load going into Elk City Lake. These nutrients may also be attributed to fertilizer or manure application to the agricultural lands being used for pasture, hay, or cropland production.

Within the Elk City Lake watershed, there are several small towns that either have stable, declining, or increasing populations. Households that are not served by the public sewer system associated with four municipal NPDES facilities within this watershed are presumably on septic systems. Therefore, failing on-site systems may contribute nutrient loadings and aggravate eutrophication problems. Biological Oxygen Demand (BOD), TSS, pH, ammonia, and fecal coliform will be sampled from the cities of Howard, Moline, Longton, and Elk City because it is presumably assumed that they discharge into the watershed as a result of the towns' population within the watershed.

Runoff is also indicated as a nonpoint nutrient source into the watershed. Natural background sources are identified as leaf litter, wastes from wildlife, atmospheric, and geological formations.

NPDES facilities within the Elk City Lake Watershed

Permit	Facility
I-VE27-PO02	Harshman Construction
I-VE14-PO01	Midwest Minerals #23 Elk City Qry
I-VE27-NP02	C & M Car Wash
M-VE23-NO01	KDWP- Elk City State Park
M-VE27-OO01	City of Moline
M-VE25-OO01	City of Longton
M-VE22-OO02	City of Howard
M-VE14-OO01	City of Elk City

EPA agrees the submittal considers all known significant sources.

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 LC for TP is 42,192 lbs/yr, or 220 lbs/day. For TN, the LC is 400,524 lbs/yr, or 2,941 lbs/day. A 45 percent reduction of both TP and TN is needed to achieve a chl_a concentration of 10 µg/L.

The LC for TSS is 76,030 tons/yr, or 473 tons/day of TSS.

EPA agrees this is an appropriate LC.

WLA Comment

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

The WLA is 2,004 lbs/yr, or 10.4 lbs/day TP, and 8,014 lbs/yr or 59 lbs/day TN.

For TSS, the WLA is 40 tons/yr, or 0.25 tons/day.

WLA for Discharging Facilities within Elk City Lake

NPDES Facility	WLA TP lbs/yr	WLA TN lbs/yr	WLA TSS tons/yr
City of Moline	640.4	2561.7	25616.5
City of Longton	345.3	1381.3	13812.8
City of Howard	808.1	3232.4	32324.4
City of Elk City	209.7	838.9	8388.6
Total	2,003.5	8,014.3	80,142.3

The WLA for non-discharging permitted facilities and the quarry operations have a WLA of zero since they do not discharge or add to the impairment of the lake.

EPA agrees this is an appropriate WLA.

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 LA is 35,671 lbs/yr, or 186 lbs/day TP, and 332,666 lbs/yr, or 2,443 lbs/day TN.

For TSS, the LA is 68,387 tons/yr, or 425.31 tons/day.

EPA agrees this is an appropriate LA.

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.

The MOS was explicitly set at 10 percent of the allocations for TP, TN, and TSS, which compensates for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality.

The MOS is 4,219 lbs/yr, or 22 lbs/day TP, and 40,052 lbs/yr, or 294.1 lbs/day TN. For TSS, the MOS is 76,030 tons/yr, or 472.84 tons/day.

EPA agrees this is an appropriate MOS.

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.

Seasonal variation has been accounted for in this TMDL due to peaks of algal growth that occur in the summer months. The summer months are indicated as the months of May-September.

Seasonality and critical conditions have been addressed in the submittal.

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)].

Since 2002, public meetings have been held to discuss TMDLs in the Verdigris Basin. A public meeting was held on July 23, 2008 in Neodesha. The Verdigris Basin Advisory Committee met on September 25, 2007 in Eureka to discuss these TMDLs, on February 27, 2008 in Independence, and on July 23, 2008 in Neodesha.

To convey information to the public on the general establishment of TMDLs in the Verdigris Basin and these specific TMDLs, an active internet web was established at <http://www/kdheks.gov/tmdl/index.htm>.

The original drafts of the TMDL documents were revised based on comments received from throughout the 2008 public notice period. All comments were considered.

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].

The 3-year sampling schedule to assess the trophic state of Elk City Lake will continue to be performed by KDHE. Based on sampling results, the improved state of the lake will be evaluated in 2016. If desired endpoints are not attained under this TMDL, refined and more intensive sampling will be conducted over the period of 2016-2018 to assess progress of this implementation. Additionally, a detailed bathymetric survey is scheduled for 2010.

The siltation component of this TMDL will be subject to revision to accurately reflect the current status of the lake as it is determined by the survey.

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.

The WLAs are set to meet WQS so no reasonable assurances are required. The submittal lists reasonable assurances that include numerous authorities and funding through the Kansas Water Plan. Kansas has identified several federal, state, local, and non-government organizations that may be included in the implementation process.