



## EPA Region 7 TMDL Review

**TMDL ID:** KS-VE-01-LM024001

**State:** KS

**Document Name:** TORONTO LAKE

**Basin(s):** VERDIGRIS BASIN

**HUC(s):** 11070101

**Water body(ies):** TORONTO LAKE

**Tributary(ies):** VERDIGRIS RIVER, WALNUT CREEK

**Pollutant(s):** DISSOLVED OXYGEN, EUTROPHICATION, SILTATION, TOTAL NITROGEN, TOTAL PHOSPHORUS, TOTAL SUSPENDED SOLIDS

**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 April 15, 2009 and April 22, 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 TMDL identified eutrophication, bundled with siltation and dissolved oxygen (DO), as pollutants for Toronto Lake. The submittal identifies the LC as 50,585 pounds per year (lbs/yr), or 263.3 lbs/day for total phosphorus (TP), and 490,450 lbs/yr, or 3,601 lbs/day total nitrogen (TN). Allocations for sediment were established with a LC for Total Suspended Solids (TSS) of 55,854 tons/yr, or 290.7 tons/day.

Eutrophication is a result of increased TN and TP nutrient loadings into the water body. In eutrophication impairments, chlorophyll *a* (chl<sub>a</sub>) 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<sub>a</sub> concentrations to be established below 10 micrograms per liter (µg/L), with reductions focused on TN and TP. The chl<sub>a</sub> target of 10 µg/L is a statewide goal for federal lakes and lakes serving as public water supplies. This target was set to improve the trophic condition of the lake from its fully eutrophic status and ensure long-term protection of the Primary Contact Recreation use within the lake. A 28 percent TP and 23 percent TN reduction are required to attain the desired endpoints and to fully support designated uses of Toronto Lake.

Siltation is a result of suspended sediment into the water body and is also known to increase turbidity. 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 Toronto Lake. When the desired endpoint for siltation is achieved, this will result in the decrease of sediment loading into Toronto Lake. The submittal uses TSS as a surrogate measure for sediment to assess water quality conditions. A 42 percent reduction of TSS is required to achieve a Secchi depth of 0.70 meters.

The submittal also states that DO should exceed 5 milligrams per liter (mg/L) for the entire water column of the lake.

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.*

Toronto Lake's eutrophication bundled with siltation and DO impairment is addressed through a narrative nutrient WQS.

The KS WQS reads 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 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 aquatic vegetation." (K.A.R. 28-16-28e(c)(7)(A));
- 3) "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)); and
- 4) The concentration of DO in surface waters shall not be lowered by the influence of artificial sources of pollution. Dissolved Oxygen (DO): 5 mg/L (K.A.R. 28-16-28e(d) Table 1g).

Designated beneficial uses for Toronto Lake are: 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.

Numeric criteria for phosphorous and nitrogen were derived through the use of the BATHTUB water quality model. BATHTUB is an empirical receiving water quality model that was developed by the United States Army Corp of Engineers used to address TMDL-related issues associated with morphometrically complex lakes and reservoirs. Clean Air Status and Trends Network (CASTNET) stations from the Konza Prairie (KS) and Cherokee Nation (OK) were averaged to estimate the atmospheric TN concentration for the model. TP atmospheric loadings were estimated using the 1983 study of Rast and Lee. The state of Kansas does not have numeric water quality criteria for inorganic turbidity associated with soil/sediment particles; instead, "Brown" scores were utilized as a guideline to determine the target TMDL for sediment, as well as watershed management goals of restoring water quality in Toronto Lake.

Eutrophication is a result of increased TN and TP nutrient loadings into the water body. In eutrophication impairments, chl<sub>a</sub> concentrations are widely used as a surrogate measure to measure algal growth and is also used as a parameter for WQS. The submittal recognizes a numeric target for summer chl<sub>a</sub> concentrations to be established below 10 µg/L, with reductions focused on TN and TP. The chl<sub>a</sub> target of 10 µg/L is a statewide goal for federal lakes and lakes serving as public water supplies. This target was set to improve the trophic condition of the lake from its fully eutrophic status and ensure long-term protection of the Primary Contact Recreation use within the lake. A 28 percent TP, and 23 percent TN reduction is required to attain the desired endpoints and to fully support designated uses of Toronto Lake.

Siltation is a result of suspended sediment into the water body and also increases turbidity. 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 Toronto Lake. When the desired endpoint for siltation is achieved, this will result in the decrease of sediment loading into Toronto Lake. The submittal uses TSS as a surrogate measure for sediment to assess water quality conditions. A 42 percent reduction of TSS is required to achieve a Secchi depth of 0.70 meters.

The submittal also states that DO should exceed 5 mg/L for the entire water column of the lake.

### **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.*

Pollutants of concern for Toronto Lake are eutrophication, siltation, and DO. Eutrophication is an increase of nutrients, TP and TN, within the natural habitat or an ecosystem. This is normally a result of stormwater runoff, effluent discharge, and many other factors. TN and TP are the targeted pollutants in this submittal because these two pollutants are often present as nutrients that have been discharged into the lake, thus resulting in the eutrophication impairment. Sediment is also considered in the submittal to account for the siltation component of this TMDL. Sediment is a form of silt that has been suspended into this waterbody as a result of erosion and storm sewers. Chla concentrations are monitored and targeted throughout this submittal because chla is known to be a useful parameter for determining the biological productivity of a water body. Increased levels of TN and TP within the water body will cause an abundance of algal growth, plant decay, and a decrease in DO levels. The siltation impairment is linked through clarity to a TSS concentration of 17.4 mg/L and a Secchi depth of 0.7 meters.

The current allocation for TP include a WLA of 6,289 lbs/yr, or 46 lbs/day, LA of 419,868 lbs/yr, or 3,083 lbs/day, MOS of 49,045 lbs/yr, or 360 lbs/day with atmospheric deposition being accounted of 15, 247 lbs/yr, or 112 lbs/day. TN allocations include a WLA of 6,289 lbs/yr, or 46 lbs/day, LA of 419,868 lbs/yr, or 3,083 lbs/day, and a MOS of 49,045 lbs/yr, 360 lbs/day. TN atmospheric deposition accounts for 15,247 lbs/yr, 112 lbs/day. The submittal states that a numeric target for chla concentrations below 10 µg/L, with the reductions focused on TP and TN nutrients. This target was set to improve the trophic condition of the lake from its fully eutrophic status and to ensure protection to support all designated uses. The desired endpoint to increase the average transparency to 0.70 meters was established to address siltation. DO should exceed 5 mg/L for the entire water column of the lake.

## 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 Toronto Lake is 70 percent grassland, 15 percent pasture, 5 percent forest, and 4 percent croplands. Remaining land distribution within in the watershed consists of 1.3 percent open water, 4 percent developed, and less than one percent of wetlands and barren land. Land lying within the scenic Flint Hills are predominantly covered by grasslands. There are nine certified confined animal feedlot operations located throughout the watershed. All animal feedlots are adjacent to stream corridors and have waste management systems designed to minimize runoff entering their facility and detain runoff emanating from their operations. They are also designed to retain a 25-year, 24-hour rainfall/runoff event as well as an anticipated two weeks of normal wastewater from their operations. The nine certified confined animal feedlot operations are divided into seven beef, one swine, and one dairy livestock facilities. The potential number of animals associated with the certified confined animal feedlot operations is 3,325 head in the watershed, the actual number of animals at the feedlot operations is typically less than the allowable permitted number. Due to the fact that the watershed is dominated by grassland and pasture the number of smaller animal feeding operations that are not registered is presumably high, particularly during seasonal feeding months in the winter.

A potential source of nutrient loading to Toronto Lake are animal wastes from both confined and unconfined feeding sites. Other sources of nutrient loadings within this watershed may be attributed to fertilizer or manure application on agricultural lands being utilized for pasture, hay, or cropland production. Land near the riparian areas are a concern because they are subject to livestock grazing or watering and fertilizer applications. Within the Toronto Lake watershed there are seven National Pollution Discharge Elimination Systems (NPDES); four of these are non-overflowing facilities that are prohibited from discharging, and three are discharging municipal wastewater treatment plants. Under extreme precipitation events, lagoons may contribute to the load, however these events would not occur at a frequency or duration to cause impairment in the watershed. The state of Kansas prohibits all non-discharging lagoon systems from discharging into surface waters.

According to the 2000 U.S. Census, the population of the watershed is approximately 3,687 people, approximating 5.3 people per square mile is the population density. The small towns within the watershed have either stable or declining populations. Projections of future water use and resulting wastewater appear to be within the design flows of the current system's treatment capacities. Within the county of Greenwood, one-third of the households are on septic systems; this includes several households within the cities of this watershed, in addition to the rural households within this watershed. Failing septic systems account for minor nutrient contributions to the lake. Contributions of failing septic systems in and around the City of Toronto and surrounding residences could presumably deliver moderate amounts of nutrients to the lake.

The mean soil permeability value of this watershed was 0.43 inches/hour, ranging from 0.01 to 2.63 inches/hour according to the Natural Resources Conservation Service State Soil Geographic (STATSGO) database. STATSGO is a database that houses soil survey information. During extreme low rainfall intensity events, runoff is contributed to the watershed because 81% of the watershed has a permeability value of less than 0.57 inches/ hour. Runoff is normally a result of infiltration excess with rainfall intensities greater than soil permeability.

Natural background sources are identified as leaf litter, wastes from wildlife, and atmospheric and geological formations which may contribute to nutrients load.

#### NPDES Facilities within the Toronto Lake Watershed

Permit	Facility
KSJ000238	KDWP-Toronto Point Wastewater Treatment Facility
KSJ000135	KDOT-Greenwood County Safety Rest Area
KSJ000538	Camp Ascension Wastewater Treatment Lagoon
KSJ000230	City of Vergil Wastewater Treatment Facility
KS0021890	City of Toronto Wastewater Treatment Facility
KS0046001	City of Hamilton Wastewater Treatment Plant
KS0093858	City of Madison Wastewater Treatment Plant

EPA agrees the submittal considers all known 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 submittal identifies the LC was set at 50,585 lbs/yr, or 263.3 lbs/day TP, and 490,450 lbs/yr, or 3,601 lbs/day TN.

The LC for TSS was established at 55,854 tons/yr, or 290.7 tons/day.

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 for TP is 1,383 lbs/yr, or 7.2 lbs/day. For TN, the WLA is 6,289 lbs/yr, or 46 lbs/day.

For TSS, the WLA is 21 tons/yr, or 0.1 tons/day.

WLA for discharging facilities in the Toronto watershed.

NPDES	WLA TP lbs/yr	WLA TN lbs/yr	WLA TSS lbs/yr
City of Toronto	486	2,696	5,304
City of Hamilton	215	855	8,546
City of Madison	682	2,738	27,278
<b>Total WLA</b>	<b>1,383</b>	<b>6,289</b>	<b>41,128</b>

The WLA for non discharging permitted facilities, as well as animal feeding operations is set at zero lbs/yr because they do not discharge or add to the impairment within Toronto Lake, except under extreme wet conditions.

The future WLA for the new Toronto WWTP is 1,410 lbs/yr TN and 352 lbs/yr TP.

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 43,913 lbs/yr, or 228.6 lbs/day TP and 419,868 lbs/yr, or 3,083 lbs/day TN.

The LA for TSS is 50,248 tons/yr, or 261.5 tons/day.

Atmospheric deposition accounts for 230 lbs/yr, or 1.2 lbs/days TP and 15,247 lbs/yr, or 112 lbs/day TN.

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 were explicitly set at 10 percent of the total allocation for TP, TN, and TSS loads. A MOS of 5,059 lbs/yr, or 26.3 lbs/day phosphorus, and 49,450 lbs/yr, or 360 lbs/day nitrogen were established.

The MOS for TSS is 5,585 tons/yr, or 29.1 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 any 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 to discuss TMDLs in the Verdigris Basin have been held. To adequately convey information to the public on the general establishment of the TMDLs in the Verdigris Basin and these specific TMDLs, an active internet web site was established at <http://www.kdheks.gov/tmdl/index.htm>.

In Neodesha on July 23, 2008, a public hearing was held in reference to the Verdigris Basin TMDLs. The Verdigris Basin Advisory Committee also met to discuss these TMDLs on September 25, 2007 in Eureka, February 27, 2008 in Independence, and July 23, 2008 in Neodesha.

The original drafts of the TMDL documents were revised based on comments received from EPA Region 7, 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].*

KDHE will continue its three year sampling schedule in order to assess the trophic state of this waterbody. In 2016, the lake will be evaluated based on the sampling results. If there are no improvements with the lake's impairment status, the desired endpoints under this TMDL will be refined and more intensive sampling will be conducted over the period 2016-2018 to assess progress in this implementation.

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