



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

11201 Renner Boulevard
Lenexa, Kansas 66219

SEP 29 2014

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

RE: Approval of TMDL document for Hillsdale Lake

Dear Dr. Moser:

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 January 14, 2014, for a Total Maximum Daily Load document which contained TMDLs for eutrophication. Hillsdale Lake was 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:

<u>Water Body Name</u>	<u>WBID</u>	<u>Cause</u>
Hillsdale Lake	KS-MC-02-L-35000	Eutrophication

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 TMDLs. The EPA believes the separate elements of the TMDLs described in the enclosed document adequately address the pollutant 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 TMDL 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 these TMDLs. Therefore, the implementation plan in this TMDL document provides information regarding implementation efforts to achieve the loading reductions identified.

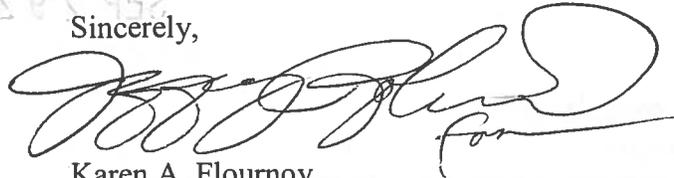
The EPA is currently in consultation under Section 7 of the Endangered Species Act with the U.S. Fish and Wildlife Service regarding this TMDL document. While we are approving these TMDLs at the present time, we may decide that changes to the TMDL document are warranted based upon the results of the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



The EPA appreciates the thoughtful effort that the KDHE has put into these TMDLs. We will continue to cooperate with and assist, as appropriate, in future efforts by the KDHE to develop TMDLs. Please contact TJ Adkins at 913-551-7128 if you have questions.

SEP 2 8 50 14

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-MC-02-L-35000
Document Name: HILLSDALE LAKE

State: KS

Basin(s): MARAIS DES CYGNES BASIN
HUC(s): 10290102

Water body(ies): HILLSDALE LAKE

Tributary(ies):

Pollutant(s): CHLOROPHYLL-A, EUTROPHICATION, NITROGEN, TOTAL, PHOSPHORUS, TOTAL

Submittal Date: 1/14/2013

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.

This TMDL document was submitted by the Kansas Department of Health and Environment as an email attachment on January 14, 2014. After comments from the U. S. Environmental Protection Agency, a modified final TMDL document was submitted as an email attachment on March 10, 2014.

The original Hillsdale Lake TMDL document was written for Eutrophication and approved by the EPA on August, 28, 2001.

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.

This TMDL document was developed because excessive nutrients are not being controlled and are causing eutrophication within Hillsdale Lake. The pollutants are defined as total phosphorus and total nitrogen. Empirical relationships and Carlson's Trophic State Index were used to link the concentration of TP to the response variable of chlorophyll a in the system. The current trophic state index is 60.2 indicating the lake is very eutrophic. Some degree of eutrophic conditions is seen with chlorophyll a over 12 micrograms per liter and hypereutrophy occurs at levels over 30 µg/L. A summer average chlorophyll a endpoint of 10 µg/L is assigned to address the domestic water supply use. All other uses will be met when the summer average chlorophyll a endpoint of 10 µg/L is met.

The BATHTUB model was used for the development of this TMDL and was calibrated for and reduced from the area-weighted mean concentrations. The model results estimate that Hillsdale Lake currently retains 81 percent of the TP and 59 percent of the TN load annually. Because Hillsdale Lake is co-limited by TP and TN, a 75 percent reduction in the TP and TN concentrations in the tributaries feeding the lake is necessary to meet the TMDL endpoint of an area-weighted mean of 10 µg/L chlorophyll a within the lake. The loading capacity for total phosphorus is 11,910.90 pounds per year, or 87.57 pounds per day TP. The LC for TN is 158,862.49 lb/yr, or 1,168.04 lb/day.

In order to improve the trophic condition of Hillsdale Lake from its current very eutrophic condition, the desired endpoint will be to maintain summer chlorophyll a average concentrations below 10 micrograms per liter, with

the reductions focused on TP and TN loading. Total phosphorus inputs must be reduced by 67 percent and TN inputs must be reduced by 57 percent. These reductions at the inflow to Hillsdale Lake will result in a 49 percent reduction of TP, a 41 percent reduction of TN and 62 percent reduction of chlorophyll a within the lake.

In the original Hillsdale Lake eutrophication TMDL document, the ultimate endpoint to improve the trophic condition of the lake from its eutrophic status was summer chlorophyll a concentrations at or below 12 µg/L, corresponding to a trophic state indicative of slightly eutrophic conditions, by 2010. To ensure the clarity of the water, the desired Secchi disc depth endpoint was summer average readings greater than 1 meter in the two arms of the lake and 1.5 m in the main body of the lake near the dam. Both chlorophyll a and Secchi disc depth endpoints were to be met in order to comply with the water quality standards.

Because targets for aquatic life are more stringent than for the other designated uses in Hillsdale Lake, achievement of the endpoint indicates loads are within the LC of the lake, the water quality standards are attained and full support of the designated uses of the lake has been achieved.

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: primary contact recreation class A; special aquatic life support; domestic water supply; food procurement; groundwater recharge; industrial water supply; irrigation; livestock watering.

Impaired Uses: All uses in Hillsdale Lake are impaired to a degree by eutrophication.

Water Quality Standards:

General – Narrative: Taste-producing and odor-producing substances of artificial origin shall not occur in surface waters at concentrations that interfere with the production of potable water by conventional water treatment processes, that impart an unpalatable flavor to edible aquatic or semiaquatic life or terrestrial wildlife, or that result in noticeable odors in the vicinity of surface waters (KAR 28-16-28e(b)(7)).

Nutrients - Narrative: 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 (KAR 28-16-28e(c)(2)(A)).

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 (KAR 28-16-28e(c)(3)(D)).

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 (KAR 28-16-28e(c)(7)(A)).

In order to improve the trophic condition of Hillsdale Lake from its current very eutrophic condition, the desired endpoint will be to maintain summer chlorophyll a average concentrations below 10 micrograms per liter, with the reductions focused on TP and TN loading. Total phosphorus inputs must be reduced by 67 percent and TN inputs must be reduced by 57 percent. These reductions at the inflow to Hillsdale Lake will result in a 49 percent reduction of TP, a 41 percent reduction of TN and 62 percent reduction of chlorophyll a within the lake. A summer average chlorophyll a endpoint of 10 µg/L is assigned to address the domestic water supply use. All other uses will be protected when the summer average chlorophyll a endpoint of 10 µg/L is met.

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.

There is an established link between the narrative water quality standards for nutrients and numeric total phosphorus and total nitrogen targets. In eutrophication impairments, chlorophyll a concentrations are used as a translator in measuring algal growth and as a parameter for WQS. When excess phosphorus enters surface waters it stimulates blooms of algae and undesirable weeds, accelerating the natural aging of lakes, a condition commonly referred to as eutrophication.

The TMDL document identifies the lake's trophic state based on Carlson's trophic state index. The pollutants of concern to address the lake's eutrophication impairment are TP and TN. The BATHTUB model, an empirical receiving water quality model, was used for the development of these TMDL targets. The BATHTUB model was calibrated for and reduced from the area-weighted mean concentrations. The BATHTUB reservoir eutrophication model estimated the current TP and TN entering the lake at 36,177 and 370,993 pounds per year, respectively. The model results also estimate that Hillsdale Lake currently retains 81 percent of the TP and 59 percent of the TN load annually. Because Hillsdale Lake is co-limited by TP and TN, a 75 percent reduction in the TP and TN concentrations in the tributaries feeding the lake is necessary to meet the TMDL endpoint of an area weighted mean of 10 µg/L chlorophyll a within the lake. Atmospheric total nitrogen was obtained from the Clean Air Status and Trends Network. The CASTNET station from the Konza Prairie was used to estimate the atmospheric TN concentration for the model. Total phosphorus atmospheric loading was estimated using the 1983 study of Rast and Lee. The loading capacity for total phosphorus is 11,910.90 pounds per year, or 87.57 pounds per day TP. The LC for TN is 158,862.49 lb/yr, or 1,168.04 lb/day.

In order to improve the trophic condition of Hillsdale Lake from its current very eutrophic condition, the desired endpoint will be to maintain summer chlorophyll a average concentrations below 10 micrograms per liter, with the reductions focused on TP and TN loading. Total phosphorus inputs must be reduced by 67 percent and TN inputs must be reduced by 57 percent. These reductions at the inflow to Hillsdale Lake will result in a 49 percent reduction of TP, a 41 percent reduction of TN and 62 percent reduction of chlorophyll a within the lake. Achievement of the endpoint indicates loads are within the LC of the lake, the WQS are attained and full support of the designated uses of the lake has been achieved.

Secchi depth readings were available beginning in 1989. A 1.9 meter reading taken in 1998 is the highest reading for the period of record. The 1990-2012 average Secchi depth comes in at 1.1 m with the 2007 through 2012 average of 1.0 m revealing slightly diminished clarity. Comparing the trophic state indices for TP, chlorophyll a and Secchi depth in Hillsdale Lake reveals the lake reached a fully eutrophic state with respect to chlorophyll a in 2003 and has been either fully or very eutrophic for the remaining period of record. Secchi depth TSI values have been at or above the slightly eutrophic range for the period of record with one excursion into the hypertrophic range in 2005. Table 5 in the TMDL document lists a comparison of the median trophic conditions in Hillsdale Lake for the 2007 to 2012 time period to the benchmarks established for lakes in Kansas. Although both TP and TN concentrations in Hillsdale Lake meet the benchmarks established for federal lakes in Kansas, the median Secchi depth and chlorophyll a concentration do not.

In the original Hillsdale Lake eutrophication TMDL document, the ultimate endpoint to improve the trophic condition of the lake from its eutrophic status was summer chlorophyll a concentrations at or below 12 µg/L, corresponding to a trophic state indicative of slightly eutrophic conditions, by 2010. To ensure the clarity of the water, the desired Secchi disc depth endpoint will be summer average readings greater than 1 meter in the two arms of the lake and 1.5 m in the main body of the lake near the dam. Both chlorophyll a and Secchi disc depth endpoints must be met in order to comply with the WQS.

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.

The predominant land uses in the Hillsdale Lake watershed include grassland (46 percent), cultivated crops (26 percent) and developed land (11 percent), together they account for 83 percent of the total land area in the watershed. The remaining land area is comprised of forest (10 percent), open water (6 percent) and wetlands (1 percent). The watershed is 11 percent developed land, of which 10.3 cubic miles, or 7 percent of the total watershed area, is located in Johnson County. During precipitation runoff events, the cultivated cropland in the watershed may contribute to the nutrient loading in the lake. Grasslands could also potentially contribute to the nutrient load during high flow events, particularly on livestock grazing lands located in the riparian areas of the watershed. Developed areas in the watershed may generate substantial nutrient loading from lawn fertilizers, domestic pet waste and other toxics found in the urban environment particularly during storm runoff events. Nutrient loading from developed areas such as golf courses are addressed in the municipal separate storm sewer system permit wasteload allocations in Table 15 of the TMDL document.

The Hillsdale Lake watershed contains twenty-seven unique points of diversion that are composed of a water right and point of diversion combination. Nineteen of the points are located in Johnson County with two designated for municipal use, three designated for industrial use and the remaining fourteen designated for use in irrigating. Eight of the points are located in Miami County and all eight are designated for use in recreation.

There are eight National Pollutant Discharge Elimination System permitted facilities in the Hillsdale Lake watershed. Two are for facilities operating non-overflowing lagoon systems that are prohibited from discharging and one permit is for a portable central mix concrete plant also prohibited from discharging. Contribution from these three facilities would only occur under extreme precipitation or flooding events. A drinking water treatment plant, owned by the city of Gardner, is permitted to discharge from settling basins that collect solids from carbon contact basins, clarifiers and filter backwashes. This facility is not expected to discharge a nutrient load and the permit does not require monitoring of nutrients and no discharge data is available. Two of the NPDES permits are tied to municipal mechanical plants operated by the Johnson County New Century wastewater treatment facility. The plant is an activated sludge plant with ultraviolet disinfection that is currently permitted to discharge to Little Bull Creek at a rate of 1.1 million gallons per day. The current (July 2012- May 2013) average discharge for the New Century facility is 0.56 MGD with a total phosphorus concentration of 1.14 milligrams per liter and a total nitrogen concentration of 30.7 mg/L. The Big Bull Creek WWTF operated by the city of Edgerton is an upgraded mechanical plant with chemical phosphorus removal, biological nitrogen removal and UV disinfection that is permitted to discharge at a rate of 1.0 MGD (average) and 3.0 MGD (peak). There are two MS4 discharge permits assigned to Johnson County and the city of Olathe. These storm water discharge permits require the implementation of best management practices in order to attenuate the discharge of nutrients into the storm water discharge systems' receiving streams and lakes.

NPDES Permitted Facilities in the Hillsdale Lake watershed.

Name	NPDES Permit #	Expiration Date
Hillsdale State Park (KDPWT)	KSJ000357	5/31/2015
Youth Front Camp West	KSJ000186	5/31/2015
Big Bull Cr WWTF	KS0100374	12/31/2016
Fordyce Concrete	KSG110205	9/30/2017
JoJo New Century WWTF	KS0119296	10/31/2017
Gardener WTP	KS0099295	12/31/2014
Johnson County	G-UA-0604-SO01	9/30/2009*
City of Olathe	G-UA-0604-SO01	9/30/2009*

*Permit pending

Wasteload allocations were established for the three NPDES permits discharging to the Hillsdale watershed, for the Johnson County municipal separate storm sewer system permit and, in anticipation of future development in

the watershed, reserve WLA have been developed for wastewater treatment and storm water runoff. Capital improvements for the Johnson County New Century wastewater treatment facility were scheduled for early 2014 that expanded the capacity of the treatment facility from 1.1 million gallons per day to 1.65 MGD during phase one of the project. Phase two will increase design capacity of the plant to 1.91 MGD. The city of Gardner also incorporated a reserve storm water WLA equal to that assigned to the Johnson County MS4 permit to account for the future build out in the watershed. The city of Edgerton also has reserved WLA for TP in anticipation of further development in southwest Johnson County.

In 2013, there were 17,200, 32,500, 11,00 and 34,500 head of cattle (including calves) in Douglas, Franklin, Johnson and Miami counties, respectively. In 2012, the inventory of hogs in Franklin, Johnson and Miami counties was 14,400, 2,200 and 1,400 head, respectively. In the Hillsdale Lake watershed, there are nineteen certified or permitted concentrated animal feeding operations. These permitted or certified livestock facilities have waste management systems designed to minimize runoff entering their operation or detaining runoff emanating from their facilities. In addition, they are designed to retain a 25-year, 24-hour rainfall/runoff event as well as an anticipated two weeks of normal wastewater from their operations. In normal instances, a rainfall event of this nature coincides with stream flow occurring less than 1-5 percent of the time. It is likely that there are some smaller, unregistered livestock operations in the area and depending on their proximity to the streams in the watershed, runoff from feedlots and grazing lands may be a contributing factor to the nutrient and siltation impairment. Refer to Table 13 of the TMDL document for the detailed list of CAFOs.

Any CAFO that does not obtain an NPDES permit must operate as a no discharge facility. Any discharge from an unpermitted CAFO is a violation of Section 301. It is 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.

Permitted CAFOs identified in this TMDL document are part of the assigned wasteload allocation. Animal feeding operations and unpermitted CAFOs are considered under the load allocation because there is currently not enough detailed information 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 has a duty to obtain a permit. If it is determined that any such operation is a CAFO that discharges, any future WLA assigned to the facility must not result in an exceedance of the sum of the WLAs in this TMDL document as approved.

The Hillsdale Lake watershed lies primarily in Johnson and Miami counties and is a mixture of rural agricultural areas and developed land. There are a total of 2,252 septic systems in the watershed with a 0.93 percent failure rate. Failing on-site septic systems have the potential to contribute to nutrient loading in the watershed.

Significant nutrient sources to Hillsdale Lake also include undissolved nutrients bound to suspended solids in the inflow that may occur in the sediment layer until they are removed by dredging. These internal nutrient loads can undergo remineralization and resuspension and may be a continuing source of nutrients in Hillsdale Lake. Geological formations, leaf litter and wastes derived from natural wildlife in the area are also likely to contribute to nutrient loads to Hillsdale Lake. An additional occurring source is atmospheric deposition of TN and TP compounds. Internal mechanisms are also a likely contributing source to the eutrophic trophic state of the lake.

The original Hillsdale Lake TMDL document for eutrophication included six discharging facilities and the revised TMDL document included eight permitted facilities. These point sources were estimated to contribute an estimated 11 percent of total annual phosphorus loads. Other sources of TP to the lake listed in the original TMDL document include runoff from agricultural lands where phosphorus has been applied, animal waste applied to land from CAFOs, fertilizer applied to lawns and golf courses, pet waste and failing septic systems. Total phosphorus is the only limiting nutrient allocated under the original TMDL document.

All known sources have been considered in the TMDL document.

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 for total phosphorus is 11,910.90 pounds per year, or 87.57 pounds per day TP. The LC for total nitrogen is 158,862.49 lb/yr, or 1,168.04 lb/day TN.

The original Hillsdale Lake TMDL document has a LC of 82,657.99 lb/yr TP. Of that, 10,147.84 lb/yr TP were allocated as the wasteload allocation, 62,244.07 lb/yr TP for the LA and 8,2665.77 lb/yr TP for the MOS. Allocations for TN were not included.

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.

Wasteload allocations are established for the three national pollutant discharge elimination system permits discharging into the Hillsdale watershed, for the Johnson County municipal separate storm sewer system and in anticipation of future development in the watershed. Additionally, reserve WLA were developed for wastewater treatment and for storm water runoff. Within the BATHTUB model, WLA for the NPDES dischargers were generated using design flows and assigned nutrient concentrations resulting in WLA totaling 4,456.60 pounds per year total phosphorus and 71,072.82 lb/yr total nitrogen for the facilities currently discharging into the watershed.

The Gardner water treatment facility is not expected to contribute significant nutrient loads to the watershed; hence, nominal nutrient concentrations of 0.4 milligrams per liter TP and 1 mg/L TN were used to generate the WLA for this facility. The TP and TN storm water WLAs for the city of Gardner were determined using the current footprint of the city (~0.9 miles squared) in anticipation of a future MS4 permit for the city. A reserve storm water WLA equal to that assigned to the Johnson County MS4 permit was also developed to account for the future build out in the watershed.

The Johnson County New Century wastewater treatment facility is scheduled for capital improvements early in 2014 that will expand the capacity of the treatment facility from 1.1 million gallons per day to 1.65 MGD during phase one of the project. Phase two will increase design capacity of the Johnson County plant to 1.91 MGD. Wasteload allocations of 2,920 lb/yr TP and 46,574 lb/yr TN were developed using a TP concentration of 0.5 mg/L, TN concentration of 8 mg/L and a flow of 1.91 MGD. The storm water WLA for the Johnson County MS4 permit was determined by assuming 10 percent of the unincorporated portion of Johnson County that lies within the Hillsdale Lake watershed and mimics typical urban runoff.

The city of Edgerton's WLA were also developed using a TP concentration of 0.5 mg/L and a TN concentration of 8 mg/L, however, the permitted design flow of 1 MGD was used to develop the annual loads of 1,522 lb/yr TP and 24,345.50 lb/yr TN. A WLA of 2,259 lb/yr TP has been reserved in anticipation for further development in southwest Johnson County.

The city of Olathe has approximately 122 acres of incorporated land in the Hillsdale Lake watershed with respective WLAs having been developed and applied to the Olathe's MS4 permit.

Refer to Table 15 of the TMDL document for detailed WLA information.

Wasteload Allocations for the Hillsdale Lake Watershed.

Facility	Federal	Design	Total	Total	Total	Total
----------	---------	--------	-------	-------	-------	-------

	Permit Number	Flow (MGD)	Phosphorus ** lb/day	Phosphorus mg/L	Nitrogen lb/day	Nitrogen mg/L
Johnson County New Century *WWTF	KS0119296	1.91	8.00	0.5	127.60	8
City of Edgerton WWTF	KS0100374	1	4.17	0.5	66.70	8
Gardner ***WTP	KS0099295	0.050	0.04	0.1	0.42	1
Reserve WLA for Future NPDES Permitted Dischargers	N/A	N/A	6.19	N/A	N/A	N/A
Total WWTF WLA	N/A	N/A	18.40	N/A	194.72	

*wastewater treatment facility = WWTF

**pounds per day = lb/day

*** water treatment plant = WTP

Municipal Separate Storm Sewer Wasteload Allocations in the Hillsdale Lake Watershed.

Facility	Federal Permit Number	Total Phosphorus lb/day	Total Nitrogen lb/day
Johnson County MS4	KSR041007	2.22	25.30
City of Olathe	KSR041025	0.07	0.85
City of Gardner (future) MS4	N/A	1.59	18.10
Future of Buildout Reserve MS4	N/A	2.22	25.30
Total Municipal MS4 WLA	N/A	6.10	69.55
Total WLA	N/A	24.5	264.27

For TP, the total WLA including future allocations is 24.50 lb/day TP. The total WLA for TN, including future allocations, is 264.27 lb/day TN.

In the original TMDL document, TP was the limiting nutrient and TN was not allocated. The WLA for all point sources was 10,148 lb/yr, or 27.80 lb/day TP. Wasteload allocations for MS4 permitted facilities were also not included in the original TMDL document.

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.

Nonpoint sources are significant contributors to nutrient input and impairment in Hillsdale Lake. The assessment suggests that runoff transporting nutrients associated with animal wastes, fertilized cultivated cropland and pastureland is contributing to siltation and eutrophication in the lake. Nutrient load allocations were calculated using the BATHTUB model and are detailed in Table 16 within the TMDL document.

The total phosphorus LA is 51.46 pounds per day and the TP atmospheric deposition contribution is 2.85 lb/day. The total LA for TP is 54.31 lb/day or 1,777.61 pounds per year.

The total nitrogen LA is 584.70 lb/day and the TN atmospheric deposition contribution is 202.27 lb/day. The total LA for TN is 786.97 lb/day or 46,517.64 lb/yr.

In the original TMDL document, the LA is 62,244 lb/yr which is a 46 percent reduction in available TP necessary to achieve the water quality goals for the lake. The revised TMDL document has improved modeling techniques with current monitoring data used, indicating an increase in the TP loading capacity. Additionally, the current

document reduces eutrophication by specifically targeting reductions in TP and TN. The original TMDL document targeted reducing aquatic plants to develop the LA for the current TMDL. Total nitrogen was also not allocated in the original TMDL document.

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 annual total phosphorus and total nitrogen loads and the chlorophyll *a* endpoint. The MOS is explicitly set at 10 percent of the total allocations for TP and TN, which compensates for the lack of knowledge about the relationship between the allocated loadings and the resulting water quality. The MOS for TP and TN are 8.76 pounds per day and 116.80 lb/day, respectively, as shown in Table 16 within the TMDL document. The yearly MOS for TP and TN are 1,191.09 pounds per year and 15,886.25 lb/yr, respectively.

In the original TMDL document, the MOS is 8,266 lb/yr TP. The revised TMDL document has improved modeling techniques with current monitoring data used, indicating an improved MOS. Additionally, the current document reduces eutrophication by specifically targeting reductions in TP and TN. The original TMDL document targeted reducing aquatic plants to develop the documents reductions. Total nitrogen was also not allocated in the original TMDL document.

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 variation has been incorporated into this TMDL document since the peaks of algal growth occur in the summer months and the monitoring data that the TMDLs are based upon were collected seasonally.

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)].

An active Internet website was established at www.kdheks.gov/tmdl/ to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Marais des Cygnes Basin. A public hearing on the Marais des Cygnes TMDLs was held on December 10, 2013, in Ottawa to receive comments on this TMDL document. Comments were received from the Johnson County Storm Water Management Program which correctly pointed out that the land use numbers used to determine the storm water wasteload allocation for their municipal separate storm sewer system permit included incorporated portions of Edgerton and Gardner over which Johnson County has no jurisdiction. The storm water WLA was recalculated by assuming 10 percent of the unincorporated portion of Johnson County that lies within the Hillsdale Lake drainage area mimics urban runoff conditions. Comments were also received from Johnson County Wastewater providing information on capital improvements to the New Century plant that will increase the design flow of the facility to 1.91 million gallons per day that are scheduled to begin early in 2014. The upgraded design flow of 1.91 MGD was used to determine the WLA for the Johnson County New Century wastewater treatment plant. The Marais des Cygnes Basin Advisory Committee met to discuss TMDLs in the basin on October 15, 2013, in Paola.

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.

The Kansas Department of Health and Environment will continue its 3-year sampling schedule in order to assess the trophic state of Hillsdale Lake. Based on the sampling results, the 303(d) listing will be evaluated in 2022. Should impairment status continue, the desired endpoints for this TMDL document may be refined and sampling conducted over the period 2022 - 2026 to assess progress in this implementation.

In accordance with the TMDL strategy for the state of Kansas, the year 2022 marks a review and evaluation of period of 303(d) activities in the Marais des Cygnes River Basin. At that point in time, data from site LM035001 at Hillsdale Lake will be examined to assess improved conditions in the lake.

Hillsdale Lake will be evaluated for delisting under Section 303(d), based on the monitoring data over 2013 - 2021. The decision for delisting will come about in the preparation of the 2022 303(d) list. Should modifications be made to the applicable water quality criteria during the implementation period, consideration for delisting, desired endpoints of this TMDL document and implementation activities may be adjusted accordingly.

As stated in the original TMDL document, the KDHE sampled Hillsdale Lake annually, with monitoring performed annually by the United States Army Corps of Engineers. The USACE and the Kansas Department of Wildlife and Parks obtained summer Secchi disc depth reading in the main body and arms of the lake, noting periods when storm water created turbid conditions beyond that associated with in-lake biological populations.

Secchi depth readings were available beginning in 1989. A 1.9 meter reading taken in 1998 is the highest reading for the period of record. The 1990-2012 average Secchi depth comes in at 1.1 m with the 2007 through 2012 average of 1.0 m revealing slightly diminished clarity. Comparing the trophic state indices for total phosphorus, chlorophyll a and Secchi depth in Hillsdale Lake reveals the lake reached a fully eutrophic state with respect to chlorophyll a in 2003 and has been either fully or very eutrophic for the remaining period of record. Secchi depth TSI values have been at or above the slightly eutrophic range for the period of record with one excursion into the hypertrophic range in 2005.

Chlorophyll a averages 13.8 micrograms per liter for the period of record (1985 - 2012) in Hillsdale Lake. The first near dam sample with a chlorophyll a concentration greater than 10 µg/L was collected in June of 1987 and recent (2007 - 2012) samplings performed by the KDHE and the USACE have an average chlorophyll a concentration of 21.2 µg/L. The highest annual concentration of chlorophyll a occurred in 2007 at 25.3 µg/L and average annual chlorophyll a concentrations have been consistently greater than 10 µg/L since 2003.

The highest annual average TP concentration occurred in 1990 while the sample with the highest TP concentration was collected on July 15, 2002 measuring 170 µg/L. The period of record (1985 - 2012) average TP concentration is 33 µg/L while the more recent (2007 - 2012) average is slightly lower at 31 µg/L.

Total nitrogen concentration reached a single sample high of 2.24 milligrams per liter in May of 1999 in a sample collected by the USACE boosting 1999 to the highest annual average at 1.22 mg/L. The TN period of record average (1992 - 2012) is 0.804 mg/L while the 2007 - 2012 average is slightly lower at 0.799 mg/L.

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.

There is good potential that agricultural best management practices will improve the condition of Hillsdale Lake. Table 17 within the TMDL document details the reduction in nonpoint source loading required to meet these TMDL goals. Some of the recommended agricultural practices are as follows:

1. Implement soil sampling to recommend appropriate fertilizer applications on cultivated cropland.
2. Maintain conservation tillage and contour farming to minimize cropland erosion.
3. Promote and adopt continuous no-till cultivation to increase the amount of water infiltration and minimize cropland soil erosion and nutrient transports.
4. Install grass buffer strips along streams and drainage channels in the watershed.
5. Reduce activities within riparian areas.
6. Implement nutrient management plans to manage manure land applications and runoff potential.
7. Adequately manage fertilizer utilization in the watershed and implement runoff control measures.

There is also potential that the implementation of urban best management practices in the watershed will improve the condition of Hillsdale Lake. Some of the recommended urban practices are as follows:

1. Educate watershed residents on proper lawn fertilizer application.
2. Install grass buffer strips along drainage channels in the watershed.
3. Promote proper management of construction sites to minimize sediment and nutrient runoff.
4. Investigate feasibility of installing a storm water wetland in the watershed to aid in the removal of nutrients.
5. Promote installation of porous and concrete grid pavement in the watershed.

Nutrient control has been proven effective through conservation tillage, contour farming and use of grass waterways and buffer strips. The proper implementation of comprehensive livestock waste management plans has proven effective at reducing nutrient runoff associated with livestock facilities. The key to success will be widespread use of conservation farming and proper livestock waste management along with addressing storm water runoff in urban areas within the watershed cited in this TMDL document.

Implementation Program Guidance:

- a. Evaluate nutrient loading from all permitted dischargers in the watershed and establish applicable permit limits.
- b. Work with dischargers to reduce individual loadings.
- c. Work with the larger municipalities to ensure statewide nutrient reduction goals are met.
- d. Inspect permitted livestock facilities to ensure compliance.
- e. New livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- f. New livestock registered facilities with less than 300 animal units will apply pollution prevention technologies.
- g. Manure management plans will be implemented, to include proper land application rates and practices that will prevent runoff of applied manure.

Watershed Management Program:

- a. Support selected Section 319 project activities including demonstration projects and outreach efforts dealing with sediment control and nutrient management.
- b. Provide technical assistance on practices geared to the establishment of vegetative buffer strips.
- c. Provide technical assistance on nutrient management in the vicinity of streams.
- d. Incorporate the provisions of this TMDL into watershed restoration and protection strategies documents relating to Hillsdale Lake.

Water Resource Cost Share and Nonpoint Source Pollution Control Programs:

- a. Apply conservation farming practices and/or erosion control structures, including no-till, terraces and contours, sediment control basins and constructed wetlands.
- b. Provide sediment control practices to minimize erosion and sediment and nutrient transport.
- c. Re-evaluate nonpoint source pollution control methods.

Riparian Protection Program:

- a. Establish, protect or re-establish natural riparian systems, including vegetative filter strips and stream bank vegetation.
- b. Develop riparian restoration projects.
- c. Promote wetland construction to assimilate nutrient loadings.

Buffer Initiative Program:

- a. Install grass buffer strips near streams.
- b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Initial implementation will proceed over the years from 2014 - 2021. Additional implementation may be required over 2022 - 2030 to achieve the endpoints of this TMDL document. Primary participants for implementation will be agricultural producers within the Hillsdale Lake watershed, the Johnson County Department of Public Works and Infrastructure and the Hillsdale Area Water Cooperative. A detailed assessment of sources conducted over 2014 - 2015 should include local assessments by conservation district personnel and city and county public works to survey, locate and assess the following within the lake drainage area:

1. Total row crop acreage and fertilizer application rates.
2. Cultivation alongside lake.
3. Livestock use of riparian areas.
4. Fields with manure applications.
5. Impervious surfaces in developed areas

Multiple authorities may be used to direct activities in the watershed to reduce pollutants and to assure allocations of pollutant to point and nonpoint sources can be attained. The State Water Plan Fund annually generates \$16-18 million and is the primary funding mechanism for implementing water quality protection and pollutant 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 watersheds and water resources of highest priority. Typically, the state allocates at least 50 percent of the fund to programs supporting water quality protection. Additionally, \$2 million has been allocated between the State Water Plan Fund and the EPA 319 funds to support implementation of the watershed restoration and protection strategy. Hillsdale Lake has a regional benefit for recreation and because it serves as a drinking water supply for the city of Gardner and several rural water districts in Johnson and Miami Counties, this watershed and its TMDL document are a high priority consideration for implementation and funding.

