

MISSOURI BASIN TOTAL MAXIMUM DAILY LOAD

Waterbody: Indian Creek Water Quality Impairment: Fecal Coliform Bacteria

1. INTRODUCTION AND PROBLEM IDENTIFICATION

Subbasin: Lower Missouri - Crooked

County: Johnson

HUC 8: 10300101

HUC 11 (HUC 14s): 010 (040 and 050)

Drainage Area: 67.9 square miles

Main Stem Segments: WQLS: 32; starting at the state line and traveling upstream to headwaters in Olathe (**Figure 1**).

Tributary Segment: Non-WQLS: Tomahawk Creek (53)

Designated Uses: Expected Aquatic Life Support, Secondary Contact Recreation; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for Main Stem Segment and Tributary Segment.

1998 303(d) Listing: Table 1 - Predominant Non-point Source and Point Source Impacts

Impaired Use: Contact Recreation

Water Quality Standard: Fecal Coliform Bacteria: 2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C)).

Classified streams may be excluded from applying these criteria when streamflow exceeds flow that is surpassed 10% of the time ((KAR 28-16-28c(c)(2)).

2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

Level of Support for Designated Use under 1998 303(d): Not Supporting Contact Recreation

Monitoring Sites: Station 204 near Leawood

Period of Record Used: 1987-2000 for Station 204 (**Figure 2**)

Flow Record: Indian Creek at Overland Park (USGS Gaging Site 06893300) 1970-1999;

Long Term Flow Conditions: 10% Exceedence Flows = 65 cfs, 7Q10 = 1 cfs

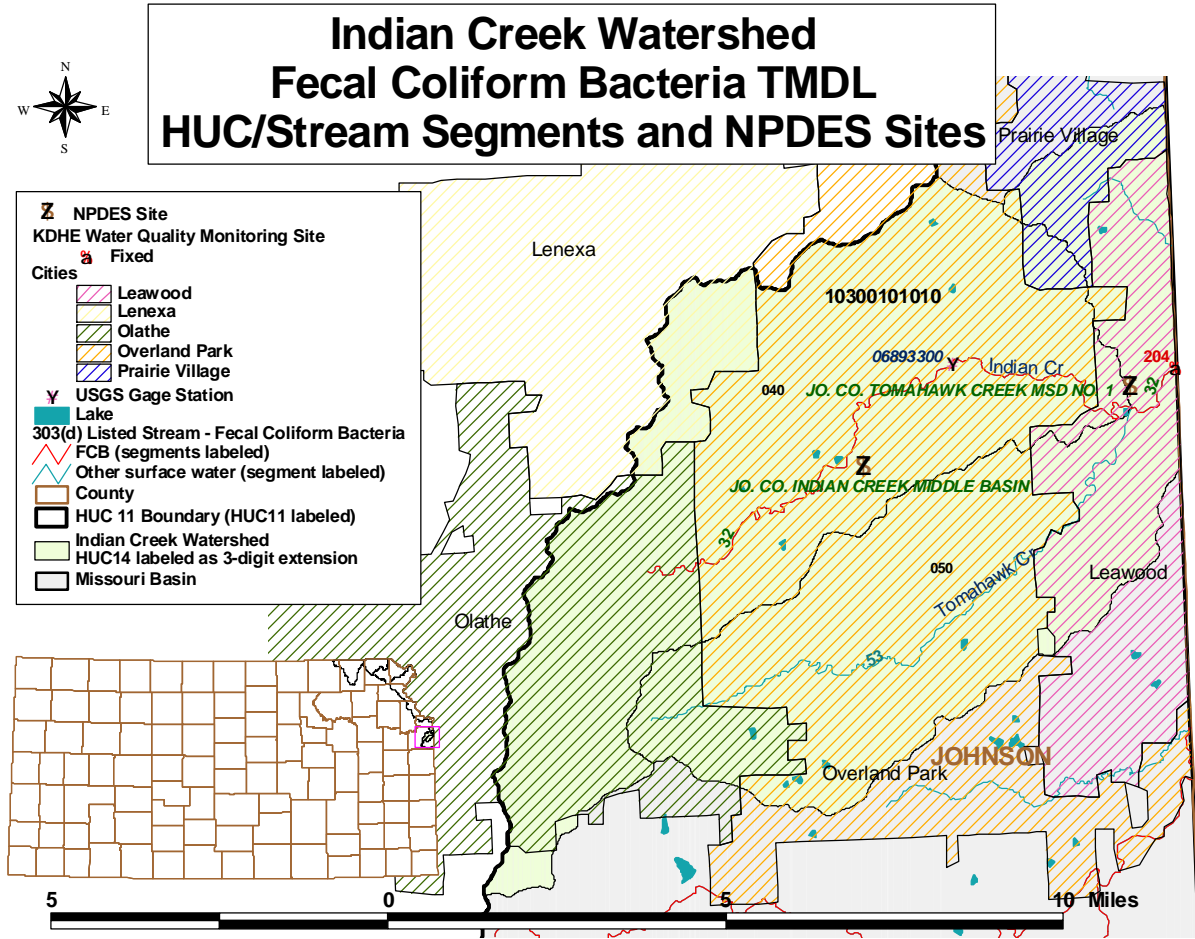


Figure 1

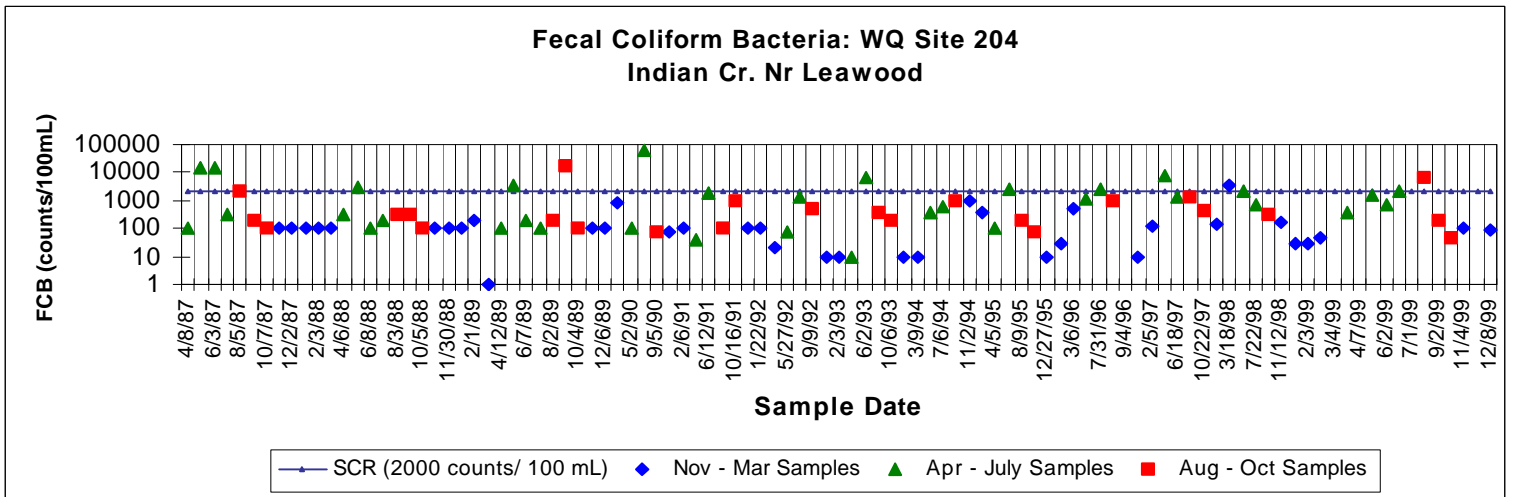


Figure 2

Current Conditions: Since loading capacity varies as a function of the flow present in the stream, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were determined from Indian Creek at Overland Park gaging station for each of the three defined seasons: Spring (April-July), Summer-Fall (August-October) and Winter (November-March). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 75-99% range. Load curves were established for the Secondary Contact Recreation criterion by multiplying the flow values along the curve by the applicable water quality criterion and converting the units to derive a load duration curve of colonies of bacteria per day. This load curves represent the TMDL since any point along the curve represents water quality for the standard at that flow. Historic excursions from the water quality standard are seen as plotted points above the load curves. Water quality standards are met for those points plotting below the applicable load duration curves (**Figure 3**).

Excursions were seen in each of the three defined seasons and are outline in Table 1. Thirty two percent of Spring samples and 8% of Summer-Fall samples were over the secondary contact criterion. Three percent of Winter samples were over the secondary criterion. Overall, 15% of the samples were over the criteria. This would represent a baseline condition of partial support of the impaired designated use.

Table 1
NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 BY FLOW AND SEASON

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%	Cum Freq.
Indian Creek at Overland Park (204)	Spring	2	5	3	1	0	0	11/34 = 32%
	Summer	1	0	1	0	0	0	2/25 = 8%
	Winter	1	0	0	0	0	0	1/37 = 3%

Desired Endpoints of Water Quality (Implied Load Capacity) at Site 204 over 2005 - 2009:

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting Secondary Contact Recreation. This TMDL will, however, be phased. For Phase One the endpoint will be to achieve the Secondary Contact Recreation value of 2,000 colonies per 100 ml and this Phase One load curve is shown in the TMDL figure (**Figure 3**). The Kansas Standards allow for excursions above these criteria when the stream flow exceeds flow that is surpassed 10% of the time, for this instance, 65 cfs. Monitoring data plotting below the TMDL curve will indicate attainment of the water quality standards.

This endpoint will be reached as a result of expected, though unspecified, reductions in loading from the various sources in the watershed resulting from implementation of corrective actions and Best Management Practices, as directed by this TMDL. Achievement of the endpoint indicates loads are within the loading capacity of the stream, water quality standards are attained and full support of the designated uses of the stream has been restored.

3. SOURCE INVENTORY AND ASSESSMENT

NPDES: There are two NPDES permitted wastewater dischargers within the watershed (**Figure 1**). These systems are outlined in Table 2.

Table 2

DISCHARGING FACILITY	STREAM REACH	SEGMENT	DESIGN FLOW	TYPE
Indian Cr Middle Basin MWTP	Indian Creek	32	9.0 mgd (22.5 mgd peak)	Mech. with (Lagoon >22.5mgd)
Tomahawk Cr MSD No. 1 MWTP	Indian Creek	32	10 mgd (45 mgd peak)	Mech. with (Lagoon >10mgd)

Population projections for Leawood, Lenexa, Olathe and Overland Park to the year 2020 indicate substantial growth (65% to 116% increases). Populations projections for Prairie Village indicate lesser growth (7% increase). The excursions from the water quality standards appear to occur under a variety of flow conditions in the Spring season but particularly under the higher flows associated with runoff events in all the defined seasons. Of significance to point sources are the excursions under lower flows in all seasons, especially during winter, indicating that point sources may have an impact in the watershed.

Livestock Waste Management Systems: There are no livestock waste management operations registered, certified or permitted within the watershed.

Land Use: Almost all of the watershed is located within the city limits of Leawood, Lenexa, Olathe, Overland Park and Prairie Village. Based on land use data compiled in 1993, most of the watershed is urban use (62% of the area), grassland (19%), cropland (14 %) and woodland (4%).

On-Site Waste Systems: Since most of the watershed is located within a city limit, there should be few on-site waste systems.

Contributing Runoff: The Indian Creek watershed's average soil permeability is 0.8 inches/hour according to NRCS STATSGO data base. One hundred percent of the watershed produces runoff even under relatively low (1.71"/hr) potential runoff conditions. Under very low (1.14"/hr) potential conditions, this potential contributing area is reduced by about a third (65%). Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. As the watersheds' soil profiles become saturated, excess overland flow is produced. Generally, storms producing less than 0.57"/hr of rain will generate runoff from 50% of this watershed

Background Levels: Some fecal bacteria counts may be associated with environmental background levels, including contributions from wildlife, but it is likely that the density of animals such as deer and waterfowl is fairly dispersed across the watershed resulting in minimal loading to the stream below the levels necessary to violate the water quality standards.

4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY

The nature of bacteria loading is too dynamic to assign fixed allocations for wasteloads and non-point loads. Instead, allocation decisions will be made which reflect the expected reduction of bacteria loading under defined flow conditions. These flow conditions will be defined by the presumed ability of point or non-point sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the seasonal TMDL curves at a particular flow duration level. Flows lower than that designated flow will represent conditions which are the responsibility of point sources to maintain water quality standards, those flows greater than the designated flow are the responsibility of non-point sources.

Point Sources: The point sources are responsible for maintaining their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. NPDES permits have been reissued for both of the discharging treatment plants in 1999 and 2000. The treatment plants presently rely on chlorination/dechlorination to disinfect their wastewater. Plans at the Indian Creek Middle Basin MWTP are for UV disinfection across a larger range of discharge (30 mgd peak) than the current system with substantial phase 1 completion by May 2001. Ongoing inspections and monitoring of these systems will be made to ensure that minimal contributions have been made by these sources.

Under normal circumstances, the Wasteload Allocation is usually defined at the flow condition of ten times the combined designed flow of the point sources in the watershed or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. Because of the very large design flows of the point sources in the watershed and their ability to disinfect wastewater under stream flow conditions encountered in the watershed usually considered to be under the influence of non-point sources (runoff conditions), the Wasteload Allocation has been more realistically limited to the combined mechanical design flow of both plants. Even then, for Indian Creek at Overland Park, that flow condition would still be flows of 0 - 24 cfs. Such flows have been exceeded 27-99% of the time. Any future NPDES and state permits will be conditioned such that discharges from permitted facility will not cause violations of the applicable criteria at or below this flow (**Figure 3**).

Non-Point Sources: Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to runoff conditions, non-point sources are also seen as a significant cause of water quality violations. Background levels are not significant as a cause of the problem. Implementation of non-point source pollution control practices should be taken within one mile of the listed stream segments and any directly contributing tributaries. All cities contributing to the Indian Creek watershed will be required to apply for and obtain Phase II stormwater permits by 2003.

Activities to reduce fecal pollution should be directed toward the urban stormwater management and any smaller, unpermitted livestock operations still remaining within the watershed. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions exceeded 26% of the time (greater than 24 cfs stream flow)(**Figure 3**). Best

Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows.

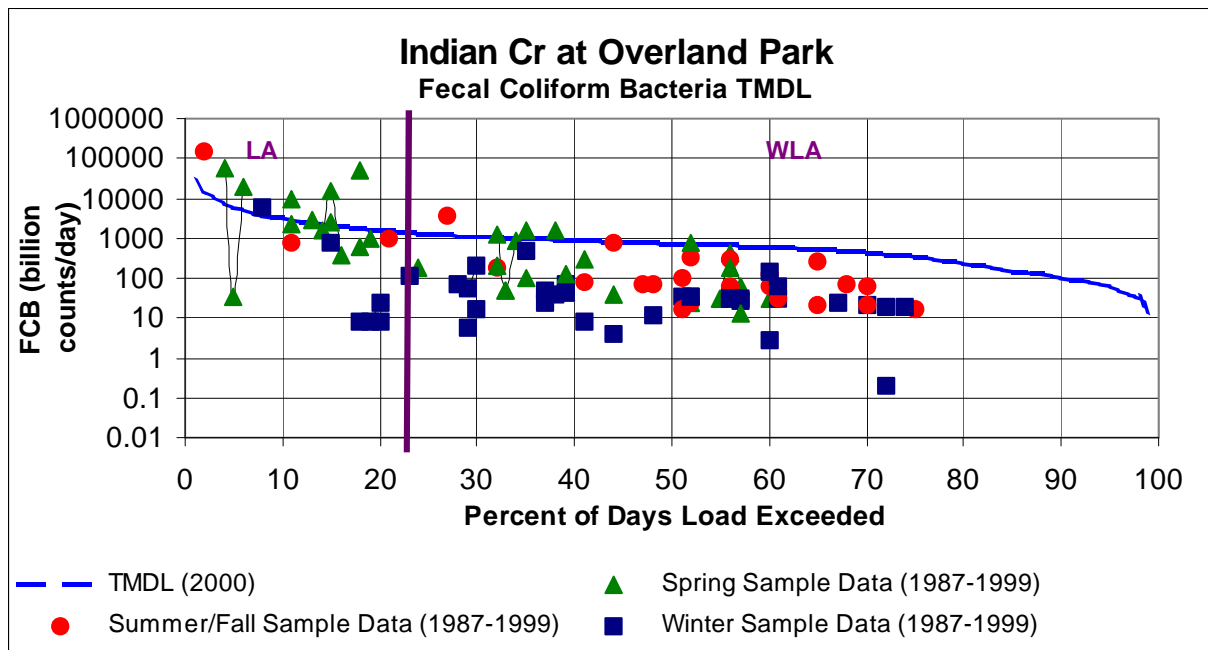


Figure 3

Defined Margin of Safety: Because there will not be a traditional load allocation made for fecal bacteria, the margin of safety will be framed around the desired endpoints of the applicable water quality standards. Therefore, evaluation of achieving the endpoints should use values set 100 counts less than the applicable criteria (1,900 colonies for secondary contact recreation) to mark full support of the recreation designated use of the streams in this watershed. By this definition, the margin of safety is 100 colonies per 100 ml and would be represented by a parallel line lying below the TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

State Water Plan Implementation Priority: Because the exceedence of standards on the Indian Creek indicates a baseline of partial support of the designated use, this TMDL will be a Medium Priority for implementation.

Unified Watershed Assessment Priority Ranking: This watershed lies within the Lower Missouri-Crooked Subbasin (10300101) with a priority of 32 (Medium Priority for restoration work).

Priority HUC 11s and Stream Segments: Priority should be directed toward installing best management practices on the main stem and listed tributary segments in the watershed, primarily Indian Creek (segment 32) and Tomahawk Creek (segment 53).

5. IMPLEMENTATION

Desired Implementation Activities

1. Maintain necessary state and federal permits and inspect permitted facilities for permit compliance.
2. Install necessary stormwater management practices in urban areas of watershed
3. Install necessary grass buffer strips or riparian areas along the stream.
4. Insure proper on-site waste system operations in proximity to targeted streams.

Implementation Programs Guidance

NPDES and State Permits - KDHE

- a. Municipal permits for facilities in the watershed will be renewed after 2003 maintaining existing operations of the wastewater treatment systems.
- b. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- c. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- d. Manure management plans will be implemented.

Stormwater Management - KDHE

- a. Review and support urban stormwater management permits and plans, including data collection efforts to isolate runoff contributions of bacteria to stream.
- b. Assist cities with evaluation of Best Management Practices which will lead to reduction in bacteria loading from urban settings during runoff.

Non-Point Source Pollution Technical Assistance - KDHE

- a. Support Section 319 demonstration projects for pollution reduction from livestock operations in watershed.
- b. Provide technical assistance on riparian management in urban areas and development of vegetated buffer strips.
- c. Guide federal programs such as the Environmental Quality Improvement Program, which are dedicated to priority subbasins through the Unified Watershed Assessment, to priority subwatersheds and stream segments within those subbasins identified by this TMDL.
- d. Assist evaluation of stormwater quality from urbanized areas of watershed.

Riparian Protection Program - SCC

- a. Develop urban riparian restoration projects
- b. Coordinate with Public Works Departments to evaluate riparian conditions.

Buffer Initiative Program - SCC

- a. Install grass buffer strips near streams.

b. Leverage Conservation Reserve Enhancement Program to hold riparian land out of production.

Kansas Center for Agriculture Resources and the Environment - Kansas State University

- a. Complete research on identifying sources of fecal coliform bacteria and evaluating effectiveness of Best Management Practices on reducing bacteria contamination.
- b. Apply methodology to Indian Creek samples to determine probable sources of bacteria in river.

Local Environmental Protection Program - KDHE

- a. Inspect any on-site waste systems within one mile of main stem and tributary segment.

Timeframe for Implementation: Pollution reduction practices should be installed within the priority subwatersheds over the years 2002-2006, with follow up implementation thereafter.

Targeted Participants: Primary participants for implementation will be Public Works Departments, any small scale livestock operations, on-site wastewater systems and municipal utility personnel. Implemented activities should be targeted at those areas with greatest potential to impact the stream. Nominally, this would be activities located within one mile of the targeted streams including:

1. Facilities without water quality controls
2. Poor riparian sites
3. Failing on-site waste systems
4. Uncontrolled entry points for urban runoff
5. Coincidental areas of impervious surfaces and incidental fecal waste dropping
6. Failing sewer lines

Some inventory of local needs should be conducted in 2002 to identify such activities. Such an inventory would be done by local program managers with appropriate assistance by commodity representatives and state program staff in order to direct state assistance programs to the principal activities influencing the quality of the streams in the watershed during the implementation period of this TMDL.

Milestone for 2006: The year 2006 marks the mid-point of the ten year implementation window for the watershed. At that point in time, milestones should be reached which will have at least two-thirds of the parties responsible for the activities identified locally for assistance participating in the implementation programs provided by the state. Additionally, sampled data from the monitoring station should indicate evidence of reduced bacteria levels at median conditions relative to the conditions seen over 1987-2000.

Delivery Agents: The primary delivery agents for program participation will be the City Wastewater and Stormwater Programs. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Johnson County.

Reasonable Assurances

Authorities: 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 KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of 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.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control nonpoint source pollution.
6. 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.
7. K.S.A. 82a-951 creates the State Water Plan Fund to finance the implementation of the *Kansas Water Plan*.
8. The *Kansas Water Plan* and the Missouri 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 in implementation.

Funding: The State Water Plan Fund 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 watersheds and water resources of highest priority. Typically, the state allocates at least 50% of the fund to programs

supporting water quality protection. This watershed and its TMDL are a Medium Priority consideration. Priority should be given to activities which reduce loadings of bacteria and nutrients to the stream after to 2006.

Effectiveness: Ultraviolet treatment is highly effective in eliminating bacteria in municipal effluent. Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed.. The key to effectiveness is participation by activities in proximity to the stream. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 1987-2000, the state may employ more stringent conditions on agricultural producers in the watershed in order to meet the desired endpoints expressed in this TMDL. The state has the authority to impose conditions on activities with a significant potential to pollute the waters of the state under K.S.A. 65-171. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response. Additionally, future stormwater permits may contain more stringent conditions protecting water quality.

6. MONITORING

KDHE will continue to collect bimonthly samples at Station 204, including fecal coliform samples, in order to assess progress in implementing this TMDL. During the evaluation period (2005-2009), more intensive sampling will need to be conducted under specified seasonal flow conditions in order to determine the achievement of the endpoint of this TMDL. The manner of evaluation will be consistent with the assessment protocols used to establish the case for impairment in these streams. Following current (1998) Kansas assessment protocols, monitoring will ascertain if less than 10% of samples exceed the applicable criterion at flows under 65 cfs with no samples exceeding the criterion at flows under 25 cfs. Use of the real time flow data available at the Indian Creek at Overland Park stream gaging station can direct sampling efforts.

Monitoring of bacteria levels in effluent will be a condition of NPDES and state permits for facilities. This monitoring will continually assess the functionality of the systems in reducing bacteria levels in the effluent released to the streams.

7. FEEDBACK

Public Meeting: A public meeting to discuss TMDLs in the Missouri Basin was held February 28, 2001 in Atchison. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Missouri Basin.

Public Hearing: A Public Hearing on the TMDLs of the Missouri Basin was held in Atchison on May 29, 2001.

Basin Advisory Committee: The Missouri Basin Advisory Committee met to discuss the TMDLs in the basin on October 4, 2000, February 28 and May 29, 2001.

Milestone Evaluation: In 2006, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Indian Creek. Subsequent decisions will be made regarding the implementation approach and follow up of additional implementation in the watershed.

Consideration for 303(d) Delisting: The river will be evaluated for delisting under Section 303(d), based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303(d) list. Should modifications be made to the applicable water quality criteria during the ten year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly.

Incorporation into Continuing Planning Process, Water Quality Management Plan and the Kansas Water Planning Process: Under the current version of the Continuing Planning Process, the next anticipated revision will come in 2002 which will emphasize revision of the Water Quality Management Plan. At that time, incorporation of this TMDL will be made into both documents. Recommendations of this TMDL will be considered in *Kansas Water Plan* implementation decisions under the State Water Planning Process for Fiscal Years 2002-2006.