

# LOWER ARKANSAS RIVER BASIN TOTAL MAXIMUM DAILY LOAD

## Water Body: Medicine Lodge River Water Quality Impairment: Fecal Coliform Bacteria

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Medicine Lodge

**Counties:** Barber, Comanche, Pratt, and Kiowa

**HUC 8:** 11060003

**HUC 11 (HUC 14s):** 010 (010, 020, 030, 040, 050, and 080)

**Drainage Area:** 262.6 square miles

**Main Stem Segment:** 8; starting at the confluence with Turkey Creek; Headwaters near Greensburg, in Kiowa County. **(Figure 1)**

**Tributary Segments:** North Branch, Medicine Lodge River(24)  
Otter Creek (25)  
Thompson Creek (26)  
Unnamed Stream Segment (559, 560) *Segment 560 removed from 1999 KS Surface Water Register by merging it to Segment 559.*  
*Soldier Creek (27) unimpaired*

**Designated Uses:** Special Aquatic Life Support; Primary and 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 Thompson Creek

Expected Aquatic Life Support; Domestic Water Supply; Food Procurement; Ground Water Recharge; Industrial Water Supply Use; Irrigation Use; Livestock Watering Use for North Branch, Medicine Lodge River

Expected Aquatic Life Support for Otter Creek

Special Aquatic Life Support and Primary Contact Recreation for Unnamed Stream

**1998 303d Listing:** Table 1 - Predominant Nonpoint Source and Point Source Impacts

**Impaired Use:** Primary and Secondary Contact Recreation on Main Stem Segment

**Water Quality Standard:** Fecal Coliform Bacteria: 900 colonies per 100 mL for Primary Contact Recreation in April - October K.A.R 28-16-28e(c)(7)(B) (disapproved);  
 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))

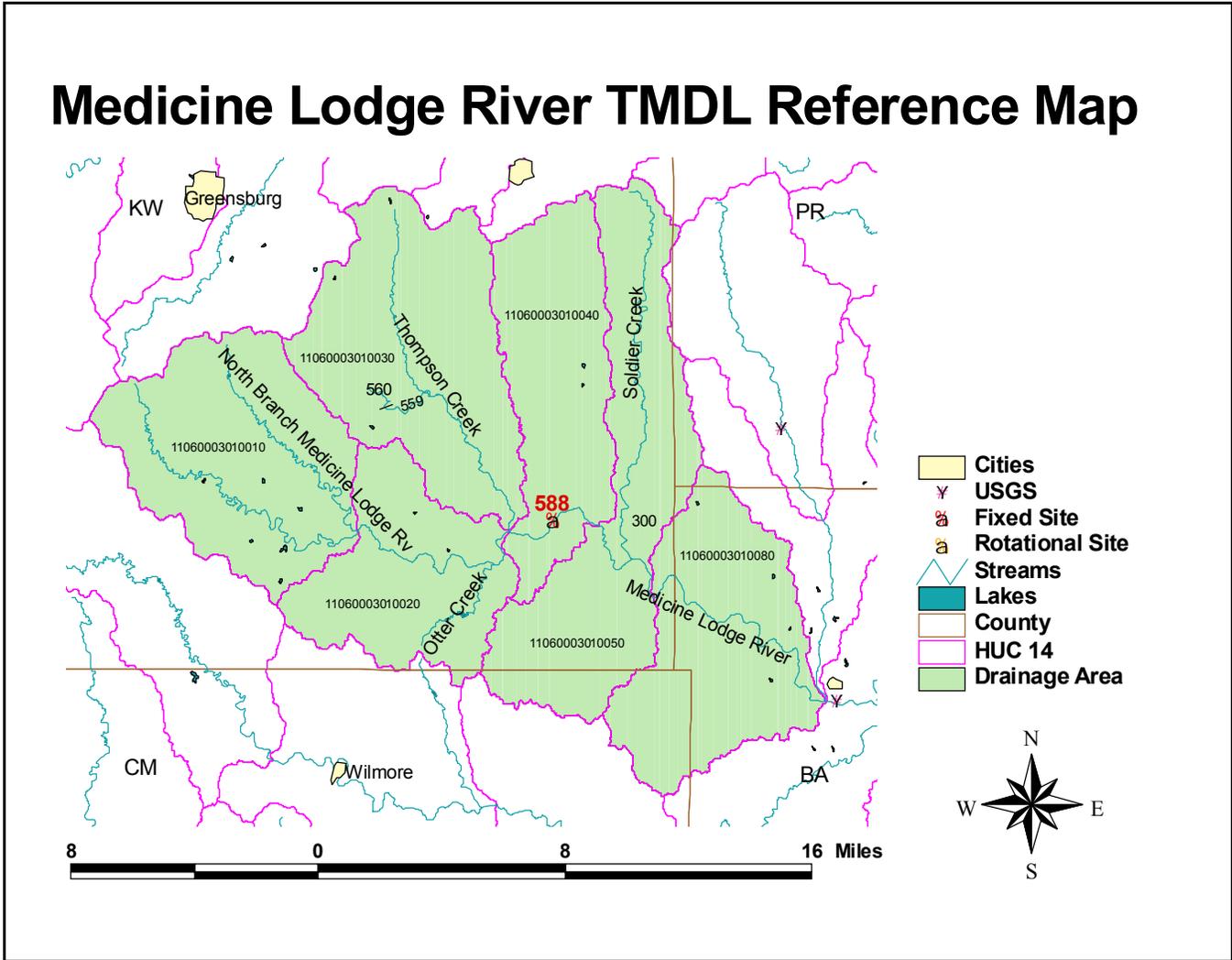


Figure 1

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Support for Designated Use under 1998 303d:** Not Supporting

**Monitoring Sites:** Station 588 near Belvidere

**Period of Record Used:** 1990 to 1998

**Flow Record:** Medicine Lodge at Sun City (07148600) flow was calculated by relating estimated flow duration data developed by USGS to actual flow duration data for the Medicine Lodge River near Kiowa (USGS Station 07149000; 1974-1999).

**Long Term Flow Conditions:** 10% Exceedence Flow = 80 cfs, 7Q10 = 1 cfs

**Current Conditions:** Since loading capacity varies as a function of the flow present in the river, this TMDL represents a continuum of desired loads over all flow conditions, rather than fixed at a single value. Flow duration data were examined from the Medicine Lodge near Kiowa Gaging Station and used to represent the cumulative frequency value for samples taken at Medicine Lodge below Sun City. 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 Primary and 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. The load curves represent the TMDL since any point along the curve represents water quality at the standard at that flow. Historic excursions from WQS are seen as plotted points above the load curve. Water quality standards are met for those points plotting below the applicable load duration curve.

Excursions were seen in all seasons. Slightly less than ten percent of samples were over the criteria. This would represent a baseline condition of full support of the impaired designated use.

**NUMBER OF SAMPLES OVER BACTERIA STANDARD OF 2000 cts/ 100 mL BY FLOW**

Station	Season	0 to 10%	10 to 25%	25 to 50%	50 to 75%	75 to 90%	90 to 100%.	Cum Freq.
Medicine Lodge River	Annual	2	1	1	0	0	1	5/52 = <10%

### **Desired Endpoint Condition of Water Quality at Station 588 over 2005 -2009**

The ultimate endpoint for this TMDL will be to achieve Kansas Water Quality Standards fully supporting both Primary Contact Recreation and Secondary Contact Recreation. This TMDL will, however, be phased. Kansas adopted a Primary Contact Recreation standard of 900 colonies per 100 ml but EPA subsequently disapproved that standard. This standard was used to establish a load duration curve shown in the TMDL curve. It is recognized, however, that the Primary Contact Recreation Standard will be revised in the future in accordance with national guidance. A revised Primary Contact Recreation TMDL curve will be established in Phase Two of this TMDL

to reflect changes in this Standard. 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 also shown in the TMDL figure. 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, 80 cfs.

Seasonal variation in endpoints is accounted for by notation of the sample date on the annual TMDL curve and will be re-evaluated based on monitoring data from 2000 and 2004. 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 indicate 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**

**Land Use:** Most of the watershed is grassland (80.6%) and cropland (18.9%). Appropriation of water and actual water use is mostly from groundwater. The chief groundwater use is associated with the subwatershed containing main stem segments (HUC14 = 030). Appropriations are made for industry, irrigation, municipalities, and other.

**Livestock Waste Management Systems:** One cattle operation is permitted within the watershed, accounting for a potential of up to 300 animal units. All permitted livestock facilities have waste management systems designed to minimize runoff entering their operations or detaining runoff emanating from their areas. Such systems are designed for the 25 year, 24 hour rainfall/runoff event, which would be indicative of flow durations well under 10 percent of the time. The actual number of animal units on site is variable, but typically less than permitted numbers. Tracking the excursions from the water quality standards to flow conditions at the tributary stations indicates that most excursions are related to ongoing runoff or the aftermath of a runoff event placing waste in the stream. The facility is located adjacent to the stream segments with a higher susceptibility to runoff.

Grazing density of livestock is average throughout the watershed. In 1997, 35,000 cattle were inventoried in Kiowa County. Since the watershed takes up 30 percent of Kiowa county, then an estimated 10,474 cattle are within the watershed.

The permitted cattle operation has an allowance of about 300 animal units. The remaining cattle (10,174 estimated head) are likely dispersed throughout the watershed in small family operations (un-permitted) and on open range/grassland.

**Contributing Runoff:** The watershed's average soil permeability is 2.5 inches/hour according to NRCS STATSGO data base. About 52% of the watershed produces runoff even under relative low (1.5"/hr) potential runoff conditions. Under very low (<1"/hr) potential conditions, this

potential contributing area is almost halved (26%). 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 0.5"/hr of rain will generate runoff from only 3% of this watershed, chiefly along the stream channels.

**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 water fowl is fairly dispersed across the watershed resulting in minimal loading to the streams 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 nonpoint 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 nonpoint sources to be the dominant influence on stream water quality. Therefore, the allocation of wasteloads and loads will be made by demarcating the TMDL curve 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 nonpoint sources up to the high flow exclusion value.

**Point Sources:** A Wasteload Allocation of zero will be established by this TMDL because of the lack of point sources in the watershed. The Medicine Lodge MWTP discharges into Elm Creek, and Elm Creek flows into the Medicine Lodge River (segment 2). However, no point sources discharge into the Upper Medicine Lodge River (segment 8). Should future point sources be proposed in the watershed and discharge into the impaired segments, the current wasteload allocation will be revised by adjusting current load allocations to account for the presence and impact of these new point source dischargers.

**Nonpoint Sources:** Based on the assessment of sources, the distribution of excursions from water quality standards and the relationship of those excursions to flow conditions, nonpoint sources are seen as the primary cause of water quality violations. Background levels might be represented by the low loads plotting below the TMDL curve. The livestock facility relies on a lagoon system for wastewater detention and long holding times to minimize the release of fecal bacteria to the receiving stream. The previous assessment suggests that activities in proximity to the stream may be contributing to the bacteria violations. These activities would include livestock in small family operations and on pastureland along the streams, as well as potentially failing on-site waste systems. Given the runoff characteristics of the watershed, overland runoff can easily carry waste material into streams.

Activities to reduce fecal pollution should be directed toward the smaller, unpermitted livestock operations and rural homesteads and farmsteads in the watershed. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over all flow conditions. Best

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

**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 (800 for primary and 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 each seasonal TMDL curve by a distance corresponding to loads associated with 100 colonies per 100 ml.

**State Water Plan Implementation Priority:** Because multiple TMDLs will be written for the watershed, this TMDL will be a High Priority for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Medicine Lodge Subbasin (HUC 8: 11060003) with a priority ranking of 49 (Low Priority for restoration work).

**Priority HUC 11s and Stream Segments:** The entire Medicine Lodge River watershed lies within the Medicine Lodge subwatershed (HUC 11-010).

## 5. IMPLEMENTATION

### Desired Implementation Activities

1. Renew necessary state and federal permits and monitor permitted facilities for permit compliance
2. Install necessary proper manure and livestock waste storage
3. Install necessary grass buffer strips along streams.
4. Install necessary pasture management practices, including proper stock density on grasslands
5. Remove feeding sites in proximity to streams
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main streams.

### Implementation Programs Guidance

#### State Permits - KDHE

- a. Livestock permitted facilities will be inspected for integrity of applied pollution prevention technologies.
- b. Registered livestock facilities with less than 300 animal units will apply pollution prevention technologies.
- c. Manure management plans will be implemented.

**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 practices geared to small livestock operations which minimize impact to stream resources.
- 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.

**Water Resource Cost Share & Non-Point Source Pollution Control Programs - SCC**

- a. Provide alternative water supplies to small livestock operations
- b. Develop improved grazing management plans
- c. Reduce grazing density on pasturelands
- d. Install livestock waste management systems for manure storage
- e. Implement manure management plans
- f. Install replacement on-site waste systems
- g. Coordinate with USDA/NRCS Environmental Quality Improvement Program in providing educational, technical and financial assistance to agricultural producers.

**Riparian Protection Program - SCC**

- a. Design feeding areas away from streams
- b. Develop riparian restoration projects

**Buffer Initiative Program - SCC**

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

**Extension Outreach and Technical Assistance - Kansas State University**

- a. Educate livestock producers on riparian and waste management techniques.
- b. Provide technical assistance on livestock waste management design.
- c. Continue Section 319 demonstration projects on livestock management.

**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.

**Agricultural Outreach - KDA**

- a. Provide information on livestock management to commodity advocacy groups.
- b. Support Kansas State outreach efforts.

## **Local Environmental Protection Program - KDHE**

- a. Inspect on-site waste systems within one mile of main tributary streams.

**Time Frame for Implementation:** Pollutant reduction practices should be installed within the priority subwatersheds during the years 2001-2005, with minor follow up implementation, including other subwatersheds over 2005-2009.

**Targeted Participants:** Primary participants for implementation will be small livestock producers operating without need of permits within the priority subwatershed. 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 streams including:

1. Facilities without water quality controls
2. Unpermitted permanent feeding/holding areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where livestock have full access to stream and stream is primary water supply
5. Grazed acreage, overstocked acreage and acreage with poor range condition
6. Poor riparian sites
7. Near stream feeding sites
8. Failing on-site waste systems

Some inventory of local needs should be conducted in 2001 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 2005:** The year 2005 marks the midpoint 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 landowners responsible for the activities identified locally for assistance participating in the implementation programs provided by the state. Additionally, sampled data from Station 588 should indicate evidence of reduced bacteria levels at moderate to low flow conditions relative to the conditions seen over 1990-1998.

**Delivery Agents:** The primary delivery agents for program participation will be the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. Producer outreach and awareness will be delivered by Kansas State Extension and agricultural interest groups such as Kansas Farm Bureau, Kansas Livestock Association, the Kansas Pork Producers Council and the Kansas Dairy Association. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Kiowa 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 Lower Arkansas 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 High Priority consideration. Priority should be given to activities which reduce loadings of bacteria and nutrients to the stream prior to 2005.

**Effectiveness:** Nonpoint 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 within a finite subwatershed to direct resources to the activities influencing water quality. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should voluntary 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 1990-1999, the state may employ more stringent conditions on nonpoint sources 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. 65-171d. If overall water quality conditions in the watershed deteriorate, a Critical Water Quality Management Area may be proposed for the watershed, in response.

## **6. MONITORING**

KDHE should collect bimonthly samples at Station 588 in 2002 and 2004 in order to assess progress in implementing this TMDL over each of the three defined seasons during the initial implementation period. 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 desired endpoints 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 at this phase if less than 10% of samples exceed the applicable criterion at flows under 80 cfs with no samples exceeding the criterion at flows under 46 cfs. Use of the real time flow data available at the Medicine Lodge near Kiowa stream gaging station can direct sampling efforts.

USGS completed analysis of SSURGO soil data and 30-m resolution DEM topographic data. This analysis evaluates the relative runoff contributing areas within the watershed and provides greater resolution on where implementation activities would be most effective.

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2001 in order to support appropriate implementation projects.

## **7. FEEDBACK**

**Public Meetings:** Public meetings to discuss TMDLs in the Lower Arkansas Basin were held March 9 in Wichita, April 26 in Wichita and Hutchinson, and April 27 in Arkansas City and Medicine Lodge. 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 Lower Arkansas Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Lower Arkansas Basin was held in Wichita on June 1, 2000.

**Basin Advisory Committee:** The Lower Arkansas Basin Advisory Committee met to discuss the TMDLs in the basin on September 27, November 8, 1999; January 13, 2000; March 9, 2000 and June 1, 2000

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:

Agriculture: January 12, February 2 and 29, 2000

Environmental: March 9, 2000

Conservation Districts: November 22, 1999

Industry: December 15, 1999, January 13, February 9 and 22, 2000

Local Environmental Protection Groups: September 30, November 2, December 16, 1999

**Milestone Evaluation:** In 2005, evaluation will be made as to the degree of impairment which has occurred within the drainage and current condition of Medicine Lodge River. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the nonpriority subwatersheds.

**Consideration for 303d Delisting:** Medicine Lodge River will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2005-2009. Therefore, the decision for delisting will come about in the preparation of the 2010 303d list. Should modifications be made to the applicable bacteria criterion during the ten-year implementation period, consideration for delisting, desired endpoints of this TMDL and implementation activities may be adjusted accordingly. Once KDHE and EPA agree to an appropriate metric to evaluate Primary Contact Recreation and establish a water quality standard using such a parameter, this TMDL will be modified to incorporate that criterion.

At this phase of the TMDL, assessment for delisting will evaluate if the percent of samples over the applicable secondary contact recreation criterion is less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2005-2009. This assessment defines full support of the designated use under water quality standards as measured and determined by current Kansas Water Quality Assessment protocols. These assessment protocols are similar to those used to cite the stream segments in this watershed as impaired on the Kansas 1998 Section 303d list. As protocols and assessments for impairment change for future 303(d) lists, the monitoring data collected under this TMDL will use these new assessments and protocols for delisting consideration.

**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 during Fiscal Years 2001-2005.

Approved August 9, 2000.