

# KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

## Waterbody: Stranger Creek Watershed Water Quality Impairment: Fecal Coliform Bacteria

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Lower Kansas      **Counties:** Leavenworth, Jefferson, and Atchison

**HUC 8:** 10270104      **HUC 11:** 050 (Unnamed Stream, Ninemile Creek, Cow Creek), 130 (Main Stem Segments 5, 6, & 7, Hog Creek), 120 (Tonganoxie Creek), 100 (Jabelo Creek, Fall Creek, Brush Creek), 090 (Scatter Creek, Indian Creek, Prairie Creek), 080 (Main Stem Segment 8, West Brush Creek, Dawson Creek, Buttermilk Creek), 070 (Crooked Creek), 060 (Camp Creek)

**Drainage Area:** 406 miles<sup>2</sup> at Tonganoxie

**Main Stem Segments:** 5, 6, 7, 8, and 9, starting at confluence of Kansas River, headwaters in Atchison County near Lancaster

**Tributary Segments:** Unnamed Stream (16)  
Cow Creek (58)  
Ninemile Creek (15 & 17)  
Tonganoxie Creek (14)  
Hog Creek (54)  
Jabelo Creek (51)  
Fall Creek (52)  
Brush Creek (49)  
Scatter Creek (13)  
    Indian Creek (48)  
    Prairie Creek (47)  
West Brush Creek (46)  
Dawson Creek (45)  
Buttermilk Creek (44)  
Crooked Creek (10 & 12)  
Camp Creek (41)

**Designated Uses:** Primary and Secondary Contact Recreation on Main Stem Segments 5 and 6.  
Secondary Contact Recreation Main Stem Segments 7, 8, 9 and tributaries.

**1998 303d Listing:** Table 1–Predominant Point and Non-point Source Impacts

**Impaired Use:** Secondary Contact Recreation on all listed segments; Primary Contact Recreation on Segments 5 and 6.

**Water Quality Standard:** Fecal Coliform Bacteria: 2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C)); 900 colonies per 100 ml for Primary (KAR 28-16-28e(c)(7)(B))  
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 303d:** Not Supporting Secondary Contact Recreation

**Monitoring Sites:** Station 501 near Linwood and 602 near Easton

**Period of Record Used:** 1990--1997; 1991

**Flow Record:** USGS Station 06892000 near Tonganoxie and drainage area proportioned to Linwood, Recorded daily data 1929–1997

**Long Term Flow Conditions:** 10% Duration High Flow Exclusion = 500 cfs; 7Q10 = 1 cfs

**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 examined from the Linwood Gaging Station for each of the three defined seasons: Spring (Apr-Jun), Summer-Fall (Jul-Oct) and Winter (Nov-Mar). High flows and runoff equate to lower flow durations; baseflow and point source influences generally occur in the 85-99% range. Load curves were established for both Primary Contact Recreation 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.

Excursions were noted in all three seasons. Sixty four percent of Spring samples and 27% of Summer-Fall samples were over the primary criterion. Fifteen percent of Winter samples were over the secondary criterion. Overall 34% of the samples were over the water quality criteria. This would represent a baseline condition of partial support of the impaired designated use.

**PERCENT OF SAMPLES OVER WATER QUALITY STANDARDS BY FLOW AND SEASON**

STREAM NAME	I M P A I R M E N T	S E A S O N	MAGNITUDE	0 T O 10%	10 T O 30%	30 T O 60%	60 T O 90%	90 T O 100%	F R E Q U E N C Y	Current Condition of Water Quality at Site 501 Over 1990-1997
STRANGER CREEK NR LINWOOD	F C B	S	900 - 2000	0	9	9	18	0	7/11 = 64%	12/35=34% Exceedence
			> 2000	0	9	0	0	0		
			> 2 X 2000	9	0	9	0	0		
		S F	900 - 2000	9	18	0	0	0	3/11 = 27%	
			> 2000	0	0	0	0	0		
			> 2 X 2000	0	0	0	0	0		
		W	> 2000	0	0	0	0	0	2/13 = 15%	
			> 2 X 2000	15	0	0	0	0		

Data collected at the rotational station (602) at Easton for 1991 and 1995 indicated occasional excursions from the secondary criterion, sometimes at very low flow.

**Desired Endpoints of Water Quality at Site 501 over 2004 - 2008:**

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 34% to less than 10% for samples taken at flows below the high flow exclusion over the monitoring period of 2004-2008. This TMDL endpoint meets water quality standards as measured and determined by 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.

Seasonal variation in endpoints is accounted for by TMDL curves established for each season and will be evaluated based on monitoring data from 2004-2008. Monitoring data plotting below the applicable seasonal TMDL curves will indicate attainment of the water quality standards. As with the overall endpoint, the manner of evaluation of the seasonal endpoints is consistent with the assessment protocols used to establish the case for impairment in these streams.

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 785 cfs with no samples exceeding the criterion at flows under 125 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 785 cfs with no samples exceeding the criterion at flows under 18 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 785 cfs.

These endpoints 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 endpoints 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

**NPDES:** There are ten NPDES permitted municipal wastewater dischargers located within the watershed, most with waste stabilization lagoons with 2-4 cells and 120 - 150 day detention. All permits expire in the year 2000.

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	# CELLS	DETENTION TIME
Basehor	Hog Creek	54	0.285 MGD	3	> 40 days
Easton	Stranger Cree	8	0.050 MGD	2	> 150 days
Effingham	Stranger Creek	9	0.085 MGD	3	> 120 days
Lancaster	Stranger Creek	9	0.035 MGD	2	> 150 days
Linwood	Ninemile Creek	15	0.054 MGD	2	> 150 days
Leavenworth SD1	Stranger Creek	7	0.026 MGD	3	> 120 days
Nortonville	Crooked Creek	12	0.080 MGD	2	> 150 days
Tonganoxie	Tonganoxie Creek	14	0.400 MGD	Oxidation Ditch	
Winchester	Crooked Creek	12	0.122 MGD	4	> 120 days
KTA-Lawrence	Ninemile Creek	15	0.019 MGD	3	> 120 days

Population projections for these municipalities to the year 2020 indicate modest growth for most of the towns with Tonganoxie experiencing 73% growth in population since 1990. Projections of future water use and resulting wastewater appear to remain under design flows for each of the wastewater systems. Most cities appear to have additional treatment capacity available. Since the excursions from the water quality standards appear to occur under flow conditions of less than 65% duration and given the magnitude of the design flows of each of these systems, point source impacts appear to be minimal to the watershed. Impacts from municipal lagoons appear to be local in nature and insignificant at the downstream monitoring site. Basehor is constructing a treatment plant to replace its two lagoon systems.

**Livestock Waste Management Systems:** Twenty seven operations are registered, certified or permitted within the watershed, accounting for a potential of up to 5,733 animal units. These operations are either swine (11) or dairy (16). All permitted livestock facilities have waste management systems designed to minimize runoff entering their operations or retaining runoff 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.

**Land Use:** The watershed is 39% cropland and 49% grassland with 11% in woodland. Grazing density of livestock is high, with a number of subwatersheds with more than 50 animal units per square mile. The following table characterizes the nine subwatersheds in terms of drainage, grassland, municipal point sources, grazing density, livestock waste management systems and permitted animal units of swine and dairy cattle.

HUC 11	Watershed Name	Drainage Area	% Grassland	NPDES	Grazing Density	WMS	Swine AU	Dairy AU
050	Ninemile Crk	69	56	2	50	4	540	49
060	Headwaters	109	42	2	45	6	364	523
070	Crooked Crk	66	30	2	44	4	1,388	91
080	Upper Stranger	73	45	1	51	3	0	392
090	Scatter Crk	45	57	0	46	1	140	0
100	Mid Stranger	76	58	0	52	3	0	770
110	Leavenworth	33	58	1	53	0	0	0
120	Tonganoxie	28	62	1	52	1	0	252
130	Lower Stranger	46	48	1	53	5	404	820

Sixty four percent of Leavenworth County is in the watershed, 21% of Jefferson County and 32% of Atchison County. Based on these proportions and assuming an even distribution of cattle and swine counted in the 1997 Ag Survey, the watershed should have about 6,900 swine and 40,400 cattle.

The 11 permitted swine facilities have approximately 2,835 animal units allowed under permit. At the definition of 0.4 animal units for each hog over 55 pounds (0.1 animal units for pigs under 55 pounds), the permitted facilities seem to account for most of the swine expected to be present in the watershed.

The 16 permitted dairies have an allowance of about 2,900 animal units, which translates to roughly 2,070 dairy cows. The remaining cattle (estimated 38,000 head) are likely dispersed throughout the watershed in small family operations (un-permitted) and on open range/grassland. The 1997 Ag survey data indicate a decline in the number of small farms with under 200 head of cattle in Atchison County, but Jefferson County has seen an increase in those small farms as well as the number of cattle in those small operations. Leavenworth County has seen a reduction in small farms, but an increase in the number of cattle in the remaining small operations. As of 1997, there remains a sizable number of these small, unregistered farms (over 1,000) in the three counties. Reflecting the high grazing density patterns in Stranger Creek, there is a high probability that a large number of these small operations are in the watershed.

**On-Site Waste Systems:** A number of residents within Leavenworth, Atchison and Jefferson Counties are in rural settings without sewer service, relying instead on septic systems or on-site waste lagoons. Failing on-site waste systems contribute bacteria loadings. In FY 1998, over 300 inspections or complaint investigations were made on on-site waste systems in Leavenworth County, 28 and 48 similar investigations were made in Atchison and Jefferson counties, respectively. In 1999, so far, 194 inspections or investigations have been made in Leavenworth County, 37 in Atchison County and 9 in Jefferson County. Leavenworth and Jefferson counties are projected to have substantial growth in rural population, while Atchison county is expected to decline by the year 2020. The infrequent excursions from the water quality standards seem to indicate a lack of persistent loadings from such systems on any grand scale. It is likely that the contribution of high bacteria loads from on-site waste systems is restricted to local areas.

**Contributing Runoff:** The watershed has an average soil permeability of 0.5 inches/hour according to NRCS STATSGO data base. Runoff would be produced under storms ranging in duration from one to six hours, having a recurrence interval of five, ten or twenty five years. Runoff is chiefly generated as infiltration excess with rainfall intensities greater than soil permeabilities. Generally, 69 percent of the watershed would generate runoff under dryer conditions or smaller storms. Moderate or wet conditions or larger storms would see runoff contributed from 92-98 percent of the 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 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 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 up to the high flow exclusion value.

**Point Sources:** Most of the ten municipal facilities rely on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. All wastewater systems are currently designed to accommodate growth. The point sources are responsible for maintaining their lagoons in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. State and NPDES permits will continue to be issued on 5 year intervals, with inspection and monitoring requirements and conditional limits on the quality of effluent released from these lagoons.

Ongoing inspections and monitoring of the lagoons will be made to ensure that minimal contributions have been made by these sources.

The Wasteload Allocation is defined at the flow condition where the sum of the design flows represent more than 10% of the flow, thereby exerting influence on the water quality of the stream. For Stranger Creek at this location, that flow condition would be flows of 0-1.8 cfs. Such flows have been exceeded 94% in the Spring, 60% in the Summer-Fall and 87% in the Winter season. Future NPDES and state permits will be conditioned such that discharges from permitted facilities will not cause violations of the applicable bacteria criteria at this low flow.

**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 seen as the primary cause of water quality violations. Background levels attributed to wildlife might be represented by the low loads plotting below each of the seasonal curves. Most of the livestock facilities rely on lagoon systems for wastewater detention and long holding times to minimize the release of fecal bacteria to receiving streams. The previous assessment suggests that livestock in small family operations and on pastureland may contribute to the occasional excursions from the water quality standards seen in the three seasons.. 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 flow conditions bracketed by the 7Q10 low flow of 1 cfs and the high flow exclusion of 500 cfs. These flows are exceeded 17-94% of the time during the Spring, 9-60% of the time over the Summer and Fall and 8-87% of the time during the Winter. Best Management Practices will be directed toward those activities such that there will be minimal violation of the applicable bacteria criteria at higher flows. On-Site waste system integrity should be addressed, particularly in Leavenworth County, as well.

**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 criteria (800 colonies for primary contact recreation; 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:** This TMDL will be a High Priority for implementation, because this watershed influences water quality in the lower Kansas River.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Lower Kansas Subbasin (HUC 8: 10270104) with a priority ranking of 1 (Highest Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Because of their higher grazing density, number of registered livestock waste management systems and drainage area and proximity to the Primary Contact reaches of Stranger Creek and the Kansas River, the following subwatersheds and stream segments are the priority focus of implementation.

<b>HUC11</b>	<b>Watershed</b>	<b>Segment Number</b>
050	Ninemile Creek	15,16,17,58
080	Upper Stranger	8,44,45,46
100	Mid Stranger	7,49,51,52
120	Tonganoxie	14
130	Lower Stranger	5,6,54

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. Renew state and federal permits and inspect permitted facilities for permit compliance
2. Install proper manure and livestock waste storage
3. Install grass buffer strips along streams.
4. Install pasture management practices, including proper stock density on grasslands
5. Remove winter 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**

#### **NPDES and State Permits - KDHE**

- a. Municipal permits for facilities in the watershed will be renewed after 2000 within existing operations of the lagoon 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.

#### **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 winter 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.

**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.

**Timeframe for Implementation:** Pollution reduction practices should be installed within the priority subwatersheds over the years 2000-2004, with minor follow up implementation, including other subwatersheds over 2004-2008.

**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 2000 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 2004:** The year 2004 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 landowners responsible for the facilities and sites cited in the local assessment participating in the implementation programs provided by the state. Additionally, sampled data from Station 501 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 or 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 Leavenworth, Atchinson and Jefferson counties.

**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 non-point 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 Kansas-Lower Republican 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 is a High Priority consideration.

In State Fiscal Year 1999, the state provided to Leavenworth, Atchison and Jefferson counties, \$192,800 of State Water Plan Funds for non-point source pollution reduction. The Commission will decide State Fiscal Year 2000 allocations in May 1999 and is expected to direct similar amounts of funding to the two counties for the next fiscal year

**Effectiveness:** 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 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 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 1990-1998, 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.

## 6. MONITORING

KDHE will continue to collect bimonthly samples at Station 501, including fecal coliform samples over each of the three defined seasons during the initial implementation period. During the evaluation period (2004-2008), 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. In Spring, at least 20 samples should be taken at flow conditions below 500 cfs, five of which should be taken below 125 cfs. In Summer and Fall, 20 samples need to be taken below flows of 500 cfs, a majority of which will be collected at flows less than 18 cfs. In Winter 10 samples need to be taken at flows below 500 cfs. Use of the real time flow data available at the Tonganoxie stream gaging station can direct sampling efforts.

USGS should complete analysis of SSURGO soil data and 30-m resolution DEM topographic data to evaluate the relative runoff contributing areas within the watershed and provide greater resolution on where implementation activities would be most effective. This analysis should be complete in 2000.

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

Local program management needs to identify its targeted participants of state assistance programs for implementing this TMDL. This information should be collected in 2000 in order to support appropriate implementation projects.

## 7. FEEDBACK

**Public Meetings:** Public meetings to discuss TMDLs in the KLR Basin were held March 10, 1999 in Topeka, April 27 in Lawrence and April 29 in Manhattan. 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 Kansas-Lower Republican Basin.

**Public Hearing:** A Public Hearing on the TMDLs of the Kansas-Lower Republican Basin was held in Topeka on June 3, 1999.

**Basin Advisory Committee:** The Kansas-Lower Republican Basin Advisory Committee met to discuss the TMDLs in the basin on December 3, 1998; January 14, 1999; February 18, 1999; March 10, 1999; May 20, 1999 and June 3, 1999.

**Discussion with Interest Groups:** Meetings to discuss TMDLs with interest groups include:  
Agriculture: November 10, 1998; December 18, 1998; February 10, 1999; April 10, 1999, May 4, 1999, June 8, 1999 and June 18, 1999.

Municipal: November 12, 1998, January 25, 1999; March 1, 1999; May 10, 1999 and June 16, 1999.

Environmental: November 3, 1998; December 16, 1998; February 13, 1999; March 15, 1999, April 7, 1999 and May 3, 1999.

Conservation Districts: March 16-18, 24-25, 1999

**Milestone Evaluation:** In 2004, evaluation will be made as to the degree of implementation which has occurred within the watershed and current condition of Stranger Creek. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the non-priority subwatersheds.

**Consideration for 303d Delisting:** The streams in this watershed will be evaluated for delisting under Section 303d, based on the monitoring data over the period 2004-2008. Therefore, the decision for delisting will come about in the preparation of the 2008 303d 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 2000-2004.

Approved January 26, 2000.