

# KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

## Waterbody: Little Blue River Watershed Water Quality Impairment: Fecal Coliform Bacteria

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Lower Little Blue

**Counties:** Republic, Washington & Marshall

**HUC 8:** 10270207

**HUC 11:** 100 (Coon & Camp Creek), 090 (Lower Little Blue), 074 (Upper Little Blue) and 083 (Mill Creek)

**Drainage Area:** 3,324 miles<sup>2</sup> near Barnes

**Main Stem Segments:** 1, 2, 3, & 4, starting at confluence of Big Blue River, headwaters in Washington County near Hollenburg

**Tributary Segments:** Fawn Creek (45)  
Coon Creek (23)  
Camp Creek (44)  
Bolling Creek (42)  
Mercer Creek (43)  
Malone Creek (37)  
Beaver Creek (38)  
Lane Branch (39)  
Cedar Creek (40)  
School Creek (49)  
Mill Creek (14, 16, 18, 20 and 22)  
Spring Creek (15 and 30)  
Ash Creek (36)  
Buffalo Creek (32)  
Camp Creek (35)  
Riddle Creek (17)  
Melvin Creek (33)  
Iowa Creek (34)  
Salt Creek (19)  
Jones Creek (29)  
Gray Creek (27)  
Bowman Creek (21)  
Walnut Creek (41)

**Designated Uses:** Primary and Secondary Contact Recreation on Little Blue River and Mill Creek, Secondary Contact Recreation on 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 Little Blue River and Mill Creek.

**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:** Little Blue: Station 240 at Blue Rapids and Station 232 near Hollenburg; Mill Creek: Station 507 near Hanover

**Period of Record Used:** 1988 to 1998

**Flow Record:** USGS Station 06884400 near Barnes, USGS Station 06884200 near Washington on Mill Creek, Recorded daily data 1968–1997

**Long Term Flow Conditions:** 10% Duration High Flow Exclusion = 4,000 cfs; 7Q10 = 150 cfs at Blue Rapids; 925 cfs and 45 cfs at Hollenberg; 210 cfs and 1 cfs on Mill Creek

**Current Conditions:** The Little Blue River enters into the Big Blue River in the vicinity of Blue Rapids. Evaluation of water quality will be based on conditions seen at Blue Rapids as well as those at the upper end of the watershed near Hollenberg. 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 Blue Rapids, Hollenberg and Mill Creek 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. These 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 curves. Water quality standards are met for those points plotting below the applicable load duration curves.

Excursions from WQS were seen in Spring (Apr. - Jun.) and Summer-Fall (Jul.- Oct.) at the Blue Rapids station. Forty two percent of Spring samples and 40 % of Summer-Fall samples were at or over the primary criterion. No Winter samples were over the secondary criterion. Overall 26% of the samples were over the criteria. This would represent a baseline condition of non-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 TO 10%	10 TO 30%	30 TO 60%	60 TO 90%	90 TO 100%	F R E Q U E N C Y	Current Condition of Water Quality at Site 240 Over 1990-1998
BIG BLUE RIVER AT BLUE RAPIDS	F C B	S	900-2000	0	0	17	0	0	5/12=42%	11/43=26% Exceedence
			> 2000	0	0	0	8	0		
			> 2 X 2000	8	8	0	0	0		
		S F	900-2000	0	7	13	0	0	6/15=40%	
			> 2000	0	0	0	0	0		
			> 2 X 2000	7	13	0	0	0		
	W	> 2000	0	0	0	0	0	0/16=0%		
		> 2 X 2000	0	0	0	0	0			

Data collected at Hollenberg indicate a similar pattern of violations of the water quality standards in terms of flow and seasonality. Five of twelve samples taken during the spring were over the primary criterion, all but one occurring under runoff conditions where flow durations were less than 85%. In the Summer-Fall period, 5 of 13 samples were over the primary criterion, two under flood conditions, the remaining three occurring under high flow conditions of less than 30% duration. No Winter samples violated the water quality standards.

Data collected on Mill Creek are also similar with 3 of 11 Spring samples over the primary criterion and 4 of 13 Summer-Fall samples taken over the primary criterion. No Winter samples violated the secondary criterion.

**Desired Endpoints of Water Quality at Site 240 over 2004 - 2008:**

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 26% 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 defined 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 4000 cfs with no samples exceeding the criterion at flows under 950 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 4000 cfs with no samples exceeding the criterion at flows under 550 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 4000 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.

Coincidentally, desired endpoints should be achieved at Site 232 near the stateline over 2004 - 2008. Overall, reduce percent of samples over criteria from 25% to under 10%. Seasonally,

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 925 cfs with no samples exceeding the criterion at flows under 270 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 925 cfs with no samples exceeding the criterion at flows under 165 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 925 cfs.

Coincidentally, desired endpoints should be achieved at Site 507 on Mill Creek over 2004 - 2008. Overall, reduce percent of samples over criteria from 18% to under 10%. Seasonally,

1. Less than 10 % of samples taken in Spring exceed primary criterion at flows under 210 cfs with no samples exceeding the criterion at flows under 40 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 210 cfs with no samples exceeding the criterion at flows under 10 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 210 cfs.

### 3. SOURCE INVENTORY AND ASSESSMENT

**NPDES:** There are five NPDES permitted municipal wastewater dischargers located within the watershed. Four utilize waste stabilization ponds for treatment of wastewater, while the other has an oxidation ditch.

MUNICIPALITY	STREAM REACH	SEGMENT	DESIGN FLOW	EXPIRATION DATE
Hanover MWWTP	Little Blue River	2	0.1 mgd	2000
Greenleaf MWWTP	Coon Creek	23	0.072 mgd	2000
Waterville MWWTP	Little Blue River	2	0.0925 mgd	2000
Cuba MWWTP	S. F. Mill Cr	31	0.04 mgd	2000
Haddam MWWTP	Myer Cr	26	0.033 mgd	2000

Population projections for these municipalities to the year 2020 indicate modest growth for Waterville, with slight declines for Cuba, Haddam, Hanover and Greenleaf. Projections of future water use and resulting wastewater appear to remain under design flows for each of the systems and all appear to have additional treatment capacity available. Since most of 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 lagoons, 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.

**Livestock Waste Management Systems:** Sixty operations are registered, certified or permitted within the watershed above Blue Rapids, accounting for a potential of up to 30,600 animal units. A majority of those operations are swine(39) with beef (13) or dairy cattle (8) comprising the remaining operations. 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. Many of the facilities are located adjacent to the stream segments with a higher susceptibility to runoff.

**Land Use:** Most of the watershed is either cropland or grassland, with 53% of the area above Blue Rapids cropland. Grazing density of livestock is uniform and moderately high (37-39 animal units per square mile) throughout the subwatersheds. In 1997, inventories of cattle and swine in Republic, Marshall and Washington counties were 64,800 and 9,900 and 44,500 and 65,000, and 65,300 and 97,000, respectively. Nine percent of Marshall County, 67% of Washington County and 14% of Republic County lie within the watershed. Assuming an even distribution, up to 56,800 cattle should be in the watershed as well as 72,300 swine.

The 39 permitted swine facilities have approximately 21,200 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 two thirds of the swine expected to be present in the watershed.

The 21 remaining permitted dairies or beef operations have an allowance of about 10,840 animal units, which translates to roughly 1,300 dairy cows and 9,000 cattle. The remaining cattle (estimated 48,000 head) are likely dispersed throughout the watershed in small family operations (unpermitted) and on open range/grassland.

Although survey data indicate a decline in the number of small farms with under 200 head of cattle in all three counties between 1992 and 1997, there remains a sizable number of these small, unregistered farms, numbering over 1350 in the three counties.

**On-Site Waste Systems:** A number of residents within Washington, Republic and Marshall 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, 47 investigations or inspections on on-site waste systems were made in Marshall County. In the first three quarters of Fiscal Year 1999, 49 visits have been made on septic systems in Marshall County. Similar numbers for Washington and Republic counties were 9 and 3 for 1998 and 13 and 1 for 1999, respectively. The infrequent excursions from the water quality standards at lower flows 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. Furthermore, population projections for all three counties indicate a decrease in rural population to the year 2020, suggesting that proliferation of on-site waste systems will not be occurring in the watershed.

**Contributing Runoff:** The Little Blue watershed has an average soil permeability of 0.8 inches/hour and the Mill Creek watershed has an average soil permeability of 0.9 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, 12 percent of the Little Blue watershed and 13 percent of the Mill Creek watershed would generate runoff under dryer conditions or smaller storms. Moderate or wet conditions or larger storms would see runoff contributed from 83-91 percent of the Little Blue watershed and 54-89 percent of the Mill Creek 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:** Four of the five 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 to maintain their systems in proper working condition and appropriate detention volume to handle anticipated wasteloads of their respective populations. Ongoing inspections and monitoring of these systems 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 or the 7Q10, whichever is greater, thereby exerting influence on the water quality of the stream. For the Little Blue River at this location, that flow condition would be flows of 0-45 cfs on the Little Blue and 0-1 cfs on Mill Creek, when design flows make up 10% or more of the flow. This range corresponds to flow durations of 99% duration for all three seasons on the Little Blue and 96% in Summer-Fall, 99% in Spring and Winter on Mill Creek. 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. The permitted 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 which on the Little Blue are exceeded 12-99% of the time during the Spring, 8-96% of the time over the

Summer and Fall and 5-99% of the time during the Winter; and on Mill Creek are exceeded 18-99% of the time during the Spring, 8-96% of the time over the Summer and Fall and 7-99% 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.

**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 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:** Because this watershed has had some activity in non-point source pollution reduction conducted under the Governor's Water Quality Initiative and is associated with other TMDLs regarding the water quality of Tuttle Creek Lake and because of the need to comprehensive package implementation measures to handle multiple pollutants in the agricultural setting, this TMDL will be a **High Priority** for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Lower Little Blue Subbasin (HUC 8: 10270207) with a **priority ranking of 10 (Highest Priority for restoration work).**

**Priority HUC 11s and Stream Segments:** Because of their higher number of animal feeding operations close to streams, the Mill Creek (HUC11=083) and the Lower Little Blue (HUC11=090) subwatersheds should be the priority focus of implementation. Following that, additional attention can be directed on activities along the Coon-Camp Creek (HUC11=100) subwatershed.

## **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**

### **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.

**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:** 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 240, 232 and 507 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 Marshall and Washington 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 Marshall, Washington and Republic counties \$385,017 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 three 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 Stations 240, 232 and 507, including fecal coliform samples over each of the three defined seasons. Over the period 2004-2008, more intensive sampling will need to be conducted under specified seasonal flow conditions. For Station 240, in Spring, at least 20 samples should be taken at flow conditions below 2000 cfs, with half taken below 950 cfs. In Summer and Fall, 20 samples need to be taken below flows of 2000 cfs, a majority of which will be collected at flows less than 550 cfs. In Winter 10 samples need to be taken at flows below 1000 cfs. Use of the real time flow data available at the Barnes and Marysville stream gaging stations can direct sampling efforts.

For Station 232, in Spring, at least 20 samples should be taken at flow conditions below 925 cfs, with half taken below 270 cfs. In Summer and Fall, 20 samples need to be taken below flows of 925 cfs, a majority of which will be collected at flows less than 165 cfs. In Winter 10 samples need to be taken at flows below 925 cfs. Use of the real time flow data available at the Hollenberg stream gaging station can direct sampling efforts.

For Station 507, in Spring, at least 20 samples should be taken at flow conditions below 200 cfs, with half taken below 40 cfs. In Summer and Fall, 20 samples need to be taken below flows of 200 cfs, a majority of which will be collected at flows less than 10 cfs. In Winter 10 samples need to be taken at flows below 200 cfs. Use of the real time flow data available at the Washington stream gaging station can direct sampling efforts.

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.

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.

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 the Little Blue River. Subsequent decisions will be made regarding implementation approach, follow up of additional implementation and implementation in the nonpriority subwatershed.

**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.