

# KANSAS-LOWER REPUBLICAN BASIN TOTAL MAXIMUM DAILY LOAD

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

### 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Lower Kansas

**County:** Johnson

**HUC 8:** 10270104

**HUC 11:** 140 (entire watershed)

**Drainage Area:** Approximately 60 square miles.

**Main Stem Segments:** 37, starting at confluence of Kansas River, headwaters near Gardner

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**Tributary Segments:** Spoon Creek (75)

**Designated Uses:** Kill Creek, Segment 37, supports Secondary Contact Recreation and all other designated uses. Spoon Creek, Segment 75, supports Secondary Contact Recreation and Expected Aquatic Life

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

**Impaired Use:** Secondary Contact Recreation on Segment 37.

**Water Quality Standard:** Fecal Coliform Bacteria: 2000 colonies per 100 ml for Secondary (KAR 28-16-28e(c)(7)(C))  
Classified streams may be excluded from applying these criteria when streamflow exceeds flow that is surpassed 10% of the time ((KAR 28-16-28c(c)(2))

### 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

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

**Monitoring Sites:** Station 253 near Desoto

**Period of Record Used:** 1987 to 1998

**Flow Record:** Calculated from Blue River Stanley (USGS Station 06893080); recorded daily data from 1974 - 1997 by proportional drainage correction.

**Long Term Flow Conditions:** 10% Duration High Flow Exclusion = 80 cfs; 7Q10 =1 cfs (est)

**Current Condition:** 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 calculated Desoto 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 were seen in Spring and Summer- Fall. Twenty three percent of Spring samples and 12% of Summer-Fall samples were over the secondary criterion. No Winter samples were over the secondary criterion. Overall 11% 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<br>M<br>P<br>A<br>I<br>R<br>M<br>E<br>N<br>T | S<br>E<br>A<br>S<br>O<br>N | MAGNITUDE  | 0<br>TO<br>10<br>% | 10<br>TO<br>30<br>% | 30<br>TO<br>60<br>% | 60<br>TO<br>90<br>% | 90<br>TO<br>100<br>% | F<br>R<br>E<br>Q<br>U<br>E<br>N<br>C<br>Y | Current Condition of Water Quality at Site 253 Over 1987-1997 |
|-------------|--|----------------------------|------------|--------------------|---------------------|---------------------|---------------------|----------------------|---|---|
| KILL CREEK  | F<br>C<br>B                                    | S                          | 900-2000   | -                  | -                   | -                   | -                   | -                    | 23%                                       | 5/43 = 11% Exceedence   |
|             |  |                            | > 2000     | 8                  | 0                   | 0                   | 0                   | 0                    |   |   |
|             |  |                            | > 2 x 2000 | 8                  | 0                   | 8                   | 0                   | 0                    |   |   |
|             | S<br>F   | S                          | 900-2000   | -                  | -                   | -                   | -                   | -                    | 12%                                       |   |
|             |  |                            | > 2000     | 6                  | 0                   | 0                   | 0                   | 0                    |   |   |
|             |  |                            | > 2 x 2000 | 6                  | 0                   | 0                   | 0                   | 0                    |   |   |
|             | W  | W                          | > 2000     | 0                  | 0                   | 0                   | 0                   | 0                    | 0%  |   |
|             |  |                            | > 2 x 2000 | 0                  | 0                   | 0                   | 0                   | 0                    |   |   |

**Desired Endpoint Condition of Water Quality at Station 253 over 2004 -2008**

Overall, the endpoint of this TMDL will be to reduce the percent of samples over the applicable criteria from 11% 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 80 cfs with no samples exceeding the criterion at flows under 12 cfs.
2. Less than 10% of samples taken in Summer or Fall exceed the primary criterion at flows under 80 cfs with no samples exceeding the criterion at flows under 3 cfs.
3. Less than 10% of samples taken in Winter exceed secondary criterion at flows under 80 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 three NPDES permitted wastewater dischargers located within the watershed. The two discharges associated with the Sunflower Ammunition Plant are located above the monitoring site, while Desoto is located near the Kansas River confluence. Based on the monitoring data, these point sources do not appear to contribute to the bacteria impairment. Future permits associated with the proposed Land of Oz development on the Sunflower grounds will need to have disinfection requirements, given the increased wastewater discharges expected from that development.

**Livestock Waste Management Systems:** There are seven livestock operations registered or permitted within the watershed, comprising 1,675 animal units. Five of these operations appear to be in close proximity to Kill or Spoon creeks. Some measure of livestock waste management system is associated with these facilities. Minimizing runoff entering or leaving these facility sites is critical to reducing bacteria loads to the creeks.

**Land Use:** The watershed is thirty percent cropland, 39% grassland and 13% woodland. Grazing density is fairly low, 26 animal units per square mile. Population density is high, 225 people per

square mile. Fifteen percent of the watershed is urban, associated with Sunflower grounds. Urban stormwater may be a contributor to the placement of fecal material and bacteria impairment in the stream. Urbanization of the county is projected to continue to the year 2020.

**On-Site Waste Systems:** A number of residents within Johnson County remain without sewer service, relying instead on on-site waste systems. Failing septic systems contribute bacteria loadings. 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 septic systems is restricted to local areas. However, there are a number of on-site wastewater systems in place in Johnson County. Inspection and complaint numbers for on-site systems in the county are over 300 per year each in 1998 and 1999. Proliferation of on-site systems and the concomitant potential for loading of bacteria is highly probable in the Cedar Creek watershed, presuming sewer service is not provided to the areas lying outside the urban areas.

**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. Some fecal pollution may be contributed by domestic animals at homesteads and parkland, this will be treated among non-point sources in the watershed.

#### **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:** Based on the assessment of sources and the small volume of wastewater discharged from Sunflower, point source contributions are not considered significant in the watershed. Disinfection requirements should be made for any facilities treating the wastewater from the Land of Oz development.

The Wasteload Allocation is defined at the flow condition where the sum of the design flows represents more than 10% of the flow or the 7Q10 flow, whichever is greater, thereby exerting influence on the water quality of the stream. For Kill Creek at this location, that flow condition would be flows of 0-5 cfs. Such flows have been exceeded 25-77% of the time during the three

seasons. 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, location and volume of point source effluent, the distribution of excursions from water quality standards and the relationship of those excursions to flow conditions, non-point sources are seen as the primary cause of water quality violations. The previous assessment suggests that activities in proximity to the stream may be contributing to the bacteria violations. These activities would include small livestock operations near the streams, as well as potentially failing on-site waste systems.

Activities to reduce fecal pollution should be directed toward suburban stormwater management and the smaller, unpermitted livestock operations and homesteads and farmsteads in the rural portion of the watershed. Investigation of runoff from the livestock areas which are registered is warranted. The Load Allocation assigns responsibility for maintaining water quality below the TMDL curve over flow conditions bracketed by the probable point source contributing flow of 5 cfs and the high flow exclusion of 80 cfs. These flows are exceeded 17-77% of the time during the Spring, 7-25% of the time over the Summer and Fall and 9-65% 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 criteria (800 colonies for primary contact recreation; 1900 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.

**State Water Plan Implementation Priority:** The Kill Creek watershed is a high priority TMDL, because implementation of this TMDL will improve support of the Secondary Contact Recreation designated use in a setting which will likely see additional future urbanization and because Kill Creek is a tributary watershed influencing the quality of the lower main stem of the 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:** HUC 140 encompasses the entire watershed. The main stem segment (37) of Kill Creek and Spoon Creek (75) should be the priority focus of implementation because of the proximity of livestock operations to the streams.

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. Maintain necessary state and federal permits and inspect permitted facilities for permit compliance
2. Install necessary manure and livestock waste storage of small operations in watershed.
3. Improve grass buffer strips along the stream.
4. Install necessary stormwater management practices along the Sunflower grounds and in suburban developments.
5. Install necessary pasture management practices, including proper stock density on grasslands
6. Reduce livestock use of riparian areas
7. Insure proper on-site waste system operations in proximity to main stream.

### **Implementation Programs Guidance**

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

- a. Municipal permits for facilities in the watershed will be renewed after 2000 maintaining capacity and disinfection requirements.
- 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.
- e. Development of Phase II stormwater plans will consider quality improvements to Kill Creek.

#### **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. Provide technical assistance on riparian management in urban areas and development of vegetated buffer strips.

#### **Non-Point Source Pollution Control Program - SCC**

- a. Install livestock waste management systems for manure storage
- b. Implement manure management plans
- c. Develop vegetated buffer strips alongside stream

#### **Riparian Protection Program - SCC**

- a. Develop riparian restoration projects
- b. Coordinate with Johnson County Public Works to evaluate riparian conditions.

**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.

**Local Environmental Protection Program - KDHE**

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

**Timeframe for Implementation:** Pollution reduction practices should be installed in areas within one mile of the priority stream segment over the years 2000-2004.

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

1. Facilities without water quality controls
2. Unpermitted permanent livestock areas
3. Sites where drainage runs through or adjacent livestock areas
4. Sites where urban runoff discharges directly into stream
5. Areas of discharge from combined or sanitary sewer overflows.
6. Poor riparian sites
7. 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 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 parties responsible for the activities identified locally for assistance participating in the implementation programs provided by the state. Additionally, sampled data from Station 253 should indicate evidence of reduced bacteria levels at moderate flow conditions relative to the conditions seen over 1990-1998.

**Delivery Agents:** The primary delivery agents for program participation will be Johnson County Public Works personnel, municipal utility officials, the conservation districts for programs of the State Conservation Commission and the Natural Resources Conservation Service. On-site waste system inspections will be performed by Local Environmental Protection Program personnel for Johnson County.

## Reasonable Assurances

**Authorities:** The following authorities may be used to direct activities in the watershed to reduce pollution.

1. K.S.A. 65-164 and 165 empowers the Secretary of KDHE to regulate the discharge of sewage into the waters of the state.
2. K.S.A. 65-171d empowers the Secretary of KDHE to prevent water pollution and to protect the beneficial uses of the waters of the state through required treatment of sewage and established water quality standards and to require permits by persons having a potential to discharge pollutants into the waters of the state.
3. K.A.R. 28-16-69 to -71 implements water quality protection by KDHE through the establishment and administration of critical water quality management areas on a watershed basis.
4. K.S.A. 2-1915 empowers the State Conservation Commission to develop programs to assist the protection, conservation and management of soil and water resources in the state, including riparian areas.
5. K.S.A. 75-5657 empowers the State Conservation Commission to provide financial assistance for local project work plans developed to control 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 Johnson County, \$47,182 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:** Ultraviolet treatment is highly effective in eliminating bacteria in municipal effluent. Non-point source controls for livestock waste have been shown to be effective in reducing pollution in locales such as the Herrington Lake watershed. The key to effectiveness is participation by activities in proximity to the stream. The milestones established under this TMDL are intended to gauge the level of participation in those programs implementing this TMDL.

Should participation significantly lag below expectations over the next five years or monitoring indicates lack of progress in improving water quality conditions from those seen over 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 253, including fecal coliform samples on a rotational basis over each of the three defined seasons. During the evaluation period determining achievement of the desired endpoints of this TMDL over the period 2004-2008, more intensive sampling will need to be conducted under specified seasonal flow conditions in three years of sampling. A majority of samples should be taken below flows conditions below 40 cfs, particularly in the Spring.

While use of the real time flow data available at the Stanley or Stranger Creek stream gaging stations can direct sampling efforts, direct measurement of streamflow is necessary on Kill Creek to confirm the flow conditions assigned to this TMDL, including estimating the high flow exclusion.

Routine sampling of bacteria from effluent discharged from permitted municipal and livestock facilities will also be conducted. Monitoring of stormwater quality should be conducted under the stormwater management program to evaluate loadings and contributions from local sources.

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 Kill Creek. Subsequent decisions will be made regarding implementation approach and follow up of additional implementation.

**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.