

# LOWER ARKANSAS BASIN TOTAL MAXIMUM DAILY LOAD

**Waterbody: Elm Creek**  
**Water Quality Impairment: Ammonia**

## 1. INTRODUCTION AND PROBLEM IDENTIFICATION

**Subbasin:** Medicine Lodge    **Counties:** Barber

**HUC 8:** 11060003    **HUC 11s:** Not applicable

**Drainage Area:** Approximately 168 sq.mi.

**Main Stem Segments:** 3

**Tributary Segments:** Not applicable

**Designated Uses:**    Secondary Contact Recreation; Special Aquatic Life Support; Domestic Water Supply; Food Procurement; Irrigation; Industrial Water Supply; Ground water Recharge; Livestock Watering

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

**Impaired Use:**        **Special Aquatic Life Support on Segment 3**

**Water Quality Standard:** K.A.R. 28-16-28e (c)(2)(F)(ii): Chronic criteria for the aquatic life support use given in tables 1a, 1b, and 1c of K.A.R. 28-16-28e(d) shall apply beyond the mixing zone.

Table 1c will be modified in Summer 2000 to reflect the 1999 E.P.A. Guidance on Ammonia. This modification alters the chronic criteria to be used in this TMDL. The new criteria continue to be protective of the aquatic life support use of Kansas streams.

## 2. CURRENT WATER QUALITY CONDITION AND DESIRED ENDPOINT

**Level of Support for Designated Use under 303d:** Not Supporting at design low flow conditions

**Monitoring Sites:** None

**Period of Record Used:** Ammonia Wasteload Dilution calculations used

**Long Term Flow Conditions:** 30Q10 = 0.62 cfs

**Current Condition:** Wasteload dilution calculations indicate impairment to aquatic life from elevated ammonia concentrations in river at critical low flow.

A permit has been issued to Medicine Lodge, effective May 1, 2000 with an ammonia limit of 2.4 mg/l (as N) at a design flow of 0.4 MGD (0.62 cfs). The permit includes provisions for the city to draft, by May 1, 2001, a facility plan, including a Schedule of Compliance, for improvements to the wastewater treatment facility to consistently meet the limit. The Schedule of Compliance will indicate dates for submitting plans to KDHE, advertising construction bids, begin and complete construction and achieve compliance with permit limits.

The current permit limit, reflecting 1999 Kansas Water Quality Standards (temperature invariant, pH=8.0, 30Q10=0.62 cfs, background NH<sub>3</sub> = 0.15 mg/l) is represented by a graph indicating the associated wasteload for 0.4 MGD of 2.4 mg/l NH<sub>3</sub> (as N). This curve represents the TMDL under existing state water quality standards and is 8.5 pounds per day of ammonia as N.

Based on the newly issued 1999 EPA Guidance on Ammonia and corresponding chronic criteria values, a temperature variant curve is also established for this segment based on a presumed pH of 8.0, the 30Q10 of 0.62 cfs, expected effluent flow of 0.4 MGD and a background level of 0.15 mg/l NH<sub>3</sub> as N. The curve diverges at temperatures below 15 degrees C depending on the presence or absence of Early Life Stages of critical fish species. These curves represent the TMDL for ammonia based on these assumptions which will be protective of the aquatic life in the segment, as supported by the 1999 Guidance. These curves will supplant the 1999 standard curve upon adoption by Kansas and approval by EPA of new ammonia standards, pursuant to the 1999 Guidance.

### **3. SOURCE INVENTORY AND ASSESSMENT**

**NPDES:** There is one NPDES permitted facility located along the river segment which will discharge ammonia under its permit.

Medicine Lodge may discharge up to 0.4 MGD (0.62 cfs) and 2.4 mg/l of ammonia (as N) on monthly average. The renewed permit was issued May 1, 2000.

**Non-point Sources:** Because the impairment is anticipated under critical dry conditions, minimal non-point source contributions are anticipated. Background concentrations entering the reach are assumed to be 0.15 mg/l of Ammonia (as N), a value which is fairly supported by ambient data collected in the basin.

### **4. ALLOCATION OF POLLUTION REDUCTION RESPONSIBILITY**

**Point Sources:** The initial Wasteload Allocation will be based on the current permit limits established for Medicine Lodge and indicated by the curve representing the 1999 Kansas Water Quality Standards. Accounting for the background concentration of 0.15 mg/l, the Wasteload

Allocation is 8 pounds per day NH3 as N for Medicine Lodge.

Upon adoption and approval of the new ammonia standards based on the 1999 EPA Guidance, the Wasteload Allocation may shift to the temperature variant curves. Permit limits on discharges must result in accumulated wasteloads which fall below each of the curves. Monthly allocations will be adjusted on based ambient water temperatures and the presence or absence of early life stages.

Ammonia criteria adopted by KDHE are based upon the effect of ammonia on the most sensitive species of aquatic life at its most sensitive life stage (spawning, hatching and early growth). The combination of these stages is termed Early Life Stage and is applicable to most state waters from March to October. During November to February the Early Life Stages are presumed to be absent. Under current standards, a criterion which is up to 3-fold higher than the normal criterion may be applied when ELS are absent. Under proposed standards, the early life stage absent condition is represented by the upper curve.

The following table illustrates the different Wasteload Allocations available under the proposed standards at various temperatures with and without ELS present.

WASTELOAD ALLOCATIONS FOR MEDICINE LODGE AS FUNCTION OF TEMPERATURE AND ELS

Temperature in Deg C	WLA w/ ELS Present (#/D)	WLA w/ ELS Absent (#/D)
0-7	15.8	26.0
8	15.8	24.3
12	15.8	18.6
15	15.3	15.3
20	10.9	10.9
30	5.5	5.5

**Non-Point Sources:** Based on the instream background level of 0.15 mg/l of Ammonia (as N), the Load Allocation under this TMDL will be 0.5 Pounds per Day of Ammonia (as N). No other non-point source allocations are seen to be necessary.

**Defined Margin of Safety:** The margin of safety is implicit, relying on conservative assumptions used in establishing permit limits. Such assumptions include coincidental occurrence of the 30Q10 with the design flow from the facility, no excursions below pH 8.0 and holding these conditions constant over a 30 day period.

**State Water Plan Implementation Priority:** Because this stream segment may be improved through point source pollution reduction in a relatively short timeframe, this TMDL will be a **High Priority** for implementation.

**Unified Watershed Assessment Priority Ranking:** This watershed lies within the Medicine Lodge (HUC 8: 10060003) with a priority ranking of 49 (Low Priority for restoration work).

**Priority HUC 11s and Stream Segments:** Because of the point source nature of the TMDL, no attention needs to be directed to the adjoining HUC 11 subwatersheds. The priority stream segment of this TMDL will be Elm Creek, Segment 3 below Medicine Lodge.

## **5. IMPLEMENTATION**

### **Desired Implementation Activities**

1. Issue NPDES permits with appropriate ammonia limits so water quality standards are met at critical low flow conditions.

### **Implementation Programs Guidance**

#### **NPDES - Municipal Program Sections- KDHE**

- a. Issue renewed NPDES permits with ammonia limits and schedule of compliance for any treatment plant upgrades which are necessary to reduce ammonia loading in order to meet current or proposed water quality standards.
- b. Evaluate any information on mixing zone geometry within Segment 3 to ascertain the appropriate level of diffusion and dilution of effluent which safely protects designated uses in the segment.
- c. Evaluate information on pH and temperature variation with flow and season and adjust wasteload allocations accordingly.
- d. Evaluate any variation in low flow background conditions which might impact downstream ammonia concentrations.
- e. Set future permit limits in accordance to site specific information, maintaining monthly wasteloads within the designated wasteload allocation region of the TMDL curve.
- f. Evaluate application of Early Life Stage Absent conditions and criteria on permit limits.
- g. Review and approve necessary plans and specifications for treatment plant upgrades in order to achieve compliance with permit limits.

#### **Technical Services Section - KDHE**

- a. Adopt new ammonia water quality standards and surface water quality implementation procedures reflecting the 1999 EPA Guidance on Ammonia.

**Timeframe for Implementation:** NPDES Permits should be re-issued by 2004. Any adjustments to existing permits will be made in 2001-2002. Planned upgrades should be completed prior to 2004.

**Targeted Participants:** Primary participants for implementation will be public works personnel at Medicine Lodge.

**Milestone for 2004:** The year 2004 marks the renewal period for the NPDES permit at Medicine Lodge. At that point in time, any necessary plant upgrades should be completed.

**Delivery Agents:** KDHE staff in the Municipal Program Sections will develop the appropriate permits, schedules of compliance and review of plans. Review of technical information and studies will be made by KDHE staff of the Technical Services Section and the Bureau of Environmental Field Services. Adoption of new water quality standards will be overseen by the Technical Services Section.

**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.S.A. 65-3335 empowers the Secretary of KDHE to provide financial assistance for wastewater treatment through the State Revolving Loan Fund.

**Funding:** The State Revolving Loan Fund is operated through the Municipal Program at KDHE and provides low interest loans for wastewater treatment improvement. Since its inception, \$128 million in loans have been made to municipal dischargers in the state.

**Effectiveness:** Nitrification techniques within mechanical treatment plans, for example, at the Great Bend Plant have been very effective in reducing ammonia concentrations within wastewater effluent. Typical levels of ammonia concentrations from upgraded treatment are well below those necessary to attain designated uses.

## **6. MONITORING**

KDHE will continue to monitor streamflow, pH, temperature and ammonia. Spot sampling should be made if flow conditions fall below 1 cfs. Routine sampling of effluent quality will be a condition of the issued permits with testing frequency consistent with Kansas Surface Water Implementation Procedures.

## **7. FEEDBACK**

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

Medicine Lodge. An active Internet Web site was established at <http://www.kdhe.state.ks.us/tmdl/> to convey information to the public on the general establishment of TMDLs and specific TMDLs for the Lower Arkansas Basin.

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

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

**Milestone Evaluation:** In 2002, evaluation will be made as to the degree of implementation which has occurred along Elm Creek. Subsequent decisions will be made regarding the implementation approach at that time.

**Consideration for 303(d) Delisting:** The river will be evaluated for delisting under Section 303(d), based on the status of construction upgrades to the Medicine Lodge facility in 2002. Therefore, the decision for delisting will come about in the preparation of the 2002 303(d) list. Should modifications be made to the applicable criterion 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.