

**MANUSCRIPT 6**

# **REGULATORY CONSIDERATIONS**

**CITY OF LINCOLN, NEBRASKA  
SALT CREEK WATER QUALITY STUDIES**

**April 3, 2000  
(Original Date)**

**Revised June 16, 2000**

Prepared for the City of Lincoln by Kelly & Weaver, A Professional Corporation

## Summary

- The proposed water quality standard for Salt Creek segment LP2-20000 retains the aquatic life designated use of the Nebraska Surface Water Quality Standards, Title 117, established under the federal Clean Water Act.
- Proposed segment LP2-20000 site-specific implementing water quality standard aquatic life criteria for ammonia are the most appropriately protective of the resource based on meeting the provisions of Ch.4. §003.02A6b(4), “other scientifically defensible procedures” and EPA regulations and guidance including Water Quality Criteria; Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia, 64 *FR* 71974, December 22, 1999, and the Salt Creek Water Quality Studies relating to early aquatic life-stage absence.
- The proposed site-specific criteria for ammonia reflect chemical, biological assessment, and Salt Creek Water Quality Studies toxicity data as a basis for assuring protection of the chemical, physical and biological integrity of the segment under §101(a) Clean Water Act, and EPA regulations and guidance including the EPA 1999 Notice and Update, WQ Criteria for Ammonia, the EPA Technical Support Document for Water Quality-based Toxics Control, 1991, and EPA 305(b) Guidelines for State Water Quality Assessments.
- The proposed winter seasonal criteria is based on the 1999 EPA Update of Water Quality Criteria for Ammonia because of the absence of early life-stages of fish in Salt Creek.
- Water quality criteria determination factors including magnitude, frequency, and duration of exposure such as flow, pH, and temperature are bases for the establishing site-specific aquatic life criteria, total maximum daily load wasteload allocations and NPDES permit requirements, under the Act, EPA Regulations at 40 C.F.R. Part 131 and 130, and EPA guidance including TSD for Water Quality-based Toxics Control. 1991.
- Compliance with water quality standards including as provided under NPDES permits is determined at the edge of the mixing zone for discharges to water bodies under EPA regulations at 40 C.F.R. Part 131, Nebraska Title 117, Ch. 2, §010, and EPA guidance including the EPA TSD, 1991.
- Water quality monitoring in water bodies is a method of assuring protection of the streams and assessing water quality standard compliance. *See*, EPA regulations including 40 C.F.R. Part 130 and EPA 305(b) Guidelines for State Water Quality Assessments.

## 1.0 INTRODUCTION

During 1999 and in 2000, the City of Lincoln ("Lincoln" or "City") conducted additional ambient monitoring and water quality assessment for Salt Creek segment LP2-20000. This monitoring and assessment was conducted to further address questions about chronic impacts of ammonia on the biota of the segment through additional *in situ* test data and additional bio-assessment data. This reported in [Manuscripts 1-5](#) above, is in addition to the Salt Creek Water Quality Studies ("SCWQSs") comprehensive database, as described in the Work Plan dated June 4, 1998; the Technical Addendum #1 dated June 21, 1999 based in part of peer review comments; and discussion with Water Environment Research Foundation Peer Review Panel members since June, 1999.

The purpose of this Manuscript 6 is to summarize the legal and Environmental Protection Agency ("EPA") policy and guidance supporting the scientific defensibility, as stated in the peer review charge, of the methodology and information reported by the Salt Creek Water Quality Studies, which is the basis for the site-specific water quality criteria of 2.1 mg N/L total ammonia for the summer regulatory season and 5.4 mg/l total ammonia for the winter regulatory season as presented in [Manuscript 5](#) for Salt Creek Segment LP2-20000.

During January and February 2000, Lincoln and the Nebraska Department of Environmental Quality have discussed in several meetings and contacts: (1) the use of the SCWQSs data including this additional data to develop a site-specific ammonia criteria, and (2) options for establishing a point of compliance for ammonia including at the edge of the mixing zone for the two Lincoln wastewater treatment plants ("WWTP's"), Theresa Street and Northeast. This Report focuses on these two areas of consideration, and the Panel's review of the scientific defensibility is the key part of the peer review charge.

## 2.0 SITE-SPECIFIC WQS SUBUSE AND CRITERIA, SCIENTIFICALLY DEFENSIBLE APPROACH

The SCWQSs have focused on the development of a site-specific WQS criteria for ammonia as authorized by the Clean Water Act and favored by EPA regulations at 40 C.F.R. Sec.131.11(b)(ii) and the Nebraska Surface Water Quality Standards, Title 117, and EPA guidance. The Salt Creek Water Quality Studies ("SCWQSs") document and characterize natural and human induced conditions related to channelization for flood protection, salinity, other biological and habitat conditions, and the actual stream use of segment LP2-20000. This characterization also documents the absence of fish early life stages and adult reproducing species during winter months. *See*, especially, EPA regulations at 40 C.F.R. §131.10(c), and EPA guidance for refinement of subuses in the Advanced Notice of Proposed Rulemaking for the Water Quality Standard Regulation.

The City's approach has developed a site-specific standard criteria using a "scientifically defensible procedures" approach, one of four options for developing site-specific criteria. *See* Ch.4, Sec.003.02A6(b)(4), Nebraska Title 117. Various EPA guidance documents also provide for use of a scientifically defensible approach including Notice of Availability; 1999 Update of Ambient Water Quality Criteria for Ammonia, 64 *FR* 71974, December 22, 1999. The Water Environment Research Foundation Peer Review Panel charge requested review of the SCWQS data and suggested

criteria options as to its scientific defensibility for setting site-specific criteria.

The Work Plan and Technical Addendum #1 provide for basing a site-specific criteria proposal on the use of *in situ* test result and bio-assessment data relating instream ammonia concentrations to the condition of the biological resource in the stream, with a seasonal adjustment factor for temperature and pH. The *in situ* test method was developed using in-stream method development tests. The method development tests and the actual 1999 stream *in situ* tests are supported by laboratory tests for quality control and quality assurance purposes.

Lincoln has provided previously a report of examples of where *in situ* test data has been used to make regulatory decisions generally under the Clean Water Act. The City recognizes that the underlying data sets and resultant findings for *in situ* tests, bio-assessment work, supporting laboratory data, and other related work meet the intent of data quality objectives of precision, accuracy, representativeness, repeatability and completeness ("PARRCs") for regulatory purposes toward establishing site-specific criteria for Salt Creek Segment LP2-20000. *See*, Manuscript 1.

The EPA 1999 Ammonia Criteria Update, includes pH and temperature factors in the laboratory derived numeric values, and provisions relating to their application in the absence of fish early life stages such as in winter months. The Nebraska Environmental Quality Council adopted amendments to the Title 117 WQS criteria for ammonia to reflect the 1999 EPA Update. Among the questions for the Peer Review Panel is whether site-specific criteria using seasonal adjustment factors from either of the EPA Ammonia Updates is scientifically defensible.

Scientific and technical manuscripts for the (1) *in situ* test data; and (2) the bio-assessment data to support the values in the 1999 are provided herein for review.

### **3.0 COMBINING *IN SITU*, BIO-ASSESSMENT, AND TOXICITY DATA TO DERIVE WQS CRITERIA FOR AMMONIA**

#### **3.1 Applicable Clean Water Act and EPA Policy Provisions**

The combined use of bio-assessment, chemical, and toxicity data to derive the proposed site-specific ammonia criteria relies on all types of available water quality data and information, not just one type and is therefore more legally, as well as scientifically, sound than would reliance on only one type of data. This integrated or combined data approach reflects the goal of the federal Clean Water Act to ensure the biological, chemical and physical integrity of the nation's waters by is supported by EPA policy, regulations and guidance.

The use of all such scientifically sound water quality data including bio-assessment data to make criteria and wasteload allocation decisions is reflected in the Clean Water Act, particularly Section 101(a), to protect the chemical, biological and physical integrity of the nation's waters as implemented in various EPA regulations and guidance such as EPA's Technical Support Document for Water Quality-Based Toxics Control, the EPA Guidelines for State Water Quality Assessments using bio-assessment, chemical and toxicity data, and scientific defensibility.

Applicable EPA policies and guidances include the EPA Technical Support Document for Water Quality-based Toxics Control, 1991, particularly §1.5; the EPA Section 305(b) Guidelines for State Water Quality Assessments; the EPA Advanced Notice of Proposed Rulemaking for the Water Quality Standard Regulation, July 1998, an expression of present Agency thinking; and other EPA scientific and regulatory guidance. Examples of the Agency's policy and guidance on combined use include:

EPA Policy on the Use of Biological Assessments and Criteria, 1991, (often identified as policy on independent application):

“States are encouraged to implement and integrate all three approaches in their water quality programs and apply them in *combination* or independently as site-specific conditions and assessment objectives dictate.”

States “may adopt criteria based on biological monitoring or assessment methods consistent with information published pursuant to section 304(a)(8) . . .”

“Biosurveys can detect aquatic life impacts that other available assessment methods may miss...”

EPA Advanced Notice of Proposed Rulemaking for the Water Quality Standard Regulation at p.119 of 132:

“Thus, if any one of the three assessment methods demonstrate that WQS are not attained, it is U.S. EPA's policy that appropriate action should be taken to achieve attainment, including use of regulatory authority.”

“For aquatic life uses, all three data types (chemical, toxicological, and biological) should be used when evaluating the reasonable potential for a discharge to cause or contribute to an excursion above a water quality criterion, and if one approach indicates that water quality is, or will be, impacted, the results from the other methods could not be used to refute that finding.”

EPA Technical Guidance Manual for Performing Wasteload Allocations, 1984: Coordinate biological and chemical surveys can help in: “identifying culprit pollutants” and “substantiating the criteria values.”

EPA 305(b) Guidelines for State Water Quality Assessments:

“Biological should be weighted more heavily than other data types.”

“In particular, it is recommended that the results of biological assessments, especially those with high levels of information, be the basis for overall ALUS determination if the data indicate impairment. This is because the biological data provide a direct measure of the status of the aquatic biota and detect the

cumulative impact of multiple stressors on the aquatic community, including previously undetected stressors. This approach is consistent with EPA' Policy on Independent Application . . . while incorporating a weight of evidence approach in determining the degree of impairment (partial or nonsupport).”

Reliance on any one type of water quality data to the exclusion or overriding of other types of data is not considered by EPA to be sound scientifically or as a matter of public policy.

### **3.2 EPA 1999 WQ Criteria Update for Ammonia**

The *Federal Register* notice issuing the 1999 Update of Water Quality Criteria for Ammonia published on December 22, 1999, recognizes that states may adopt numeric criteria based on “. . . other scientifically defensible methods. 40 CFR 131.11(b)(1).” 64 *FR* 71980. The *FR* notice also recognizes that ammonia criteria may be established for waters where fish early life-stages are absent including on a site-specific basis. 64 *FR* 71978.

The EPA 1999 Update provides guidance as to how the early life-stage absent criteria can be applied:

To best determine when the ELS-absent provision should be applied, all readily available information regarding the fish species distributions, spawning periods, nursery periods and the duration of sensitive life stages found in the waterbody should be considered. Information on waterbody temperature might also be useful. Expert opinions from fisheries biologists and other scientists should be considered, and where it can be obtained, the consensus opinion from a diverse body of experts may be heavily relied upon. The determination of the timeframe during the year when sensitive life stages are most likely not to be present in numbers that, if chronic toxicity did occur, would affect the long-term success of the fish populations, should include a record of information adequate to withstand public scrutiny. EPA will use this record as the basis upon which to approve or disapprove the standard. The record should clearly explain all the factors and information considered in arriving at the determination. EPA does not have minimum data requirements for these determinations; however, States and Tribes should rely on the preponderance of available information. Without adequate and reliable information, EPA would make the judgment that sensitive life stages are present and must be protected at all times of the year.

64 *FR* 71979. The documentation in Manuscript #1 of this report for winter seasonal criteria in the absence of fish early life stages is consistent with this EPA guidance.

### **3.3 Application to Salt Creek**

Over the course of the WERF Peer Review Panel's involvement in this project, and before, Lincoln has been considering ways of combining the site-specific ammonia criteria derived from the *in situ* test and the bio-assessment data, as well as toxicity data. The criteria values derived using *in situ*

test data are full-scale chemical and toxicity tests representing instream conditions; the findings of which are based on ammonia properties as a single toxicant. The criteria values derived using both *in situ* test data and bio-assessment data related to instream ammonia concentrations reflect the long-term condition of Salt Creek biological communities.

A summary of the procedural rationale for combining all types of water quality data for deriving a site-specific criteria for Salt Creek, as reflected in Tables 5-1 and 5-2 of [Manuscript 5](#), is:

The combined consideration of bio-assessment, *in situ* chemical test, and toxicity test data used to characterize ammonia impact and to derive a site-specific criteria using the following steps:

1. Bio-assessment data is the most scientifically direct measure of impact, integrates all stream impacts over time, and can detect impacts which other sources of information may miss. The bio-assessment value of greater than 2.1 mg/l as the “floor” or most stringent value for bio-assessment data was derived by correlating fish and macroinvertebrate impacts at various sample sites to the concentration of total ammonia at each of those sites.
2. Chemical data developed through site-specific *in situ* testing of 30 days continuous duration is a “snap-shot” or short-term chronic exposure situation and is sound for identifying the *source* of impact. The *in situ* chemical data value of 1.4 mg/l reported on Table 5-1 for channel catfish summer season, while not a complete measure of impact, is functionally equivalent to the bio-assessment value.
3. The toxicity study value of 4.4 mg/l derived by effluent toxicity tests for the summer season is the least stringent ammonia value among the three types of water quality data, and corroborates the bio-assessment value of 2.1 mg/l as the floor or minimal value.
4. Considering all three types of data, the “greater than” 2.1 mg/l bio-assessment value is bounded by the chemical and corroborating toxicity values for the summer season:
  - Toxicity data value for ammonia: 4.4 mg/l
  - Bio-assessment data value for ammonia: 2.1 mg/l
  - Chemical *in situ* test data value for ammonia: 1.4 mg/l

The 2.1 mg/l value is more stringent than the central tendency equivalent value of 2.9 mg/l between the toxicity and chemical *in situ* summer season values for ammonia.

5. Instream, ambient monitoring is proposed to continue under §305(b) Clean Water Act for Salt Creek segment LP2-20000 as one of several appropriate responses under EPA guidance to assure attainment of the WQS use.

This procedure which considers all available site-specific water quality data and information supports the goals and provisions of the Clean Water Act and EPA guidance.

#### **4.0 WASTELOAD ALLOCATION AND POINT OF COMPLIANCE**

Lincoln has been seeking a total maximum daily load wasteload allocation for use in determining compliance with the site-specific water quality standard criteria for ammonia at the edge of the mixing zone for each of the two city WWTPs, as provided by EPA regulations at 40 C.F.R. Part 130, implementing Section 303(d) CWA. (Part 130 is presently under revision by the Agency in the rulemaking process.) *See* also Nebraska Title 117, Ch. 2 §010 relating to the use of mixing zones for WWTP discharge regulation. Compliance with water quality standards including as provided under NPDES permits is determined at the edge of the mixing zone for discharges to water bodies under EPA regulations at 40 C.F.R. Part 131, Nebraska Title 117, Ch. 2, §010, and EPA guidance including the EPA TSD, 1991.

Compliance with water quality standards by the two WWTPs at the edge of the respective mixing zone would be assured by continuing and frequent ambient stream monitoring providing biological, chemical, and toxicity data to also supplement the SCWQSs data. Abundant ambient data as well as continued end-of-pipe monitoring would be used to manage each of the WWTPs, as well as determining compliance with the respective NPDES permits. Additionally, Lincoln is further considering the application of EPA regulations at 40 C.F.R. §122.44(d), which provide for determinations of reasonable potential to exceed water quality standards before including discharge limits in NPDES permits.

Recent discussion with NDEQ has included an approach for determining NPDES permit compliance for the WWTPs at the edge of the mixing zones to be developed consistent with EPA regulations and guidance and any determination of reasonable potential to exceed the site-specific WQS criteria. That optional approach suggested here by Lincoln includes: (1) establishing the point of compliance determination under the NPDES permits at the edge of each respective WWTP mixing zone; (2) continuing end of pipe monitoring particularly for WWTP management purposes; and (3) a process by which:

- An exceedance of the criteria at the edge of the mixing zone would be an exceedance or violation of a permit requirement;
- A review of the edge of the mixing zone value would be triggered by an exceedance of an end-of-pipe value;
- An exceedance of the end-of-pipe value but not edge of mixing zone criteria/ WLA would result in a finding of no permit violation.

The wasteload allocation based on a total maximum daily load allocation and point of compliance determination can be established in a water quality management plan authorized under Sections 303 and 208 of the Clean Water Act and EPA implementing regulations at 40 C.F.R. Part 130.

#### **5.0 CONCLUSION.**

The proposed Salt Creek segment LP2-20000 site-specific water quality standard criteria for ammonia is based on consideration of the capabilities of water quality data from bio-assessments,

chemical impact sampling through *in situ* tests, and whole effluent toxicity tests. The procedure used to develop the site-specific criteria is one of four authorized in Nebraska regulations and EPA guidance as “other scientifically defensible procedures.” This procedure option was used so that all types water quality would be used to focus on the biological and toxicological as well as chemical integrity of Salt Creek. The application of this procedure to Salt Creek has been subject to the scientific peer review arranged by the Water Environment Research Foundation.

**Electronic Version:** [Return to Start of Report](#) (for Table of Contents)