The State Continuing Planning Process for Water Quality Management

A Compilation of the Processes Utilized by the Nebraska Department of Environmental Quality's Water Quality Division for Implementing Water Quality Management Programs and Activities in Nebraska

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

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LISTING OF CONTENTS

LISTING OF CONTENTS (Continued)

§303(e) CONTINUING PLANNING PROCESS

INTRODUCTION

CPP Document Number: 1.0

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1.0 INTRODUCTION

1.0 What is the Continuing Planning Process?

The primary goal of the Federal Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Wherever attainable, water quality is to provide for the protection and propagation of fish, shellfish, and wildlife and provide for recreation in and on the water (fishable/swimmable goal). Section 303(e) of the CWA requires each State to have an approved Continuing Planning Process (CPP) that will result in plans for all navigable waters within such State. 40 CFR Part 130.5 states that each State is responsible for managing its water quality program as specified in the State's CPP. Thus, the CPP provides direction and a framework from which to build and implement a State's water quality program towards the CWA goal. The Nebraska Department of Environmental Quality, Water Quality Division's (NDEQWQD) CPP is intended to provide this direction and framework by compiling strategy, planning and procedural documents that lead to implementation of water quality management programs and activities.

1.1 Federal Clean Water Act Requirements for the Continuing Planning Process

The CPP is to be reviewed from time to time to insure that the planning process is at all time consistent with the CWA. As such, the NEDQWQD will revise Nebraska's CPP, as necessary, to insure compliance with this requirement.

Nebraska's first CPP was prepared in 1976 by the Nebraska Natural Resources Commission in cooperation with the Nebraska Department of Environmental Control and the Nebraska State Office of Planning and Programming. Prior to the current revisions, the Nebraska Department of Environmental Control last revised the CPP in 1984.

40 CFR Part 130.5 that States may determine the format of their CPPs as long as the minimum requirements of the CWA and this regulation are met. The following processes must be described in each State CPP, and the State may include other processes at its discretion.

(1) The process for developing effluent limitations and schedules of compliance at least as stringent as those required by sections 301(b) (1) and (2), 306 and 307, and at least as stringent as any requirements contained in applicable water quality standards in effect under authority of section 303 of the CWA.

(2) The process for incorporating elements of any applicable areawide waste treatment plans under section 208, and applicable basin plans under section 209 of the CWA.

(3) The process for developing total maximum daily loads (TMDLs) and individual water quality based effluent limitations for pollutants in accordance with section 303(d) of the CWA and § 130.7(a) of this regulation.

(4) The process for updating and maintaining Water Quality Management (WQM) plans, including schedules for revision.

(5) The process for assuring adequate authority for intergovernmental cooperation in the implementation of the State WQM program.

(6) The process for establishing and assuring adequate implementation of new or revised water quality standards, including schedules of compliance, under section 303(c) of the CWA.

(7) The process for assuring adequate controls over the disposition of all residual waste from any water treatment processing.

(8) The process for developing an inventory and ranking, in order of priority of needs for construction of waste treatment works required to meet the applicable requirements of sections 301 and 302 of the CWA.

(9) The process for determining the priority of permit issuance.

1.2 Water Quality Management Programs and Activities Included in the Continuing Planning Process

Nebraska's CPP is compilation of stand-alone strategy, planning and procedural documents that lead to implementation of water quality programs and controls. These documents are program or activity specific and provide the guidance to implement the various programs within NDEQ's Water Quality Division. The documents included in the CPP are organized according to the following categories:

Identification of Water Quality Monitoring Needs
Development and Implementation of Surface Water Quality Standards
Development and Implementation of Ground Water Quality Standards
Implementation of the National Pollutant Discharge Elimination System (NPDES) Permitting Program
Implementation of the Total Maximum Daily Load (TMDL) Program
Implementation of the Nonpoint Source (NPS) Management Program
Basin Management Planning
Miscellaneous Water Quality Management Planning

In addition, the CPP includes identification of specific water quality management plans and priorities to date. The NDEQWQD intends this CPP to be working guidance and a dynamic document. As such, the CPP includes a schedule for development and revision of CPP components. In order to aid readers, various sections are dated on the bottom of each page. The dates represent the last revision of each section.

SURFACE WATER QUALITY MONITORING STRATEGY

CPP Document Number 2.1

Prepared by:

Water Quality Division
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TABLE OF CONTENTS

Page

1. INTRODUCTION

1.1 WHY A SURFACE WATER QUALITY MONITORING PROGRAM IS NEEDED IN NEBRASKA

Water quality monitoring is an integral component for the successful management and protection of Nebraska's surface water resources. A monitoring program can provide the information needed by decision-makers to implement effective surface water quality management programs and activities. The Intergovernmental Task Force on Monitoring Water Quality (ITFM, 1995) defines water quality monitoring as an integrated activity for evaluating the physical, chemical, and biological character of water in relation to human health, ecological conditions, and designated water uses. Some key questions that can be answered by a properly designed surface water quality monitoring program include:

- What is the water quality condition of the state's surface water resources?
- Are surface water quality goals and standards being met in Nebraska?
- Where, how, and why are surface water quality conditions in the state changing over time?
- Where are the problems related to surface water quality and what is causing the problems?
- How extensive are any identified surface water quality problems and what are the options for their control?
- Are control measures to prevent or remediate surface water quality problems working effectively in Nebraska?

The Nebraska Department of Environmental Quality (NDEQ) recognizes the importance of a properly designed monitoring program for the effective implementation of the state's surface water quality management programs. The NDEQ has prepared this document, "*Surface Water Quality Monitoring Strategy*", to facilitate the development and implementation of its surface water quality monitoring efforts.

1.2 MONITORING PROGRAM DESIGN CONSIDERATIONS

An effective monitoring program will provide the critical information needed by decision makers to effectively implement and evaluate surface water quality management programs and activities. Properly designing a monitoring program will ensure that it effectively delivers the critical information needed by water quality analysts and managers. A poorly planned monitoring program may result in the expenditure of significant time and resources to generate information that is of little or marginal use to decision makers. An effective monitoring program will be supported by a monitoring strategy that, among other things, clearly defines and identifies data needs and usage, monitoring objectives, and data collection approaches to be utilized.

To ensure that a monitoring program is properly designed, it is imperative that a Systematic Planning Process (SPP) be utilized to develop data quality objectives (DQOs) for all data collection efforts. DQOs are qualitative and quantitative statements developed by data users that establish the variability that can be tolerated by the user and still meet the needs of the program. DQOs clarify the objectives for monitoring, define the most appropriate type of data to collect, determine the most appropriate conditions from which to collect the data, and specify tolerable limits on decision errors which will be used as the basis for establishing the quantity and quality of data needed to support the decision. Establishment of DQOs involves the interaction of program managers and technical staff in deciding what information is needed, why it is needed, how it will be used, how it will be collected, and any time/resource constraints affecting data collection. By involving everyone who plans to use the data, as well as the groups assigned to collect it, one can increase the likelihood that it will meet the needs of the user(s). The SPP is a concept, planning process and product for ensuring environmental data are of the type, quantity, and quality needed for making decisions. It provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, the tolerable level of decision errors for the program, and how many samples to collect. The outputs of the SPP should be clearly articulated in a monitoring strategy that supports the monitoring program defined to facilitate the implementation and evaluation of the identified water quality management program and/or activity.

1.3 FEDERAL CLEAN WATER ACT REQUIREMENTS

The federal Clean Water Act (CWA) contains several mandates regarding surface water quality monitoring. Among other things, the CWA requires the states, in cooperation with the U.S. Environmental Protection Agency (EPA), to perform the water quality monitoring necessary to: 1) establish, revise, and implement the states water quality standards; 2) systematically assess ambient water quality and report on conditions and trends; 3) identify waterbodies impaired by point and nonpoint sources of pollution; 4) develop total maximum daily loads (TMDLs); 5) development discharge permit limits in compliance with the National Pollutant Discharge Elimination System (NPDES) and assess discharger compliance with NPDES provisions; and 6) assess the effectiveness of implemented best management practices (BMPs) for the management of nonpoint source pollution. To facilitate the States' implementation of these mandates, the CWA provides funding under Sections 104(b)(3), 106, 319, and 604(b).

In their report "*Surface Water Monitoring: A Framework for Change*" (USEPA, 1987), the EPA suggests that states should be encouraged to design their monitoring programs to address all types of surface water quality monitoring. Their programs should attempt to use cost-effective source assessments in conjunction with biological monitoring to help identify specific pollutants likely to contribute to water quality problems. The actual effectiveness of state monitoring programs will be judged to a great extent by the degree to which they in fact deliver information that the state and EPA decision-makers need to manage for environmental results.

1.4 DEFINITIONS

This strategy uses a broad definition of "water quality monitoring", encompassing all of the activities that provide biological, chemical, geological, physical, and/or environmental data necessary for the implementation of surface water quality management programs. Integral components of monitoring include: 1) defining monitoring objectives, 2) identification of data needs and usage, 3) sample collection and analysis, 4) data storage and management, 5) data evaluation and reporting, and 6) development and implementation of quality assurance/quality control (QA/QC) provisions. Although the relative importance of these activities may vary depending on the purpose of the monitoring, they should always be a part of any monitoring effort.

2. STATE SURFACE WATER QUALITY MANAGEMENT AND MONITORING GOALS

2.1 STATE WATER QUALITY MANAGEMENT GOALS

The water quality management goals identified for the state of Nebraska for the facilitation of implementing the state's surface water quality management programs and activities are as follows:

- Maintain a water quality monitoring program that provides the information needed for the effective management of surface water quality in the state.
- Assess the water quality of all significant surface water resources in the state, and periodically identify and prioritize surface waters impaired or threatened by water pollution.
- Known water quality impairments resulting from surface water pollution will be abated, and significant threats to water quality from present and future sources of surface water pollution will be prevented.
- Establish and/or maintain strong working partnerships and collaboration with appropriate local, state, and federal agencies/entities and private sector and public groups regarding surface water pollution management.
- Inform the citizenry and encourage them to take individual and collective action to prevent and reduce surface water pollution.
- Maintain state water quality management programs that are effective and responsive in managing surface water pollution.

2.2 STATE SURFACE WATER QUALITY MONITORING GOALS

The following state surface water quality monitoring goals have been developed to articulate the overall monitoring needs of Nebraska's surface water quality management programs and activities:

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- In accordance with the federal CWA, prepare a Section 303(d) list, based on credible data, that identifies waterbodies impaired or threatened by surface water pollution.
- Collect the data necessary to develop water quality-based effluent limitations where Total Maximum Daily Loads (TMDLs) are not established.
- Collect the data necessary to develop credible surface water quality management plans (i.e., Basin Management Plans, Watershed Management Plans, and TMDLs).
- Collect the data necessary to determine if regulated entities are in compliance with specified permit conditions regarding surface water discharges.
- Collect the data necessary to credibly determine if implemented water pollution control measures effectively improved or protected surface water quality.
- Develop credible water quality criteria for the protection of surface water quality in Nebraska.
- Collect defensible data to support enforcement actions regarding surface water quality regulations.

3. APPROACHES FOR MONITORING SURFACE WATER QUALITY IN NEBRASKA

3.1 GENERAL SURFACE WATER QUALITY MONITORING APPROACHES

Surface water quality monitoring approaches can be characterized as either source or ambient monitoring. Source monitoring involves assessing and evaluating the composition of industrial or municipal effluent discharged into waterways, and of the "mixing zones" where this wastewater merges with the receiving water. Ambient monitoring refers to all forms of monitoring conducted beyond the immediate influence of a "discharge pipe", including sampling of sediments and living resources. The main approaches to source and ambient surface water quality monitoring include:

Source Monitoring:

- **Self-monitoring of effluent** by industrial and municipal dischargers to check for compliance with permit conditions (i.e., Discharge Monitoring Reports – DMRs).
- **Compliance sampling inspections** by the NDEQ or EPA to provide a cross check on discharger self-monitoring (i.e., Compliance Monitoring).
- **Effluent characterization studies** to determine the constituents of the wastestream and/or characteristics of the mixing zone.

Ambient Monitoring:

- **Networks of "fixed stations"**, locations where water samples are systematically collected over time to provide an overview of water quality conditions and trends at a specific site and across the entire area covered by the network.
- **Intensive surveys**, which are more detailed studies of water quality conditions, sediments, and/or aquatic life at specific sites or relatively well-defined geographic areas such as stream segments, lakes, and watersheds.
- **Statistically-designed special studies**, most often one-time surveys with a given geographic overage and a specific focus.

3.2 SURFACE WATER QUALITY MONITORING APPROACHES UTILIZED BY THE NDEQ

In implementing its surface water quality monitoring efforts, the NDEQ currently utilizes the following data collection approaches:

- Long-term fixed station ambient monitoring,
- Rotating basin monitoring,
- Detailed watershed assessments,
- Self-monitoring of effluent (Discharge Monitoring Reports – DMRs),
- Compliance sampling inspections,
- Special studies,
- Investigative monitoring, and
- Volunteer monitoring.

3.2.1 Long-Term Fixed Station Ambient Monitoring

Long-term fixed station ambient monitoring is intended to provide information that will allow the NDEQ to describe the status and trends of surface water quality in Nebraska. This type of sampling consists of systematically collecting samples at the same location over a long period of time (i.e., collecting monthly water samples at the same site for several years). The NDEQ is currently implementing a long-term fixed station ambient monitoring network for selected streams across the state. Both instream water quality and fish tissue samples are being collected as part of this effort. Monitoring objectives for the instream water quality sampling include: 1) characterize the broad-scale geographic and seasonal distribution of the water-column water-quality conditions of the state's streams and rivers, and 2) evaluate geographic and seasonal distributions of water-column water-quality conditions of the state's streams and rivers in relation to the sources, transport, fate, and effects of contaminants.

3.2.2 Rotating Basin Monitoring

The NDEQ initiated the Basin Management Approach (BMA) in April of 1994 (NDEQ, 1994). The BMA seeks to improve the efficiency and effectiveness of implementing water quality management activities by geographically focusing water quality planning activities on a 5-year rotating basis among the state's 13 major river basins. The 13 major river basins in the state are: Big Blue, Elkhorn, Little Blue, Loup, Lower Platte, Middle Platte, Missouri Tributaries, Nemaha, Niobrara, North Platte, Republican, South Platte, and White River-Hat Creek. The following 14 steps were identified for implementation of the BMA (NDEQ, 1994):

- Step 1: Draft Strategic Monitoring Plan
- Step 2: Initial Public Outreach
- Step 3: Implement Strategic Monitoring Plan
- Step 4: Canvas for Information
- Step 5: Analyze Information
- Step 6: Prioritize Problems and Critical Issues
- Step 7: Continue Public Outreach
- Step 8: Implement Updates to Strategic Monitoring Plan
- Step 9: Quantifying Problems and Issues
- Step 10: Develop Management Strategies
- Step 11: Prepare Draft Basin Plans
- Step 12: Perform Agency and Public Review
- Step 13: Finalize Basin Plan
- Step 14: Implement Basin Plan

Implementation of the BMA from 1994 through 2000 has moved through the first 5 steps. Most of the activities to date have involved monitoring and analyses for assessment of surface water quality beneficial use support and the identification of probable pollutants of concern. If the BMA is to move forward towards its goal of developing *Basin Plans* which articulate water quality management strategies, data collection and analysis activities need to be expanded to address the quantification of problems and issues (e.g., pollutant loadings, model calibrations, TMDL development, etc.).

3.2.2.1 Beneficial Use Assessment and Identification of Pollutants of Concern

Basin monitoring for the assessment of beneficial use support and the identification of probable pollutants of concern has occurred since 1994. This information has been published in the NDEQ's biennial 305(b) water quality reports. This monitoring has consisted of short-term (i.e., one-year) fixed station monitoring of streams and lakes in the targeted basins where weekly or monthly samples were collected and analyzed for selected parameters.

3.2.2.2 Quantification of Problems and Issues

Basin monitoring for the quantification of problems and issues is concerned with the collection of information that will move implementation of the BMA through Step 9 (see above) and beyond. The BMA framework document describes the "Quantification of Problems and Issues" (Step 9) as follows:

> *"Additional problem quantification will be performed, where required, to establish the magnitude of a problem, determine assimilative capacity, calculate loads for contributing sources of pollutants of concern, or otherwise characterize problems such that sufficient information is available for management strategy development. Activities will include field calibration of models and development of TMDLs."*

The purpose of this monitoring is to collect and analyze information that will allow the NDEQ, within the targeted basins, to 1) determine the magnitude of identified surface water quality concerns and problems; 2) determine the assimilative capacity of waterbodies of concern; 3) calculate and/or verify loads for contributing sources of pollutant of concern [i.e., wasteload allocations (WLAs) and load allocations (LAs)]; and 4) collect any additional information on identified problems to fully characterize the surface water quality concern and allow for the development of TMDLs if necessary.

The objectives that have been defined for the "BMA -- Quantification of Problems and Issues" monitoring effort include:

- Determine the assimilative capacity of identified waterbodies for pollutants of concern within the targeted river basins. This will include the definition of appropriate *design conditions* for the determination of assimilative capacity and a review of available gaging information for flow analyses.
- Collect the information necessary to calibrate any water quality models to be used for planning purposes within the targeted basins. Models may be those to be applied at a basin, watershed, stream reach, or lake scale.
- Estimate existing instream loadings for pollutants of concern for identified waterbodies within targeted river basins. Characterize the seasonal/temporal, and if appropriate spatial, variation in the estimated instream loadings. Ascribe, as possible, instream loadings to nonpoint source, background, and contributing individual point sources.
- Collect the information necessary to develop TMDLs or identify the additional information needed to facilitate the development of individual TMDLs for identified waterbodies. As appropriate, develop WLAs and LAs.
- Identify any data deficiencies regarding the quantification of problems and issues that need to be addressed and incorporated into updates to strategic monitoring plans.

3.2.3 Detailed Watershed Assessments

The purpose of detailed watershed assessments is to collect the information, as necessary, to facilitate implementation of the state's Nonpoint Source (NPS) Management Program. The information collected is used to facilitate the development and implementation of a watershed-specific NPS water quality management plan. The identification of watershed-specific NPS pollutants, sources, loadings, necessary loading reductions, contributing critical areas, and calibration and validation of needed models are an integral part of any watershed management plan developed to address NPS pollution.

3.2.4 Self-Monitoring of Effluent (Discharge Monitoring Reports – DMRs)

It is the responsibility of each NPDES permitted facility to collect a wastewater sample, have it analyzed, and submit the results to the NDEQ on DMR forms. The frequency of sample collection varies depending on the permit (e.g., weekly, monthly, quarterly). DMRs are submitted to the NDEQ on a quarterly basis. The number and type of parameters to be monitored by the permittee also varies. Most municipal facilities will monitor such things as biochemical oxygen demand (BOD), total suspended solids, pH, fecal coliform bacteria, flow rates and in some cases heavy metals and ammonia. Industrial facilities could be required to monitor the same parameters and also such things as temperature and toxic organic compounds. Many facilities, both municipal and industrial, are required to do biomonitoring of their wastewater discharges to indicate if the discharge is toxic to aquatic life. The NDEQ has the ability to require the dischargers also to sample water quality instream if it is deemed necessary.

3.2.5 Compliance Sampling Inspections

The NDEQ or EPA usually conducts compliance monitoring. In many cases automatic composite samplers are utilized. Typically a wastewater sample will be collected each of three days at a permitted facility. Sample collection involves taking field blanks, proper sample preservation, and various collection techniques for different types of analysis. A given facility can have as many as 116 compounds listed in their permit requiring 10 analytical techniques. There can also be several discharge points at each facility. This makes sample collection a complex task. The monitoring findings are usually summarized in a report prepared by the NDEQ or EPA.

3.2.6 Special Studies

Special studies are conducted on a periodic basis to collect information to address specific surface water quality concerns or questions. Special surface water quality studies currently being conducted or facilitated by the NDEQ include:

- Pre-Project NPS Assessments;
- Post-Project NPS Assessments;
- Lake Sedimentation Assessments;
- Statewide Lake Classification;
- Quantification of Problems and Issues Regarding the Occurrence of Atrazine in the Lower Kansas River Basin, Kansas and Nebraska;
- Application of a Probabilistic Statistical Sampling Design (R-EMAP); and
- Ambient Wetlands Assessment.

3.2.6.1 Pre-Project NPS Assessments

Pre-Project NPS Assessment monitoring is conducted on waterbodies and/or their associated watersheds where watershed management plans are likely to be developed and NPS management projects likely to be implemented. The primary purpose of Pre-Project NPS Assessments are to collect information to facilitate preparation of NPS watershed water quality management plans and the evaluation of the effectiveness of implemented BMPs. It has been suggested (USEPA, 1991) that 3 years or more of pre-implementation data may be required to assess post-implementation water quality changes that may be attributable to implemented BMPs. Pre-project NPS assessment monitoring provides benchmark water quality conditions to be used for future BMP effectiveness evaluations. The collected information is also used to refine beneficial use support and pollutant severity assessments and to assess general water quality trends.

3.2.6.2 Post-Project NPS Assessments

Post-Project NPS Assessments are conducted on waterbodies and/or their associated watersheds where NPS management measures have been implemented that have a high likelihood of succeeding or where there are questions regarding their effectiveness. The purpose of Post-Project NPS Assessment monitoring is to collect the necessary information to evaluate the effectiveness of implemented watershed management plans and BMPs. This information is used to provide feedback during project implementation on its effectiveness in controlling NPS pollution, and to document any water quality and/or beneficial use support improvement from a project that may be attributable to BMP implementation.

3.2.6.3 Lake Sedimentation Assessments

Sedimentation is suspected of being a primary cause of declining water quality in Nebraska reservoirs. However, very little information is available on many reservoirs suspected of having high sedimentation rates. Beginning in 1998, the NDEQ initiated a special study to quantify sedimentation rates on reservoirs deemed to be a high priority.

Through the NPS Management Program, Section 319 funding has been utilized on several reservoirs to address sedimentation problems. In many cases, sediment basins have been constructed above reservoirs to trap sediment and keep it from reaching the reservoir. In most cases, resource management agencies have relied on

literature values to determine the effectiveness of sediment basins in trapping sediment. Site-specific information on the effectiveness of these basins is needed in order to evaluate progress in meeting lake sedimentation goals and for planning future projects.

A Global Positioning System (GPS) is being employed to provide "exact" geographic locations on a reservoir or sediment basin surface and depth is then recorded. This information is used to estimate lake volume for a given lake surface elevation. In most cases, an initial survey is needed to establish baseline conditions. Once baseline information is available, follow-up surveys will be conducted to determine volume loss for a given period of time and sedimentation rates determined.

3.2.6.4 Statewide Lake Classification

Nebraska's surface water resources include nearly 400 public lakes, thousands of privately-owned lakes and ponds, over 1,300 natural Sandhill lakes, and more than 800 manmade sandpit lakes. Many of these lakes suffer from water quality degradation caused by excessive nutrient and sediment loading. In order to effectively manage these impoundments, differences in water quality due to hydrology, geographic location, and physical morphology need to be determined.

The overall intent of this study, which is being conducted by the University of Nebraska-Lincoln through a grant from the NDEQ, is to develop a statewide lake classification system and methodologies to evaluate water quality that are specific to lake types and/or regions. The classification system will be based on physical, chemical, and biological information collected on a variety of lake types across the state. The objectives of the study are: 1) develop a classification system for Nebraska lakes and reservoirs, 2) establish reference conditions for each lake class identified in the classification, 3) develop preliminary lake water quality criteria for each lake class and region, 4) initiate the creation of a methodology for assessing lake water quality in the state, 5) analyze water quality samples collected from selected lakes, 6) provide specific recommendations for lakes and reservoirs to be included in the annual monitoring program, and 7) develop a water quality and lake management extension/education program for lake owner associations, state and local agencies, and other interested parties.

3.2.6.5 Quantification of Problems and Issues Regarding the Occurrence of Atrazine in the Lower Kansas River Basin, Kansas and Nebraska

This study is a cooperative effort between Nebraska and Kansas governmental agencies, agricultural organizations, universities, and the NOVARTIS Corporation to determine atrazine concentrations and loadings in the Big and Little Blue River Basins. Weekly grab samples are being collected from April through September for atrazine and other parameters at 14 stream sites in Nebraska. In addition, Kansas State University-Cooperative Extension is collecting spring and summer runoff samples from 9 of these 14 sites during all significant rainfall events using automatic sampling equipment. Monthly grab samples are being collected at each of the 14 sites from October through March.

3.2.6.6 Application of a Randomized Probabilistic Statistical Sampling Design (R-EMAP)

The R-EMAP effort involves the sampling of streams using a unique randomized sampling design that allows for the application of probabilistic statistical assessments. These assessment procedures allow for the quantification of water quality conditions with a known level of confidence. Monitoring under this study includes the collection of fish and aquatic insect samples, physical habitat measurements, instream water quality and sediment samples, and fish tissue samples. Sampling to date has been on a rotating basin cycle.

3.2.6.7 Ambient Wetlands Assessment

This monitoring effort has been ongoing since 1994. Its primary purpose is to collect water quality samples that will allow for the definition of baseline and seasonal water quality conditions for Nebraska's wetlands. It is hoped that this information will help facilitate decisions regarding the management of wetlands water quality in the future.

3.2.7 Investigative Monitoring

Investigative monitoring is typically initiated in response to the occurrence of a significant pollution event, public compliant, or report of a fish kill. Sampling in this situation may be conducted to define the extent and impact of the pollution event, determine if remedial actions need to be implemented for public health or environmental protection, identify possible pollution sources and/or responsible parties, or determine if state rules and regulations have been violated. The type of sampling that is done for investigative purposes is highly specific to the situation under investigation.

3.2.8 Volunteer Monitoring

Successful use of volunteers depends on understanding that citizens can be a valuable resource for many types of surface water quality monitoring when they are well trained and managed. Citizens should not, however, be viewed as an adjunct voluntary service of an agency; rather, they are partners who share in environmental management. What keeps the volunteers together is not a single monitoring task, but their expanded role as the guardians and stewards of their local water resources. This requires cooperation among regulators, resource trustees, and citizens at the local level. Making this partnership successful is a central challenge of all volunteer monitoring programs.

Planning a state-managed or sponsored volunteer monitoring program is a multi-step process. To begin, water quality program managers need to take a careful look at their existing programs, identify gaps in the database, and consider where data collected by volunteers can be used to fill these gaps. This approach will help establish general goals for the program and identify uses and potential users of the data. Next steps include developing a "Quality Assurance Project Plan" to establish effective quality assurance and control procedures and assigning qualified state staff to implement the program. Volunteer monitoring programs are generally developed for the following reasons:

- To supplement water quality data collected by professional staff in water quality agencies and scientific institutions,
- To educate the public about water quality issues, and
- To build a constituency of citizens to practice sound water quality management at a local level and build public support for water quality protection.

All three efforts can be achieved with a well-organized program, but priorities should be set so that the program can be designed to meet a clearly stated primary goal. It is important to specify whether gathering data of known quality takes priority over public participation and education.

The experience of several state-managed volunteer monitoring programs has shown that implementation should begin with a pilot project. A pilot project allows the state to test is chosen approach – its recruitment and training procedures, its equipment and parameters for testing, and its data management and analysis procedures – on a limited scale before moving on to an expanded program. The pilot project provides an opportunity for the coordinator and supporting personnel to encounter on a small scale the types of problems they will face in setting up a statewide program.

3.3 DATA COLLECTION APPROACH MATRIX

Table 3.1 summarizes the data collection approaches utilized, or in need of being utilized, to address the monitoring needed for implementation of surface water quality management activities.

Table 3.1. Summary of the data collection approaches utilized, or in need of being utilized, to address the monitoring needed for implementation of surface water quality management activities.

Surface Water Quality Management Activity	Long-Term Fixed Station Ambient Monitoring	Rotating Basin Monitoring	Detailed Watershed Assessments	Discharge Monitoring Reports (DMRs) – Self Monitoring	Compliance Monitoring	Investigative Monitoring	Special Studies	Volunteer Monitoring
NPDES Program Implementation	●	●		●	●		●	
Pretreatment Program Implementation				●	●		●	
Nonpoint Source Management Program Implementation	●	●	●				●	●
TMDL Development and Implementation	●	●	●	●	●		●	
Water Quality Standards Development and Implementation	●	●					●	
Water Quality Assessment – Status and Trends (305b Report)	●	●					●	
Basin Management Planning – Identification and Quantification of Water Quality Problems and Issues within River Basins	●	●	●	●	●		●	
Fish Tissue Program – Human Consumption Risk Assessment	●	●					●	
Investigation of Fish Kills and Complaints						●		
Wastewater Facilities Operator On-Site Assistance Training				●	●		●	

4. MONITORING STRATEGIES FOR SURFACE WATER QUALITY MANAGEMENT ACTIVITIES

Several surface water quality management activities currently being implemented by the NDEQ depend heavily on water quality monitoring information. These surface water quality management activities include:

- NPDES Program Implementation
- Pretreatment Program Implementation
- Nonpoint Source Management Program Implementation
- TMDL Development and Implementation
- Surface Water Quality Standards Development and Implementation
- Surface Water Quality Assessment -- Status and Trends [i.e., 305(b) Report]
- Basin Management Planning – Identification and Quantification of Surface Water Quality Problems and issues within River Basins
- Fish Tissue Program -- Human Consumption Risk Assessment
- Investigation of Fish Kills and Complaints
- Wastewater Facilities Operator On-Site Assistance Training

Monitoring strategies have been developed for each of these surface water quality management activities to ensure that the appropriate information is collected to meet the stated needs of water quality analysts and decision makers.

4.1 MONITORING STRATEGY FOR NPDES PROGRAM IMPLEMENTATION

4.1.1 Program/Activity Description

Municipal and industrial point sources are allowed to discharge effluent to the nations waters if the discharge is permitted under the National Permit Discharge Elimination System (NPDES) established under the federal CWA. The NPDES program establishes two principal bases for effluent limitations. First existing dischargers are required to meet technology-based effluent limitations that reflect the best controls available considering economic impacts. New source dischargers must meet the best demonstrated technology-based controls. Second, where necessary, additional requirements are imposed to assure attainment and maintenance of water quality standards established by the States and approved by EPA. In establishing NPDES permit limits, States and/or EPA must ensure that the limits will result in the attainment of water quality standards and protect designated water uses, including an adequate margin of safety. Where violations of water quality standards are identified or projected, the States are expected to develop appropriate water quality-based effluent limits for inclusion in any issued permits.

The collection of surface water quality data to support implementation of the NPDES permitting program addresses three primary purposes: 1) the establishment of "wasteload allocations" on which to base the development of water quality-based effluent limits, 2) the preparation of Discharge Monitoring Reports (DMRs) based on "self-monitoring" to assess discharger compliance with permit effluent limitations, and 3) the assessment of discharger compliance with permit effluent limitations through "independent" compliance monitoring.

4.1.2 Overview of Monitoring Needs

4.1.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to develop water quality-based effluent limitations where Total Maximum Daily Loads (TMDLs) are not established.
- Collect the data necessary to determine if regulated entities are in compliance with specified permit conditions regarding surface water discharges.
- Collect defensible data to support enforcement actions regarding water quality regulations.

4.1.2.2 Monitoring Objectives

Monitoring Objective 1: Determine the need to establish water quality-based effluent limits within NPDES discharge permits.

Water quality-based effluent limitations are required if a discharge would result in impairment of water quality within the receiving waterbody. To determine the need for a water quality-based permit, an assessment of the receiving water's assimilative capacity under specified design conditions is conducted. Information that is evaluated includes instream flow, instream pollutant background concentration, discharge flow, and disharge pollutant concentration. This information is assessed to determine if the appropriate water quality standards for the receiving water are in threat of being exceeded due to a facility's discharge.

Monitoring Objective 2: Where water quality-based permit limits are required for a facility and a TMDL isn't needed, develop WLAs for the appropriate pollutants and receiving.

The establishment of water quality-based effluent limitations requires the preparation of a "wasteload allocation" (WLA) on which to base the development of the water quality-based permit limits. The WLA in this case is defined as the amount of a single pollutant that can be discharged to a delineated reach of a receiving waterbody that allows water quality standards to be maintained. The WLA is based on the assimilative capacity of the receiving waterbody for the single pollutant in question. The assimilative capacity of a waterbody for a pollutant takes into account instream dilution, degradation, and other attenuation factors.

Monitoring Objective 3: Determine compliance of facilities with their permit limits.

DMRs are used to assess if the discharged effluent from a permitted facility is in compliance with its NPDES permit limits. The submittal of DMRs by NPDES permitted facilities is required under the NDEQ's Title 119, "*Rules and Regulations Pertaining to the Issuance of Permits under the National Pollutant Discharge Elimination System*", and under federal regulations. Representative samples of a facility's wastewater discharge are collected and analyzed by the permitted facility and submitted to the NDEQ for compliance evaluation. If the permittee is found to be out of compliance with the permit limits, enforcement action by the NDEQ could be taken against the permittee.

Monitoring Objective 4: Determine if submitted DMRs are reflective of the facility's effluent quality.

Compliance monitoring is a sampling event usually performed by the NDEQ or EPA. A wastewater sample from a permitted facility is collected by either agency and analyzed. The sample results are evaluated for compliance with the facility's permit and consistency with the facility's submitted DMR results.

Monitoring Objective 5: Initiate and support needed enforcement actions against facilities that are exceeding their permit limits.

Data reported on DMRs or collected through compliance monitoring can be used in enforcement cases against permitted dischargers. Therefore, the collection of these data must adhere to defined quality assurance and quality control procedures that ensure their defensibility.

4.1.2.3 Data Needs and Usage

To assess the need for water quality-based permit limits and establishment of WLAs, both data on the receiving stream and the effluent discharged is needed. Instream data needed for the receiving water include historic flow information and background concentrations for the pollutants of concern. Effluent discharge data needed include the volume of flow and concentrations of the pollutants of concern. Facility design conditions are also considered. The need for water quality-based permit limits is based on whether the assimilative capacity of the receiving stream would be exceeded when accounting for the discharge of individual pollutants under defined "*design conditions*". Conservative design conditions normally include a targeted low stream flow and either a high or average pollutant discharge. If water quality standards are projected to be exceeded a water quality-based permit would most likely be required. The amount of historic data present determines the confidence that can be placed on the WLA developed. Table 4.1 defines the information needed to make high, medium, and low confidence estimates of the receiving water's assimilative capacity and the resulting WLA.

DMR data collection requirements are specified in the individual issued permits. A larger need regarding DMR data is the ability to readily access and evaluate the data. DMR data is currently stored in and managed with EPA's Permit Compliance System (PCS). PCS is an archaic system that doesn't facilitate easy access and retrieval of data. The system also does not support any statistical or GIS analysis capabilities. The PCS needs to be significantly updated or an alternative data management system needs to be employed for management of DMR data if this data is to be effectively utilized in making decisions regarding the implementation of the NPDES program.

Compliance monitoring data is used for several purposes. These purposes include: determining if a facility's discharge is in compliance with its permit limits, determining if submitted DMRs are representative of a facility's effluent quality, collect data for the development of WLAs, and collect data for use in enforcement cases. The data collected through compliance monitoring will vary in regards to the type of facility and conditions of its permit. Compilance data suffers from some of the same problems as DMR data. Notably, there currently is no standard data management system used for storing and retrieving the collected data. If this data is to be effectively utilized in making decisions regarding the implementation of the NPDES program a data management system needs to be "developed" and utilized. This system not only needs to allow for the storage of data, but it must also facilitate statistical and GIS analyses.

Table 4.1. Confidence in developed WLAs or determination of the need for a water quality-based permit limit based on the availability of needed data.

Data Need	Confidence in Developed WLAs or Determination of the Need for a Water Quality-Based Permit Limit		
	High	**Medium**	**Low**
Receiving Water Flow	• USGS or NDNR gaging station located with close proximity to the facility discharge point. Period of record should extend through current date or within 25 years from the date of evaluation. Review of the available data considers hydrologic modifications and representiveness of the current watershed conditions and stream morphology. • Association or correlation with a USGS or NDNR gaging station can be determined.	• 10 or more instantaneous measurements obtained in the direct vicinity of the discharge point. Review of the available data considers hydrologic modifications and representiveness of the current watershed conditions and stream morphology. • USGS or NDNR gaging data has a period ending date greater than 25 years previous to the date of evaluation.	• Instream flows estimated from watershed ratios or from "adjacent" watershed stream flow gaging station that can't be directed correlated back to the discharge point. • Less than 10 instantaneous flow measurements. • Default flows from the NDEQ's Title 117 are used due to the lack of other flow information.
Receiving Water Instream Water Quality	• Water quality information upstream of the discharge point is available, Data and information is obtained from EPA's STORET, NDNR's database, USGS's database, or other reliable source. Water quality information is less than 25 years old. Data is determined to be representative based on consideration of hydrologic modifications, land use changes, or other factors that may impact the physical and chemical quality of the water. A minimum of 15 summer season and 10 winter season values must be available.	• Water quality information is available in the vicinity of the discharge point, but one or more pollution sources may be influencing the results. • Data is greater than 25 years old, but is still considered representative based on a review of hydrologic modifications, land use changes, or other factors that may impact the physical and chemical quality of the water. A minimum of 10-14 measurements for the summer season and 5-9 measurements for the winter season must be available.	• Ecoregion median values used to estimate physical and chemical instream water quality. • Water quality information is available, but there are less than 10 summer season and 5 winter season measurements.
Effluent Flow and/or Discharge Volume	• DMR or other records provide monthly measurements from the previous 3-year period. Data points may be discarded if they are determined to be unrepresentative of the discharge (I.e., excess flow from infiltration and inflow). The date range may be increased to 5 years provided the historic records are representative of the current population or production.	• Less than 24 summer season and 12 winter season measurements obtained over the previous 3-year period.	• Facility design flow or other value that is not a direct measurement is used to estimate effluent flow.
Effluent Water Quality	• DMR or other records provide monthly measurements from the previous 3-year period. Data points may be discarded if they are determined to be unrepresentative of the discharge (I.e., excess flow from infiltration and inflow). The date range may be increased to 5 years provided the historic records are representative of the current population or production.	• Less than 24 summer season and 12 winter season measurements obtained over the previous 3-year period.	• Default, ecoregion, literature, or other value that is not a direct measurement is used to estimate effluent water quality.

4.1.3 Data Collection Approach

4.1.3.1 Discharge Monitoring Reports (DMRs) – Self Monitoring

DMR reporting is a mainstay of the state's NPDES program. Data collected through the submission of DMRs by permittees will be used to address NPDES Monitoring Objectives 3, 4, and 5.

4.1.3.2 Compliance Monitoring

Information resulting from compliance inspections conducted by the NDEQ and EPA will be used to address NPDES Monitoring Objectives 3, 4, and 5.

4.1.3.3 Long-Term Fixed Station Ambient Monitoring

Long-term fixed station ambient monitoring can facilitate implementation of the NPDES program by providing the instream water quality and flow data necessary to develop WLAs and determining whether a water quality-based permit is necessary. For this instream data to be useful, it must be collected in close proximity of the appropriate discharge points. Data collected as part of the long-term fixed station ambient stream monitoring network can be used to help address Monitoring Objectives 1 and 2.

4.1.3.4 Rotating Basin Monitoring

Rotating basin monitoring can provide information critical to determining whether a water quality-based permit is necessary and for the development of WLAs. In many cases, a lack of data allows for only low confidence determinations (see Table 4.1). If a higher level of confidence is desired, the rotating basin monitoring allows for the collection of more site-specific data (i.e., at the location of an identified facility discharge) for identified facilities on a 5-year rotating basis. It is important that facilities be identified where additional data is needed so that the collection of that data can be incorporated into the appropriate basin monitoring plan. The data collected as part of these efforts will greatly facilitate Monitoring Objectives 1 and 2.

4.1.3.5 Special Studies

Special studies can facilitate implementation of the NPDES program by allowing for the collection of site-specific information on a facility outside of the basin monitoring effort. A special study could encompass in-plant or instream monitoring and be involved with compliance or instream water quality issues. Special studies would most likely address Monitoring Objectives 1, 2 and 5.

4.2 MONITORING STRATEGY FOR PRETREATMENT PROGRAM IMPLEMENTATION

4.2.1 Program/Activity Description

The Pretreatment Program is designed to control the discharge of industrial pollutants to Publicly Owned Treatment Works (POTWs) that could interfere with or upset the proper operation or pass through the POTW. This program is very similar to the NPDES program in that pretreatment facilities are issued permits by the NDEQ and submit monitoring data on DMR forms. There are currently about 85 permitted pretreatment facilities in Nebraska.

4.2.2 Overview of Monitoring Needs

4.2.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to develop water quality-based effluent limitations where Total Maximum Daily Loads (TMDLs) are not established.
- Collect the data necessary to determine if regulated entities are in compliance with specified permit conditions regarding surface water discharges.
- Collect credible data to support enforcement actions regarding water quality regulations.

4.2.2.2 Monitoring Objectives

Monitoring Objective 1: Determine compliance with pretreatment permit conditions and state regulations.

Data collected through DMRs or compliance monitoring are utilized to determined if pretreatment facilities are incompliance with their pretreatment permit limits and other regulatory provisions. Since these data can be used

in enforcement cases, their collection must adhere to defined quality assurance and quality control procedures that ensure their defensibility.

Monitoring Objective 2: Determine if industrial dischargers are causing interference, upset conditions, or the pass through of pollutants at a POTW.

Most POTWs treat wastes through biological processes; specifically, through the breakdown of waste materials through bacteriological metabolism. These biological processes can be adversely affected by toxic materials discharged by industrial sources. If a POTW is ineffectively treating influent waste and industrial dischargers are present, review of pretreatment monitoring results may provide some insights.

Monitoring Objective 3: Determine if a POTWs' existing design loading criteria are being exceeded.

POTW's are designed to treat specified quantities of municipal and industrial wastes. When constructed, the size and processes of a POTW are based on the expected influent waste conditions over a planned period of time. If these design conditions are exceeded, a POTWs' effectiveness and efficiency in treating the influent waste will most likely be reduced. Monitoring wastes being discharged by pretreatment facilities can provide insights to whether design loading criteria for a POTW are, or are in threat of, being exceeded.

Monitoring Objective 4: Determine sources of wastewater sludge contamination that would limit disposal options.

A by-product of waste treatment produced by most POTWs is sludge (i.e., solids remaining after mechanical and biological treatment). Disposal of sludge is an ongoing concern at most POTWs. One possibility for disposal is land application of "raw" or composted sludge. This disposal option can be limited if the raw or composted sludge material contains toxic materials picked up from industrial dischargers to the POTW.

4.2.2.3 Data Needs and Usage

The data obtained from pretreatment DMRs are evaluated by the NDEQ to ensure correctness and completeness. Violations of permit conditions indicated by the data triggers enforcement investigations. The data can also be used to indicate trends in compliance or correlated with POTW operational or compliance problems.

The NDEQ does not currently have the ability to collect enough of the appropriate data to make certain program decisions. Additional data collection from pretreatment facilities and POTWs would enable the NDEQ to set permit conditions that could assist in the proper operations of POTWs.

4.2.3 Data Collection Approach

4.2.3.1 Discharge Monitoring Reports (DMRs) – Self Monitoring

The collection of pretreatment DMR data is similar to that of NPDES DMR data with respect to sampling frequencies and number of parameters monitored. It is the responsibility of the pretreatment permitted facility to collect and analyze wastewater samples and submit the results to the NDEQ on DMR forms. Pretreatment DMR data will be used to address Monitoring Objectives 1, 2, 3, and 4.

4.2.3.2 Compliance Monitoring

Compliance monitoring is usually conducted by the NDEQ, but could also be conducted by the EPA. Compliance monitoring would be similar to that described under the NPDES program. Pretreatment compliance monitoring will be used to meet Monitoring Objective 1, and help facilitate Monitoring Objectives 2, 3, and 4.

4.2.3.3 Special Studies

Special Studies can facilitate implementation of the pretreatment program by allowing for the collection of site-specific information on a pretreatment facility or POTW. A special study could encompass sampling within an

industrial facility, sewer system, or treatment plant and be involved with compliance or investigation issues. Special studies would most likely be used to help address Monitoring Objectives 2, 3, and 4.

4.3 MONITORING STRATEGY FOR NONPOINT SOURCE MANAGEMENT PROGRAM IMPLEMENTATION

4.3.1 Program/Activity Description

Water quality monitoring for nonpoint sources of pollution includes the important element of relating the physical, chemical, and biological characteristics of receiving waters to land use characteristics. A well-planned and implemented program of water quality monitoring will provide current information needed to address several key NPS management questions, including:

- What are the characteristics, including ranges of temporal and spatial variability, of NPS pollutants within waters of the state?
- Where within the state are water resources impaired or threatened by NPS pollution?
- Which NPS pollution problems in the state pose the greatest threat to human health and the environment?
- What are the causes or sources of identified NPS pollution impairments or threats, and to what extent must NPS pollution from these sources be reduced to protect water quality?
- What sort of management actions can be implemented to address identified NPS pollution problems?
- Are implemented management actions effective in controlling NPS pollution problems?

Without current information, water quality and the effects of land-based activities on water quality cannot be assessed, effective NPS management and remediation programs cannot be implemented, and program success cannot be evaluated.

4.3.2 Overview of Monitoring Needs

4.3.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- In accordance with the Federal Clean Water Act (CWA), prepare a Section 303(d) list, based on credible data, that identifies waterbodies impaired or threatened by water pollution.
- Collect the data necessary to develop credible surface water quality management plans (i.e., Basin Management Plans, Watershed Management Plans, and TMDLs).
- Collect the data necessary to credibly determine if implemented water pollution control measures effectively improved or protected surface water quality.

4.3.2.2 Monitoring Objectives

Monitoring Objective 1: Identify waterbodies, and their corresponding watersheds, where surface water quality and/or beneficial uses are impaired or imminently threatened by NPS pollution.

Meeting this objective involves investigating key parameters to determine the general condition of aquatic habitat or water quality. Measurements of individual pollutants in waterbodies are taken to determine whether water quality standards or other target criteria are being exceeded. Biological monitoring is also useful when evaluating whether designated uses are supported. Results of this monitoring might reveal that a suspected problem is more complicated or serious than originally thought and that more intensive monitoring studies will be necessary.

Monitoring Objective 2: Determine the extent and severity of surface water quality and/or beneficial use impairment or threat for targeted waterbodies and watersheds.

Even if a problem is known to exist, the geographic and temporal extent of the problem might not be known. Does the problem affect a stream reach, or does the problem extend to the downstream lake? Some pollution sources are emitted only during certain parts of the year or in association with certain events, such as

storms, or might be a problem only during a particular time of the year, such as a fish spawning season. Determining the geographic and temporal aspects of a pollution problem will help focus management on BMP systems that will have the most benefit.

Monitoring Objective 3: Identify contributing NPS pollutants and their sources within targeted watersheds.

In most cases, monitoring is required to determine the cause of an identified NPS pollution problem. Determining the pollution's source is often more difficult than determining its presence because there are often many potential sources whose influences overlap. When conducting monitoring for this purpose, it is important to monitor the appropriate water quality characteristics and account for climatic factors to establish a cause-and-effect relationship, even though it might be difficult to prove.

Monitoring Objective 4: Determine the loading capacity of targeted waterbodies for identified NPS pollutants of concern.

The loading capacity of a waterbody is the amount of a pollutant that the waterbody can assimilate (i.e., be present in the waterbody) and still allow attainment and maintenance of the appropriate water quality standards or target criteria. Loading capacities are dependent upon hydrologic and/or morphologic conditions of the waterbody (e.g., streamflow, lake volume, etc.). Other conditions (e.g., background water quality conditions, sediment oxygen demand, etc.) may also influence the loading capacity of a waterbody. Determining the loading capacity of a waterbody for an identified pollutant of concern is a critical step in problem quantification. The loading capacity of a waterbody defines the threshold level of "pollution" that can occur in the waterbody without the occurrence of a water quality problem; it is the benchmark used to determine how much a pollutant load must be reduced to protect and maintain water quality. Loading capacities may be determined empirically (e.g., lake volume available for sedimentation, streamflow available for dilution under critical flow conditions, etc.) or through the use of models (e.g., tolerable total phosphorus input to a lake based on EUTROMOD, dynamic modeling of critical stream conditions, etc.).

Monitoring Objective 5: Estimate the current watershed loadings to targeted waterbodies for identified NPS pollutants of concern.

Establishing the current watershed loadings of a pollutant to a waterbody is needed to define the loading reductions necessary of that pollutant to maintain and protect water quality. The estimated existing load of a pollutant to a waterbody is compared to its loading capacity to determine the loading reduction of that pollutant that is necessary for protecting water quality. Existing NPS pollutant loadings to a waterbody can vary greatly with climatic factors, such as the duration, frequency and timing of precipitation events. Existing loads can be estimated based on an "event-basis" (e.g., 24-hour 10-year storm event, etc.) or annualized (i.e., average pollutant load that could be delivered annually over a 100-year time span). The NDEQ typically estimates existing loads through the uses of models (i.e., EUTROMOD, BATHTUB and AGNPS models) or empirical methods (i.e., volume loss in reservoirs determined from bathymetric surveys to determine sedimentation rates).

Monitoring Objective 6: Identify critical NPS areas for application of BMPs in targeted watersheds.

Critical areas have been defined as those areas or sources where the greatest water quality improvement can be accomplished for dollar spent (Maas, et. al., 1985a). There are two distinct critical-area perspectives: the land resource perspective and the water resource perspective. Critical areas, from the land resource perspective, are those lands on which soil loss exceeds the rate at which soil can be replaced by natural processes -- the soil loss tolerance or T value. Although areas of severe soil loss often are the most critical areas for treatment of NPS pollution, this need not be the case. From the water resources perspective, critical areas are those areas or sources where the greatest improvement to an impaired water resource can be obtained for the least investment in BMPs. Determination of critical areas requires consideration of such factors as the type of water quality impairment, dimensions and dynamics of the impaired water resource, hydrology of the watershed, magnitude of pollution source areas, and investment in BMPs. Implied in this approach is the concept of treatability of the resource, which is a basic consideration in any NPS pollution control project (Maas et. al., 1985b). Critical area identification can be facilitated through the use of models such as AGNPS.

Monitoring Objective 7: Calibrate and validate water quality and watershed models used to assess and predict NPS pollution occurrence and response to management measures.

Model calibration is the first stage of testing a model and tuning it to a set of field data. Field data are necessary to guide the modeler in choosing the empirical coefficients in a model before the model can be used to predict the effect of management techniques or activities. Models that are being considered for use by the NDEQ for NPS surface water management purposes are EUTROMOD, BATHTUB, AGNPS, BASINS, and SWAT.

Model validation involves the testing of a model using a second set of field data. In most cases, the second set of field data should represent an independent data set that extends the range of conditions for which the model is valid. If an independent data set is not available, a set of randomly selected data should be used for validation. Once a model has been validated, it can be used to assist with management decisions within the range of the calibration and validation data sets.

Monitoring Objective 8: Evaluate the effectiveness of implemented NPS control practices (i.e., BMPs) within targeted NPS pollution control areas.

Individual BMPs or groups of BMPs are monitored to determine the effectiveness of NPS pollution control. Monitoring for individual BMPs can typically be conducted at a plot or field scale. Monitoring for BMP systems is usually conducted on a watershed scale because the combined effect of a few or several BMPs is being investigated. Studies of some individual practices can be conducted in a relatively short time (i.e., less than 5 years), while others might take longer. Evaluation of BMP systems is typically conducted over a long time (i.e., more than 5 years) because BMP implementation can take years to affect water quality. This type of monitoring is difficult due to the presence of pollutant reserves in soil and sediments, the effect of many land uses within a study area, the variety of approaches that landowners use to implement similar systems of BMPs, and the need to track land management as well as water quality and climate variables.

It has been demonstrated clearly in agricultural NPS watershed projects that at least three years of both pre-implementation and post-implementation monitoring are needed for the detection of water quality trends (USEPA, 1991). Watershed project work plans, therefore, should include monitoring for a minimum of 6 to 10 years to increase the probability of successful documentation of water quality improvements resulting from NPS implementation efforts. These long-term monitoring efforts must be consistent over time (e.g., parameters, sampling protocol, sampling frequency and location, monitoring design, implementation tracking, etc.) such that an adequate database is developed for statistical analyses.

4.3.2.3 Data Needs and Usage

[The following discussion is largely taken from the U.S. Environmental Protection Agency publication "Monitoring Guidance for Determining the Effectiveness of Nonpoint Source Controls" (USEPA, 1997)]

In these days of increasing monitoring and evaluation needs and relatively small monitoring and evaluation budgets, it is extremely important to design efficient monitoring and evaluation programs. The variables selected for a monitoring program should be tied directly to the monitoring objectives. It is often the case that some variables in addition to those of prime interest are monitored because they are relatively cheap to monitor and might provide some useful information for purposes of statistical analyses.

In many instances the water quality problem will directly indicate what variables should be monitored. For example, a dissolved oxygen problem would strongly suggest monitoring of dissolved oxygen. (Typically, biochemical oxygen demand, sediment oxygen demand, temperature, and nutrients would be monitored as well). Or, if the goal is to assess the impact of NPS controls in terms of standards violations, then the variables selected should be those required for the analysis of standards violation.

In some cases, it might be more beneficial to use surrogate measures instead of the variables mentioned in the monitoring goals and objectives. In these cases, objectives for the surrogates that are consistent with the overall monitoring and evaluation goals should be established. The key to using surrogate measures is to be certain that a

reliable relationship exists between the true measure and the surrogate measure. For example, if the objective is to monitor the condition of salmon spawning areas, surrogate measures are necessary because the condition of salmon spawning areas is a composite of many factors. Good surrogate measures could be streambank undercut, embeddedness, and vegetative overhang. The corresponding surrogate goals could be to reduce cobble embeddedness and to increase vegetative overhang to appropriate levels for salmon spawning. The monitoring goals would then be to document changes in cobble embeddedness and vegetative overhang.

Poor surrogate selection results when a known relationship between the monitoring goals and objectives and the chosen surrogate measures does not exist. For example, a poor surrogate for estimators of sediment delivery to water resources is the unqualified use of erosion rates. Without the existence of a known relationship between these two measures (i.e., sediment delivery ratio), the surrogate will produce misleading results.

Variable selection should also reflect the NPS data analysis and presentation plan. For example, if the plan involves data normalization or grouping prior to data analysis, the variable list should include those variables used to normalize and/or group the data. Some analyses might require discrete observations, whereas others might use continuous data. All monitoring sites should be characterized sufficiently for meaningful data interpretation, including georeferencing,

Since there are numerous variables to choose from but monitoring budgets are limited, some method to prioritize variable selection is often necessary. When available, existing data should be used to guide variable selection. In some cases, optimal variable selection is not possible, perhaps due to lack of local data. In such cases, it may be necessary to rely on professional judgment and the review of monitoring programs of similar nature and scope.

Physical and Chemical Water Quality Data

Physical and chemical water quality data are essential to almost all NPS monitoring and evaluation efforts, due to the relationships between flow and pollutant characteristics. For example, it might be necessary to establish watershed water budgets so that the location and magnitude of NPS or background sources can be determined. In other cases, the extent of the floodplain might prove critical to assessments of BMP control needs. Important physical and chemical water quality variables to monitor include flow (streams), temperature, transparency, suspended sediment, sedimentation rate, dissolved oxygen, pH, conductivity, alkalinity/acid neutralizing capacity (lakes), and nutrients. Other factors, such as cobble embeddedness, woody debris, and salinity, might be important depending on type of waterbody and monitoring goals.

Biological Data

Biological data can be very useful for evaluating water resource impairment due to NPS impacts because aquatic organisms integrate the exposure to various nonpoint sources over time. Measures of biological communities integrate the effects of different pollutant stressers -- excess nutrients, toxic chemicals, increased temperature, excessive sediment loading, and others -- and thus provide an overall measure of the aggregate impact of stressers. Monitoring changes in aquatic communities over time can serve as a measure of improvement due to BMPs. The biological survey approach used depends on waterbody type, i.e., stream, river, lake, wetland, or estuary. Important biological parameters to monitor include bacteria, algal biomass, macrophyte biomass and location, macroinvertebrates, and fish populations.

Precipitation Data

Precipitation data, including total rainfall, rainfall intensity, storm interval, and storm duration, have proven to be key to successful interpretation of nonpoint source data in the Nationwide Urban Runoff Program (NURP), Model Implementation Program (MIP), and Rural Clean Water Program (RCWP) studies. By combining precipitation data with pollutant loading evaluations, it has been found that a few storms can account for a large proportion of the total annual pollutant load. Johengen and Beeton (1992) found that, in the Saline Valley RCWP, a few storms accounted for more than 50 percent of the annual loading. Interestingly, they found that initial estimates of suspended solids and phosphorus loadings were only 20 and 50 percent of loadings estimated by adjusting for

daily precipitation. The project-mandated weekly sampling had missed the loading spikes that lasted for only a few days.

Research has shown that average annual soil loss can be estimated using only a few site-specific factors, among which is rainfall-runoff erosivity factor (R). The other factors used to estimate soil loss are soil erodibility, topography, and land use and management. The Universal Soil Loss Equation (USLE) has been revised and is now known as the Revised USLE (RUSLE). The rainfall-runoff erosivity factor found in the RUSLE is also used in several NPS models, including the Agricultural Nonpoint Source Pollution Model (AGNPS) (Young et. al, 1985). A procedure derived from the NURP program uses storm frequency and other factors to determine recurrence intervals for instream pollutant concentrations resulting from urban NPS pollution (USEPA, 1984).

Land Use Data

Land use data includes information on treatments applied to land, current and historical use of the land, spatial and temporal information on land use activities, and changes in land use made before and during a project. Data on these elements are important for evaluating correlations between land surface activities and water quality. Establishing a correlation between a change in water quality and a change in land treatment must be based on both the detection of a water quality trend and detailed information on changes in land use or management, and it requires rigorous statistical analysis. Land treatment can be linked to water quality impacts at the field, subwatershed, watershed, or project level. In general, the larger the drainage area, the harder it is to associate land treatment and water quality. Subwatershed monitoring is the most effective means for demonstrating water quality improvements from a system of BMPs because at this scale the confounding effects of external factors, other pollutant sources, and other BMPs or BMP systems are minimized Coffey et. al., 1993).

Two key points must be considered in NPS monitoring with respect to linking water quality and land treatment. First, weather and season are important confounding influences on NPS activities because they strongly influence the types of land-based activities that can occur, and hence the timing and quantity of runoff from treated lands and the consequential water quality effects. Second, spatial variation must be considered. The location of land treatments relative to surface waters is likely to vary from year to year, and this adds variation to the effects of land treatment on water quality (Meals, 1991).

Correlations between water quality and land treatment can be made much more easily if land use and land treatment monitoring are considered as part of monitoring design in a project's preliminary stages. It is also very important to control for the effects of hydrologic variation.

Geographic Information Systems (GIS) are effective management tools for land use data. They allow for tracking and manipulating spatial land use data and remarkably improve the ease of visual inspection and comprehension of the data. A major concern with utilizing GIS is populating the data layers (georeferencing spatial data) to be used for assessment.

Topographic Data

Topographic data are required for many NPS monitoring and evaluation efforts, particularly when soil erosion, water runoff, and sedimentation are estimated with models. For example, the USLE includes both slope length and slope steepness factors. AGNPS input includes a slope shape factor, field slope length, channel slope, and channel side slope.

4.3.3 Data Collection Approach

4.3.3.1 Long-Term Fixed Station Ambient Monitoring

Data collected as part of the ambient stream monitoring network will be used to help address NPS Monitoring Objectives 1, 2, 3, and 4.

4.3.3.2 Rotating Basin Monitoring

Information generated from the BMA regarding the quantification of problems and issues will be used to help address NPS Monitoring Objectives 2, 3, 4, 5, 7, and 8.

4.3.3.3 Detailed Watershed Assessments

Information generated from detailed watershed assessments is used to help address NPS Monitoring Objectives 2, 3, 4, 5, 6, 7, and 8.

4.3.3.4 Special Studies

Special studies ongoing, or in need of being initiated, to address NPS surface water quality concerns and questions as of 2000 include the following.

Pre-Project NPS Assessment

The primary purpose of Pre-Project NPS assessment monitoring is to collect information to help answer NPS Monitoring Objectives 1, 2, 3, 7, and 8.

Post-Project NPS Assessment

The purpose of Post-Project NPS Assessment monitoring is to collect the necessary information to answer NPS Monitoring Objective 8.

Lake Sedimentation Assessment

Information obtained from the lake sedimentation assessment will be used to address NPS Monitoring Objectives 1, 2, 3, 4, 5, and 8.

Statewide Lake Classification

Data generated from the Statewide Lake Classification study will be used to help facilitate Monitoring Objectives 1 and 7.

Quantification of Problems and Issues Regarding the Occurrence of Atrazine in the Lower Kansas River Basin, Kansas and Nebraska

Data generated from the Lower Kansas River Basin Joint Atrazine study will be used to facilitate Monitoring Objectives 1, 2, 3, 4, 5, and 6.

4.3.3.5 Volunteer Monitoring

Through a Section 319 grant, the NDEQ is funding a stream conservation and volunteer monitoring pilot program being implemented by the Nebraska Wildlife Federation (NWF). The NWF has established an Adopt-A-Stream program under which volunteer groups at 24 sites across the state are adopting a local stream or wetland, assessing the aquatic habitat present, monitoring changes in the habitat, and developing conservation projects designed to restore or improve the habitat. At these 24 sites, the NWF is providing on-site assistance from an aquatic biologist; written materials designed to explain habitat assessment methods and serve as reference materials; and basic equipment like nets, buckets, and water quality testing kits. The on-site assistance is to be provided over a period of several years to help firmly establish the projects at selected sites. If the pilot program is successful, it will be expanded to volunteer groups across the state. Current volunteer monitoring efforts are largely directed at information and education, but could provide information to help address NPS Monitoring Objectives 1 and 8.

4.4 MONITORING STRATEGY FOR TMDL DEVELOPMENT AND IMPLEMENTATION

4.4.1 Program/Activity Description

Section 303(d) of the Clean Water Act requires that States from time to time identify waters that are not meeting the primary "fishable/swimmable" goals of the Act. The NDEQ assigns beneficial uses to surface waters and has promulgated the criteria to protect those uses within the context of Title 117 – Nebraska Surface Water Quality Standards (NDEQ, 2000). Waterbodies determined to be non-supportive of their designated beneficial uses (i.e., impaired) are included on the Section 303(d) lists. Once a waterbody is placed on the 303(d) list a TMDL in most cases must be developed for each contributing pollutant identified for each listed waterbody. A *total maximum daily load* is the quantity of a pollutant that a waterbody can assimilate and not exceed a water quality standards or goal. The complete definitions and specific implementing regulations and requirements driving both the Section 303(d) list and TMDL development can be found in 40 CFR Part 130.

Similar to other water quality management programs, the TMDL program requires data of sufficient quality and quantity to: 1) identify waters where beneficial uses are not being fully supported, 2) implement management measures to address the water quality impairment, and 3) evaluate the success of the implemented management measures in addressing the identified problems. A lack of data (either quantity or quality) could result in the misallocation of pollutant loads, the misidentification of "impaired" waters or pollutant sources, or a misrepresentation of a TMDL's success or failure towards improving water quality. In order to avoid potential errors the following strategy has been developed and should be utilized when formulating specific monitoring plans.

In many cases, data collected in support of other programs and activities can be applied to Section 303(d) listing and TMDL development; however, in other cases data needs may be specific to the TMDL program. The purpose of this strategy is to describe the needs specific to the development and implementation of TMDLs; however, the coordination of all monitoring efforts is imperative. Development and revision of the Section 303(d) list is supported as part of the NDEQ's basin management planning efforts.

4.4.2 Overview of Monitoring Needs

4.4.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to develop credible surface water quality management plans (i.e., Basin Management Plans, Watershed Management Plans, and TMDLs).
- Collect the data necessary to determine if regulated entities are in compliance with specified permit conditions regarding surface water discharges.
- Collect the data necessary to credibly determine if implemented water pollution control measures effectively improved or protected surface water quality.

4.4.2.2 Monitoring Objectives

Monitoring Objective 1: Determine the extent of impairment and existing loadings for the pollutants causing impairment for 303(d) listed waterbodies.

Data collected that identifies waterbody impairment may not be complete enough to characterize the geographical and temporal extent of the impairment. When allocating loads and developing implementation plans it is essential to know if the impairment is indicative of the entire stream segment, lake/reservoir or wetland, or if the impairment isolated to a specific area or region. It is important to know if the impairment has a seasonal component or if the pollutant(s) increase in response to a storm event or drought condition stream flows.

Monitoring Objective 2: Determine the allowable waterbody loading/assimilative capacity for the pollutant(s) impairing beneficial uses for 303(d) listed waterbodies.

Loading capacity is defined by 40 CFR Part 130.2 as being "*the greatest amount of (pollutant) loading that a water can receive without violating water quality standards*". Loading capacities are dependent upon hydrologic and morphologic conditions. As well, other factors and conditions such as, sediment oxygen demand, "natural" or background water quality, physical characteristics (i.e., pH and temperature) may influence the overall waterbody loading capacity. The determination of the loading capacity is a critical step in the TMDL process, as this will be used as the threshold or ceiling pollutant load that can be allowed without the occurrence of water quality problems. Once defined, the loading capacity is also used to determine if pollutant reductions are needed and to what extent. Loading capacities can be determined empirically (i.e. stream flow dilution availability, reservoir volume loss/sedimentations) or through the use of predictive models such and QUAL-IIe, EUTROMOD or BATHTUB.

Monitoring Objective 3: Determine the sources of pollution contributing to beneficial use impairments for 303(d) listed waterbodies and quantify the contributions from individual sources or source category (point or nonpoint source).

One of the main objectives of the TMDL process is to assign loading reductions to sources (i.e., WLAs to point sources and LAs to nonpoint sources) that if met, will result in the attainment of water quality criteria and support beneficial uses. In order to assign the reductions to specific sources (e.g., municipal or industrial facilities, subwatersheds, etc.) identifying the specific source(s) responsible for the water quality impairment is essential. In some instances, several potential sources may exist in the watershed but may not contribute to the impairment or the contributions are minimal in comparison to other sources. In these cases it may be prudent to assign a loading reduction to a single source rather than all sources.

Many pollutants can be delivered by point and/or nonpoint sources. To differentiate between the two, pollutant concentrations at various stream flow stages are evaluated. A generally accepted principal is that if a pollutant concentration increases as flow decreases point source are likely responsible, and if pollutant concentrations increase as flow increases nonpoint source are likely responsible.

Monitoring Objective 4: Calibrate and validate water quality models used in the TMDL process.

Water quality models are often used to predict a waterbody's response to a set of circumstances. For example, the QUAL-IIe model may be used to predict the fate, transport, and existence of a pollutant being discharged under low stream flow when instream dilution is minimized. The water quality model is used because low stream flows occur infrequently and measuring the affects of a pollutant load directly may not be feasible. Calibration of a model with empirical data is important to increase the confidence of its results to a local application. Empirically generated data are also used in models in lieu of default values or coefficients to strengthen the results of the modeling application. Model validation involves the testing of a model using a second set of field data. In most cases, the second set of field data should represent an independent data set that extends the range of conditions for which the model is valid. If an independent data set is not available, a set of randomly selected data should be used for validation. Once a model has been validated, it can be used to assist with management decisions within the range of the calibration and validation data sets. Models under consideration for use in the TMDL program include: BASINS, GWLF, AGNPS, EUTROMOD, BATHTUB, QUAL-IIe, SWAT, and Simple Dilution.

Monitoring Objective 5: Determine the effectiveness of implemented TMDLs in improving water quality.

The federal CWA requires that implemented TMDLs be evaluated to determine their effectiveness in improving water quality in identified impaired waters. If TMDLs are found to be ineffective through water quality monitoring, the TMDL must be reevaluated and modified. Monitoring can either be on an individual level (point source) or on a broad scale such as a watershed (nonpoint source). Detecting water quality differences in the control of point source pollution can often be seen in a short period of time after capitol construction or operational changes have occurred. Detecting water quality differences for nonpoint source pollution control usually involves a longer period of time as it may take several years to implement best management practices (BMPs) and following implementation it may take additional time for the BMP to affect water quality. Based upon this long-term monitoring may be needed.

The knowledge of water pollution control effectiveness can also be used when formulating TMDLs and future monitoring plans. To obtain the needed information, monitoring of the system prior to the implementation of controls may need to take place. If concerns arise with obtaining data during similar hydrologic and climatic conditions, then an option may be to monitor both a treated and untreated site, in the same region simultaneously and compare the results.

4.4.2.3 Data Needs and Usage

Data collected in support of the TMDL program is highly dependent upon which monitoring objective the samples are targeted at meeting. For example, data collected to be used for determining the extent of impairment is likely different than the data needed to calibrate a water quality model. A general discussion of the data needs and sampling approaches is provided below. The points raised should at a minimum, be included in the process of developing any Monitoring Project Plan used to implement the TMDL program.

Above all, the collection of "credible" data is a key component to consider when planning specific monitoring activities. Credible data is that data where the user has a high degree of confidence that the information accurately represents the targeted condition within a waterbody. Decisions made based upon this data are less likely to be in error and the decisions are less likely to be challenged.

A major step in defining TMDL monitoring needs is the consideration of available data. Prior to the collection of any data under the TMDL program, the existing data should be reviewed to determine if the data represents or describes the current conditions and to determine if any gaps in the data exist. If possible, existing data should be utilized in the TMDL process, and additional data collected, as necessary, to fill data gaps.

Beneficial use assessment can often be the start of the TMDL process as these assessments can indicate waterbodies are impaired. Depending on the credibility of the data used in the assessment phase, program managers can choose to move into TMDL development or utilize the assessment as the initial step in a thorough waterbody beneficial use investigation. The decision of which direction to pursue depends on the waterbody system, the available data, the assigned beneficial uses, and the confidence required before identifying a waterbody as impaired.

Pollutant concentrations in water vary according to sources and delivery mechanisms. Pollutants delivered from point source are usually consistent in volume and concentrations over time, and the variation of the instream pollutant concentration is a factor of the available dilution and background loading. In the case of nonpoint sources, many factors contribute to the volume and concentrations of pollutants delivered and variability of the pollutant loading (e.g., precipitation, land use, etc.). Accounting for all the variation in pollutant loadings many require a detailed monitoring effort where numerous samples and environmental measurements must be obtained.

Finally, it is desired that the data collected meet more than one monitoring objective. This approach not only conserves resources it also results in the more timely completion of TMDLs. This outcome should be a primary consideration when plans are being developed for the Rotating Basin monitoring. The results of the TMDL monitoring efforts should be a major component of the *Basin Management Plans* that are developed.

4.4.3 Data Collection Approach

4.4.3.1 Long-Term Fixed Station Monitoring

An ambient stream network has been re-initiated by the NDEQ and is intended to provide information on the existing conditions (status) and trends observed in the quality of the State's rivers and streams. The monitoring objectives for the ambient stream network include: 1) characterize the broad scale geographic and season distribution of the water column, water quality condition of the State's streams and rivers and, 2) evaluate the geographic and seasonal distributions of water column, water quality condition of the State's streams and rivers in relation to sources, transport, fate and effects of contaminants. Data and information collected as part of the ambient stream monitoring network can be used in addressing, at least in part, all of the TMDL monitoring objectives.

4.4.3.2 Rotating Basin Monitoring

Implementation of the BMA through the first 5-year rotation has mainly revolved around beneficial use assessment. While this has been useful in completing some of the requirements of the CWA's Section 303(d) the ultimate goal of completing basin management plans is not being realized. In order to complete *Basin Management Plans* the BMA must move into data collection and analysis for problem quantification and TMDL development. Completed TMDLs are envisioned as being a major component of future *Basin Management Plans* that are prepared. It is the intent of the Water Quality Divisions Planning Unit to utilize the BMA to fulfill the needs of the TMDL program and, on an annual basis, a Monitoring Project Plan will be developed that details the data needs within the targeted basins. Data collected through the rotating basin monitoring effort is envisioned as playing a large role in meeting all the TMDL monitoring objectives.

4.4.3.3 Detailed Watershed Assessments

Prior to recommending an implementation strategy for the control of nonpoint source pollutants detailed information from a watershed is needed. Assessments are usually targeted on watersheds that have been prioritized based on a previously identified problem. The identification of loads, pollutant sources, variations, loading reductions and the calibration/verification of models are integral components of watershed management plans. Information collected during the detailed watershed assessment can be used to meet all the TMDL monitoring objectives.

4.4.3.4 Discharge Monitoring Reports (DMRs) – Self Monitoring

Data and information collected during the DMR self-monitoring can be used to meet the TMDL Monitoring Objectives 2 through 7.

3.5.3.4 Compliance Monitoring

Data and information collected during the compliance monitoring can be used to help meet all the TMDL monitoring objectives.

4.4.3.5 Special Studies

At this time no special studies have been instigated to facilitate TMDL development, however; several special studies that are being undertaken by the Water Division are facilitating TMDL development.

Pre-project NPS Assessments

Data collected during the pre-project NPS assessments can be used to meet the TMDL Monitoring Objectives 1 through 3.

Post-project NPS Assessment

Data collected during post-project NPS assessment monitoring can be used to fulfill TMDL Monitoring Objective 5.

Lake Sedimentation Assessment

Information generated from the lake sedimentation assessment can be used to address TMDL Monitoring Objectives 1 through 3.

Statewide Lake Classification

Data collected during the statewide lake classification monitoring can be used to address TMDL Monitoring Objectives 1 and 2.

Point Source Mixing Studies

Title 117 – Nebraska Surface Water Quality Standards allows for a zone of assimilation downstream of point source discharges. Within this area, the applicable water quality criteria can be exceeded. The development of NPDES permit limits can account for this area. Often the amount of dilution used in the mixing calculations is based upon equations, formulas and defaults rather than direct measurements and these procedures are conservative. The NDEQ or a regulated facility may initiate a mixing zone analysis to gain more accurate information from the receiving waterbody. Two of the main components of such studies are usually targeted at the instream dilution utilized at the mixing zone boundary and seeking relief from stringent permit limits. Fluoroscein dye or other instantaneous instream measurements (i.e., specific conductance, temperature) are used to identify the wastewater plume.

The data and information collected during point source mixing study monitoring can be used to meet all the TMDL monitoring objectives.

4.5 MONITORING STRATEGY FOR SURFACE WATER QUALITY STANDARDS DEVELOPMENT AND IMPLEMENTATION

4.5.1 Program/Activity Description

Section 303(c) of the federal CWA assigns responsibility of adopting water quality standards and criteria to States. Although most criteria are adopted using EPA provided guidance and recommended criteria, certain implementation aspects of Nebraska's surface water quality standards require collection of data.

Implementation of the antidegradation provisions of the Standards require additional data to determine whether certain non-State Resources Waters should be designated as State Resources Water Class B (high quality waters). Additionally, as EPA pressures States to adopt criteria for nutrients or face promulgation of EPA criteria, data will be needed to develop state criteria.

4.5.2 Overview of Monitoring Needs

4.5.2.1 State Surface Water Quality Monitoring Goals Addressed

- Develop credible water quality criteria for the protection of surface water quality in Nebraska.
- Collect credible data to support enforcement actions regarding water quality regulations.

4.5.2.2 Monitoring Objectives

The following monitoring objectives have been defined for water quality standards development and implementation:

Monitoring Objective 1: Identify waterbodies meeting the definition of State Resource Water Class B.

State Resource Waters Class B are surface waterbodies that have exceptional water quality exceeding levels necessary to maintain recreational and aquatic life uses (i.e. high quality waters). Meeting this objective involves evaluating key parameters in specific waterbodies to determine the general condition of water quality. Measurements of individual pollutants in waterbodies are taken to determine whether target conditions for State Resource Water Class B are met. These measurements of water quality are defined in the NDEQ's Antidegradation Implementation Procedures (NDEQ, 1994b). Biological metrics are not currently included in the target conditions; however, they may be included in the future. Thus biological monitoring may be a useful component in meeting this objective.

Monitoring Objective 2: Develop baseline water quality conditions for each designated State Resource Water Class A and B.

State Resource Waters Class A are surface waterbodies that constitute outstanding State or National resources. These waterbodies may not necessarily be high quality waters, but may have a characteristic that gives them State or National importance (e.g. Wild and Scenic Rivers designation). In referring to State Resource Waters – Class A, Title 117 – Nebraska Surface Water Quality Standards states *"the existing water quality of these surface waters shall be maintained and protected"* (Title 117, Ch.3, 002). Although some historical data are available for these waterbodies, they should be augmented with additional observations and sample locations to increase confidence and establish the baseline for existing water quality.

State Resource Waters Class B are surface waterbodies that have exceptional water quality exceeding levels necessary to maintain recreational and aquatic life uses. In referring to State Resource Waters – Class B, Title 117 – Nebraska Surface Water Quality Standards states *"the existing water quality of these surface waters shall be maintained and protected"* although lower water quality may be allowed as a result of important and necessary economic or social development in the area (Title 117, Ch.3, 003). Some historical data are available for these waterbodies; however, they should be augmented with additional observations and sample locations to increase confidence and establish the baseline for existing water quality.

Monitoring Objective 3: Obtain representative range of concentrations and loadings for total N, total P, chlorophyll *a*, and turbidity (or secchi depth) from waterbodies in each ecoregion of Nebraska for future nutrient criteria development.

EPA will be requiring state water quality standards to include nutrient criteria, which are comprised of numerical measures of total phosphorus, total nitrogen, chlorophyll *a*, and a measure of turbidity (e.g. turbidity, secchi depth) by December, 2003. EPA has developed guidance for arriving at these numerical criteria, which involves the distribution of measurements for either reference sites or the universe of observations. Without state specific data, Nebraska may be forced to adopt criteria based on data from EPA Region VII. Adequate data exist for lakes; however, stream monitoring is not comprehensive enough and lacks chlorophyll *a* and a measurement of turbidity. These measurements need to be representative of all ecoregions, waterbody classifications (e.g. recreation, coldwater A, coldwater B, warmwater A, and warmwater B), and stream size. Reference site data should be collected which will lead to defining a reference condition to develop the criteria. These sites need not be within unimpaired or undeveloped watersheds, but should represent the "least impaired condition". Using reference sites is preferred to using the universe of observations because the resulting criteria will be more realistically achievable. Conservative assumptions required when using the universe of observations produce lower criteria than using reference sites.

4.5.2.3 Data Needs and Usage

Data Needs and Usage to Address Monitoring Objective 1:

Candidate waterbodies will be identified from past biological monitoring and general knowledge of watershed that may have high quality waters. A waterbody qualifies as State Resource Water Class B if it has water quality that exceeds levels necessary to protect assigned beneficial uses. Currently, this is defined in the Antidegradation Implementation Procedures (NDEQ, 1994b) as meeting all of the following criteria:

1) 90 percent or more of the fecal coliform samples were less than or equal to 400 colonies/100 ml.
2) 95 percent or more of the pH values ranged from 6.5 to 9.0 standard units.
3) 95 percent or more of the un-ionized ammonia values were less than or equal to 0.06 mg/l as N.
4) 90 percent or more of the dissolved oxygen values were greater than 8.0 mg/l.
5) 90 percent or more of the suspended solids values were less than 100 mg/l.
6) 90 percent or more of the turbidity values were less than 50 JTU.

For a waterbody to qualify as a State Resource Water Class B using the above criteria, a minimum of 30 observations for these parameters is required over a two-year sampling period. This amounts to a minimum of 15 samples per year for two years; therefore, it is suggested that monthly sampling with twice-monthly sampling during the growing season be required at a fixed location for each candidate waterbody.

In addition to the above list of six parameters, water temperature, conductivity, kjeldahl nitrogen, nitrate-nitrite, total phosphorus, and flow should also be collected. This will result in the following parameter list:

Streamflow	Water Temperature	Specific Conductance	pH
Dissolved Oxygen	Ammonia	Suspended Solids	Turbidity
Fecal Coliform	Kjeldahl Nitrogen	Nitrate-Nitrite	Total Phosphorus

If resources permit, it is also suggested that biological monitoring for fish and macroinvertebrates be conducted once each sampling year as these data may be used in the future for further characterization of State Resource Waters.

Because qualification as a State Resource Water Class B is dependent on the percentile of the data distribution, no sampling restrictions should be imposed. Collection may occur under any condition of streamflow, runoff, or time of day.

Data Needs and Usage to Address Monitoring Objective 2:

Waterbodies have been designated State Resource Water Class A due to geographic location or special designation (e.g. Wild and Scenic Rivers, National Wildlife Refuge, etc.) rather than qualification because of exceptional water quality data. In some cases, water quality data may not exist. Preferred monitoring locations will be fixed locations where no data exist for designated streams. If additional resources are available, fixed locations will be established on streams with minimal data. Since this objective serves to provide a baseline of existing water quality, monthly sampling at fixed locations should be performed in order to define seasonal variations. The parameter list and collection scenario remains the same as for Monitoring Objective 1.

Monitoring locations will be selected from previously established sites on State Resource Water Class B streams. Preference will be given to streams with the least amount of data. Since this objective serves to augment data already collected, it will not be necessary to collect 30 samples within a two-year period. Monthly sampling at fixed locations should be performed in order to define seasonal variations. Otherwise, the parameter list and collection scenario remains the same as for Monitoring Objective 1.

Data Needs and Usage to Address Monitoring Objective 3:

The most reasonable nutrient criteria that can be developed under the guidance issued by EPA will be from reference waterbody data. Since nutrient criteria for lakes and reservoirs are already under consideration by the Regional Technical Advisory Group (RTAG) and under a separate Section 319 project grant to the University of Nebraska-Lincoln, monitoring for this objective should concentrate on reference streams and rivers. Reference sites are not necessarily pristine or unimpacted. They can be defined as least impaired or occurring in the least modified watershed for the grouping they represent. Reference sites will be determined by biometrics from the biological monitoring program and general knowledge of watershed characteristics (e.g. land use, riparian integrity).

Reference site selection will be grouped by ecoregion, and stratified by aquatic life use class. Each ecoregion will need to have at least one stream site that qualifies as reference from each of the various aquatic life use classes. The Central Plains Center for BioAssessment at Kansas University is also monitoring some reference sites in Nebraska as part of the RTAG effort to develop nutrient criteria for streams; therefore, site selection needs to be coordinated to avoid duplication of effort. Site locations should be established on different streams than CPCB samples, although sampling runs on different dates at the same sites are acceptable if no other reference site can be established.

To satisfy this objective the samples should be analyzed for the following parameter list:

Streamflow	Water Temperature	Specific Conductance	pH
Dissolved Oxygen	Total Phosphorus	Kjeldahl Nitrogen	Nitrate-Nitrite
Turbidity	Periphyton Chlorophyll *a*		

Since criteria are to be based on the statistical distribution of data by grouping, a greater number of samples will enhance confidence in the data. It is recommended that sites be monitored monthly from March through November. No samples are needed from winter months because low water temperatures and low streamflows do not provide conditions where nutrients could be a problem. Because the criteria will rely on the statistical distribution of the data, no sampling restrictions should be imposed. Collection may occur under any condition of streamflow, runoff, or time of day.

Nutrient criteria can also be based on the universe of observations for these parameters. It is recommended that all fixed stations monitored by NDEQ be analyzed for these same parameters. The additional data may prove useful in deriving criteria or providing comparisons to the reference site data.

4.5.3 Data Collection Approach

4.5.3.1 Long-Term Fixed Station Ambient Monitoring

The Ambient Stream Monitoring Network is intended to provide information that will allow the NDEQ to describe the status of, and trends in, the quality of the state's stream and river resources. Monitoring objectives for the ambient stream monitoring network include: 1) characterize the broad-scale geographic and seasonal distribution of the water-column water-quality conditions of the state's streams and rivers, and 2) evaluate geographic and seasonal distributions of water-column water-quality conditions of the state's streams and rivers in relation to the sources, transport, fate, and effects of contaminants. Data collected as part of the ambient stream monitoring network will be used to help address Water Quality Standards Monitoring Objectives 2 (if stations are located on State Resources Waters), and 3.

3.6.3.2 Rotating Basin Monitoring

Most of the rotating basin monitoring efforts to date have centered on monitoring and analyses for assessment of surface water quality beneficial use support and the identification of some pollutants of concern. This has provided data for the assessment of beneficial use support and the identification of pollutants of some concern since 1994. These data can be used to help address WQS Monitoring Objectives 2 (where State Resource Waters have been monitored), and 3.

As the BMA moves forward towards its goal of developing *Basin Plans* that articulate water quality management strategies, "Implement Updates to Strategic Monitoring Plan" (Step 8) will provide additional monitoring opportunities to help address WQS Monitoring Objectives 2 (where State Resource Waters are to be monitored), and 3. Specifically, it is recommended that any rotating basin monitoring of State Resource Waters also include the parameters to meet WQS Monitoring Objectives 2 and that all rotating basin monitoring include parameters to meet WQS Monitoring Objective 3.

3.6.3.3 Special Studies

Special studies are conducted on a periodic basis to collect information to address specific surface water quality concerns or questions. Special studies in need of being initiated to address WQS issues include the monitoring of candidate waterbodies to be designated as State Resource Water Class B. This monitoring must involve a minimum of 30 observations over a two-year sampling period and collection of streamflow, water temperature, specific conductance, pH, dissolved oxygen, ammonia, suspended solids, turbidity, fecal coliform, kjeldahl nitrogen, nitrate-nitrite, and total phosphorus. It is also suggested that biological monitoring for fish and macroinvertebrates be conducted once each sampling year as these data may be used in the future for further characterization of State Resource Waters. Information generated from this special study, if implemented, could be used to address WQS Monitoring Objective 1. Data collected through the *Statewide Lake Classification Study* will help facilitate meeting WQS Monitoring Objective 3.

4.6 MONITORING STRATEGY FOR SURFACE WATER QUALITY ASSESSMENT – STATUS AND TRENDS [i.e., 305(B) REPORT]

4.6.1 Program/Activity Description

The federal CWA establishes a process for the development of information concerning the quality of the Nation's water resources and the reporting of this information to the EPA and the U.S. Congress. The requirements for this process are found largely in Section 305(b) of the CWA, and are referred to as the 305(b) process. This process requires each State to develop a program to monitor the quality of its surface waters and prepare a report every two years describing the status of the State's surface water quality. The EPA is required to transmit these reports to Congress along with an analysis describing the status of water quality conditions nationwide.

Under the 305(b) process, States are to conduct statewide assessments of water quality conditions and trends that correspond to measures expressed in the biennial 305(b) guidance. In conducting these assessments, States are to address their waters using the following order of priority:

1) Waters that are not supporting designated uses and are *priority waters* (*priority waters* are those waters for which pollutant abatement and control decisions are most needed to prevent or reverse the impairment of a designated use).
2) Waters that are not supporting designated uses and, while not currently designated as *priority waters*, will likely become *priority waters* in the near future.
3) All other waters that are not supporting designated uses or are threatened and are not included in the above categories.
4) All other waters not included under the above categories.

The 305(b) reporting requirements involves several water quality programs and activities. Much of the information required for the 305(b) report is generated by the monitoring efforts which support these programs and activities (e.g., NPDES, NPS Assessment, 303(d) listing and TMDL development, fish tissue assessment, etc.). The data needs described below are those needed to address the 305(b) guidance requirements in addition to those already being met by other surface water quality programs and activities.

4.6.2 Overview of Monitoring Needs

4.6.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- In accordance with the Federal Clean Water Act (CWA), prepare a Section 303(d) list, based on credible data, that identifies waterbodies impaired or threatened by water pollution.
- Collect the data necessary to develop credible surface water quality management plans (i.e., Basin Management Plans, Watershed Management Plans, and TMDLs).

4.6.2.2 Monitoring Objectives

Monitoring Objective 1: Characterize the broad-scale geographic and seasonal distribution of the water quality conditions of the state's surface water resources.

The water quality of Nebraska's surface water resources is subject to spatial and temporal variability. Lakes, streams, and wetlands are a reflection of their watersheds and, in many cases, the hydrogeologic setting underlying them. Water quality conditions within an individual waterbody can also vary widely over time in response to climatic and seasonal influences. A thorough understanding of the spatial and temporal variability of Nebraska's surface water resources is needed if the NDEQ is to meaningfully assess and manage surface water quality in the state.

Monitoring Objective 2: Evaluate geographic and seasonal distributions of water quality conditions on the state's surface water resources in relation to the sources, transport, fate, and effects of contaminants.

As mentioned above, water quality of the state's surface water resources is subject to spatial and temporal variability. While it is important to understand how surface water quality varies geographically and seasonally, it is also important to gain insights into what influences this variability. Understanding how the occurrence of point and nonpoint sources of pollution affect surface water quality, and how these affects are transported through the surface water system is important if surface water quality conditions are to be meaningfully assessed.

Monitoring Objective 3: Assess surface water conditions in the state to accurately determine if waterbodies are supporting their designated beneficial uses.

In preparing the Section 305(b) report, the NDEQ is required to assess surface water quality conditions in regards to a waterbody's ability to support its designated beneficial uses. This assessment is used to help identify surface water quality concerns within the state. Because of the role beneficial use support assessments play in identifying surface water quality concerns, it is imperative that the assessments accurately reflect existing surface water quality conditions.

Monitoring Objective 4: Determine if surface water quality conditions in the state are improving, degrading, or staying the same over time.

In preparing the Section 305(b) report, the NDEQ is required to report on the trends in surface water quality. If properly conducted, trend assessment can yield valuable information regarding whether the state's surface water quality conditions have improved, degraded, or remained unchanged over the period assessed.

4.6.2.3 Data Needs and Usage

In conducting the assessments in support of the 305(b) process, the NDEQ will consider carrying out the following types of activities as part of a balanced surface water quality monitoring program:

- Monitor chemical parameters for the purpose of determining statewide surface water quality conditions (including support of designated uses) and trends.
- Conduct bioassessments to evaluate the general health of the biological community. In monitoring the biological community the NDEQ will focus on the fish and macroinvertebrate communities. The purpose of this type of monitoring is to evaluate existing conditions and trends in aquatic life use support and establish baselines for development and implementation of management measures.

The NDEQ needs to continue to monitor surface waters that collectively will help to evaluate statewide water quality trends. Monitoring conducted in these waterbodies should be designed to show the current condition of the waterbody and whether that condition is improving, staying the same, or getting worse. Areas selected for the purpose of determining statewide trends must be done carefully. A stable network of reaches selected according to a predetermined statistical design will help ensure the development of informative surface water quality trends. Parameters should be selected that measure water quality in terms of the waterbody"s designated use and site-specific conditions. The selected sampling frequency must provide sufficient information for computing trends. Monitoring for determining long-term trends requires commitment to sampling at the same site over a long period.

The NDEQ needs to continue to broaden the data base for assessing surface water quality conditions throughout the state. Information needs to be collected for previously unassessed waters. Priority should also be given to high quality waters (i.e., State Resource Waters, Class A Coldwater Aquatic Life Waters, and reference sites). This may be accomplished using less resource intensive monitoring surveys or with periodic monitoring at fixed sites (i.e., rotating basin monitoring). Screening bioassessment techniques can be utilized for this purpose once assessment techniques for evaluating the collected information are established. Data from these assessments could allow the NDEQ to: 1) check for emerging problems, 2) determine if the existing water quality is maintaining designated uses, and 3) prepare more descriptive water quality trend assessments.

4.6.3 Data Collection Approach

4.6.3.1 Long-Term Fixed Station Monitoring

An ambient stream network has been re-initiated by the NDEQ and is intended to provide information on the existing conditions (status) and trends observed in the quality of the State's rivers and streams. The monitoring objectives for the ambient stream network include: 1) characterize the broad scale geographic and season distribution of the water column, water quality condition of the State's streams and rivers and, 2) evaluate the geographic and seasonal distributions of water column, water quality condition of the State's streams and rivers in relation to sources, transport, fate and effects of contaminants. Data and information collected as part of the ambient stream monitoring network can be used in addressing all of the Surface Water Quality Assessment Monitoring Objectives.

4.6.3.2 Rotating Basin Monitoring

Data collected through the rotating basin monitoring effort can also help to address all the identified Surface Water Quality Assessment monitoring objectives.

4.6.3.3 Special Studies

Pre-project NPS Assessments

Data collected during the pre-project NPS assessments can be used to meet Surface Water Quality Assessment Monitoring Objective 3.

Lake Sedimentation Assessment

Information generated from the lake sedimentation assessment can be used to address Surface Water Quality Assessment Monitoring Objective 3.

Statewide Lake Classification

Data collected during the statewide lake classification monitoring can be used to address Surface Water Quality Assessment Monitoring Objectives 1 and 2.

Lower Kansas River Basin Atrazine Assessment

Data collected during the Lower Kansas River Basin assessment can be used to address Surface Water Quality Assessment Monitoring Objective 3.

R-EMAP

Data collected from the R-EMAP monitoring can be used to address Surface Water Quality Assessment Monitoring Objectives 3 and 4.

Ambient Wetlands Assessment

Data generated from the ambient wetlands assessment monitoring can be used to address Surface Water Quality Assessment Monitoring Objectives 1, 2 and 4.

4.7 MONITORING STRATEGY FOR BASIN MANAGEMENT PLANNING – IDENTIFICATION AND QUANTIFICATION OF WATER QUALITY PROBLEMS AND ISSUES WITHIN RIVER BASINS

4.7.1 Program/Activity Description

The NDEQ initiated the Basin Management Approach (BMA) in April 1994. The BMA seeks to improve the efficiency and effectiveness of implementing water quality management activities by geographically focusing water quality planning activities on a 5-year rotating basis among the state's 13 major river basins. The 13 major river basins are the Big Blue, Elkhorn, Little Blue, Loup, Lower Platte, Middle Platte, Missouri Tributaries, Nemaha, Niobrara, North Platte, Republican, South Platte and White River-Hat Creek.

The ultimate goal of the BMA is to produce *Basin Management Plans* for each of the major river basins that will be used as the basis for much of the future water quality management decisions for surface water program activities. In order to achieve these goals the data collection process will need to include the quantification of problems and issues. Where other water quality programs are specifically focused (i.e. Total Maximum Daily Loads, Nonpoint Source Management, Beneficial Use Assessment), the quantification of problems and issues tends to step back and consider a broader scale. Problem quantification is being performed in order to: identify pollutants of concern, establish the magnitude of a problem, determine assimilative capacity, calculate loads from contributing sources of pollutants or otherwise characterize problems such that sufficient information is available for management strategy development.

The data needs of the Basin Quantification of Problems and Issues (BQPI) activity is similar to the Total Maximum Daily Load (TMDL) Program and much of the data collected will facilitate TMDL development. However, the charge of the TMDL program is to identify "impaired" waters (specific segments or waterbodies) and develop the management plan to correct the impairment. The major difference in the activities is that the BQPI is not limited to waters identified as "impaired". Also, one scope of the BQPI is to initially collect data and information on the (major) basin scale then if problems or potential problems are detected, the BQPI can further be utilized to perform detailed monitoring at the watershed, sub-watersheds or river/stream segment level.

4.7.2 Overview of Monitoring Needs

4.7.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- In accordance with the Federal Clean Water Act (CWA), prepare a Section 303(d) list, based on credible data, that identifies waterbodies impaired or threatened by water pollution.
- Collect the data necessary to develop water quality-based effluent limitations where Total Maximum Daily Loads (TMDLs) are not established.
- Collect the data necessary to develop credible surface water quality management plans (i.e., Basin Management Plans, Watershed Management Plans, and TMDLs).

4.7.2.2 Monitoring Objectives

Monitoring Objective 1: Identify waterbodies (streams, lakes/reservoirs and wetlands) where water quality and/or the assigned beneficial uses are impaired or imminently threatened by point source, nonpoint source or a combination of point and nonpoint source pollutants or pollution.

This objective is being pursued to facilitate the development of the required Nebraska Section 303(d) list. In order to meet this objective, water quality data of sufficient quality and quantity must be collected to determine the status of the waterbody in relation to the assigned beneficial use(s) and associated water quality criteria. Measurements of water quality parameters are taken and compared to the applicable criteria to determine if a parameter is exceeded or not. Biological monitoring can be used to identify impairment, however the results usually require follow up monitoring of additional water quality parameters.

Monitoring Objective 2: Identify the pollutant(s) or pollution, and its source(s), that is contributing to beneficial use impairment.

For some water quality parameters identified in Title 117 this objective may be met simultaneously with Monitoring Objective 1. In the cases where biological monitoring indicates a waterbody is impaired or narrative water quality criteria associated with beneficial use protection is determined to be impaired, additional monitoring is required to identify the exact cause [i.e., pollutant(s) and sources] of the water quality and/or beneficial use impairment.

Monitoring Objective 3: Estimate the existing instream loads for targeted pollutants and waterbodies.

Once a pollutant has been identified as "significant", information is needed to define the extent of the problem. Establishing the current waterbody/watershed loading is also necessary information in the event pollutant load reductions are needed. Pollutant concentrations and loads vary with climactic factors such as duration, frequency, and timing of precipitation events. This also includes the lack of precipitation. For this reason the BQPI requires that the load be calculated or estimated for each of the 10^{th} percentile nodes within the stream's hydrograph.

For some pollutants such as sediment, it may be prudent to develop event based (25-year, 24-hour storm) loads rather than percentile loading. This will also be acceptable.

Loads can either be calculated based upon empirical data or estimated using a single or combination of water quality models such as QUAL-IIe, AGNPS or BASINS. As well, load can be determined using a combination of calculations and modeling.

Monitoring Objective 4: Determine the pollution loading/assimilative capacity for targeted pollutants and waterbodies based on hydrologic conditions (i.e., by 10^{th} percentile flows).

The loading/assimilative (loading) capacity of a waterbody is the amount of a pollutant that the waterbody can assimilate (i.e., be present in the waterbody) and still allow attainment and maintenance of applicable water quality criteria, goals or beneficial uses. Loading capacity changes depending upon the hydrologic condition (flow volume) and therefore should be determined for each of the 10^{th} percentile nodes of the hydrograph. Other conditions may influence the loading capacity such as background and natural loading, oxygen demand and decay. As well, chemical and physical conditions (i.e., pH and temperature) change with increasing and decreasing stream flows that supports the 10^{th} percentile segmentation. Determining the loading capacity is a critical step, as this will define the maximum amount of pollution the waterbody can tolerate without the occurrence of water quality violations or problems. If reductions are needed, the loading capacity will also be used as the benchmark to in order to target those reductions.

Similar to Monitoring Objective 3, loading capacities can either be determined from empirical data or through the use of models.

Monitoring Objective 5: Characterize the seasonal/temporal and if possible the spatial variation associated with pollution loads for targeted pollutants and waterbodies.

Pollutant loads instream can vary for many reasons. Precipitation events, frequency, land use, disturbance of land use, practices associated with land use (e.g., fertilizer application, etc.) and available treatment(s), and others can and do have an affect on the quantity of a pollutant being delivered to a waterbody. To meet this objective, data must be collected that accounts for the variation in the instream pollutant loads. If load reductions are required, the implementation of treatment will be based upon the variation of the data and be tailored to address these situations.

Monitoring Objective 6: Determine the pollution load contributed by individual point sources, nonpoint sources, and natural background loading for targeted pollutants and waterbodies.

In the case of BQPI additional or detailed monitoring may be required to identify the pollutant sources. Because the BQPI tends to initially focus basin-wide, the source identification will be limited to identification of a source category (point or nonpoint). Associating a pollutant load with a source will be based on the accepted hypothesis that if an increasing pollutant load is observed as flow volume increases, nonpoint sources are likely responsible and if an increasing pollutant load is observed as flow volume decreases, point sources are likely responsible.

Should the need arise; additional monitoring can be pursued to identify specific sources and watersheds or sub-watersheds of concern. Monitoring to meet this goal must account for climatic factors and include hydrologic (flow) measurements.

Monitoring Objective 7: Determine the appropriate design conditions for pollution management within the River Basin.

Once a pollutant has been affiliated with a source or source category, monitoring should be performed to determine the design conditions. Design conditions are considered the worst case, or when the pollutant and source exhibit the greatest potential to negatively impact the waterbody (e.g., ammonia from point sources and low stream flow, etc.). Design conditions must be determined to assign loading reductions if necessary and aid in the selection of appropriate treatments.

Monitoring Objective 8: Calibrate and validate water quality models used in basin management planning for each River Basin.

Water quality models may require data and/or information that have not been included in the BQPI monitoring plan. When these situations arise the needed modeling will be completed at the level necessary to provide credible data.

Model calibration is the first stage of testing a model and tuning it to a set of field data. Field data are necessary to guide the modeler in choosing the empirical coefficients in a model prior to that model being used to predict desired scenarios. As well, model calibration strengthens the decision maker's confidence in the model output and the management decisions made as a result of the model conclusions.

4.7.2.3 Data Needs and Usage

In the case of Section 303(d) listing, procedures have been developed that describe how the data will be assessed. Specific Monitoring Project Plans designed at collecting data to be used in the Section 303(d) listing process should consult those procedures to ensure the data collected meets the criteria needed to determine if a waterbody is impaired or not.

The data to be collected in support of the BPQI will be limited to chemical water quality information and stream flow volume. A fixed station, systematic monitoring approach should be the basis for meeting the data needs of the BQPI program. There is also a need to perform additional monitoring to collect "event-based" samples usually associated with extreme flow events. As well, specialized sampling may be needed to collect the data and information necessary to run and/or calibrate water quality models. Ancillary data may also be needed in order to determine the applicable water quality criteria (i.e., pH and temperature for ammonia criteria calculations).

Comprehensive water quality samples must be obtained that is, a single grab sample from one location in a stream will be insufficient. For this reason, width integrated sampling, and in some cases depth integrated sampling should be utilized. The number of individual aliquots required per location (sample site) will be dependent upon the width and depth of the waterbody and the sampling location.

Stream flow volume is a necessary parameter of the BQPI activity and no data should be pursued if the collection of an associated flow measurement cannot be guaranteed. The preferred method of collecting stream flow information will be through the use of permanent gage stations. This is specifically necessary when long-term flow statistics (i.e., 7q10, 30q5) are needed. The existing sites of gage stations will be considered when selecting sample sites. However, where gages are absent, the NDEQ will like contract with the Department of Natural Resources or the United States Geological Survey to provide the necessary flow information.

Also, depending upon the parameter and the usage of the sample, instantaneous flow measurements will be acceptable. Precipitation data will be useful when attempting to identify categories of sources, event based samples, and to account for the variation of the data. While this data is useful, the BQPI will rely heavily on the existing database of precipitation measurement sites and gages.

4.7.3 Data Collection Approach

4.7.3.1 Long-Term Fixed Station Monitoring

Ambient Stream Monitoring Network

Data and information collected as part of the ambient stream monitoring network will be used in addressing, at least in part, all of the BQPI monitoring objectives.

3.5.3.2 Rotating Basin Monitoring

Data and information collected through rotating basin monitoring will be extensively used in addressing all of the BQPI monitoring objectives.

3.5.3.5 Special Studies

Special studies are conducted on a periodic basis to collect information to address specific water quality concerns or questions. At this time no special studies have been specifically initiated to facilitate basin management plan development; however, special studies undertaken by the Water Division that generate information to be used in the BQPI program are as follows:

Pre-Project NPS Assessments

Data collected during the pre-project NPS assessments can be used to meet the BQPI Monitoring Objectives 3 through 8.

Post-Project NPS Assessment

Data collected during post-project NPS assessment monitoring can be used to fulfill BQPI Monitoring Objective 1.

Statewide Lake Classification

Data collected during the statewide lake classification monitoring can be used to fulfill BOPI Monitoring Objectives 1, 5 and 8.

Point Source Mixing Studies

The data and information collected during point source mixing study monitoring could be used to help meet all the BQPI monitoring objectives.

3.5.3.6 Discharge Monitoring Reports (DMRs) – Self Monitoring

Data and information collected during the DMR self-monitoring can be used to meet the BQPI Monitoring Objectives 1, 2, 3 and 6.

3.5.3.7 Compliance Monitoring

Data and information collected during the compliance monitoring can be used to meet the BQPI Monitoring Objectives 1, 2, 3 and 6.

4.8 MONITORING STRATEGY FOR FISH TISSUE PROGRAM -- HUMAN CONSUMPTION RISK ASSESSMENT

4.8.1 Program/Activity Description

The NDEQ has collected fish tissue samples from Nebraska streams and lakes as a part of EPA Region VII's Regional Ambient Fish Tissue Monitoring Program (RAFTMP) since 1977. Data generated from the fish tissue analyses provides the means by which the NDEQ and the Nebraska Department of Health and Human Services System assess human health concerns and issue fish consumption advisories. The RAFTMP also acts as a screening tool by the NDEQ to identify surface waters of the state where pollution problems may exist. Fish tissue samples can be quite useful when identifying chronic or long-term pollution problems because fish tend to bioaccumulate many toxicants that occur in surface waters. Toxicants that are not detectable in water samples may be found to be present in fish tissue samples.

4.8.2 Overview of Monitoring Needs

4.8.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- In accordance with the Federal Clean Water Act (CWA), prepare a Section 303(d) list, based on credible data, that identifies waterbodies impaired or threatened by water pollution.

4.8.2.2 Monitoring Objectives

Monitoring Objective 1: Identify the presence and concentrations of toxic residues in indicator fish species from waterbodies in Nebraska.

Fishes are capable of accumulating many toxic substances in excess of 1,000 times the concentrations found in surface waters. Subsequently, fish tissue analyses may provide information concerning the presence of toxicants in a waterbody that may not be detected through either water or sediment samples. As such, fish tissue monitoring is an excellent early indicator of potential toxic problems in surface waters.

Monitoring Objective 2: Determine the suitability of fish for human consumption in targeted waterbodies, based on the concentrations of toxic contaminants in fish and public health concerns.

The analysis of fish fillets for toxicants is needed to determine the suitability of fish for human consumption. Numerous requests are received from the public annually for information concerning whether or not fish from different waterbodies are safe to eat. Thus, it is important that answers to questions concerning public health be based on substantiated knowledge of toxicants in fish fillets and the public health risks associated with measured toxicant concentrations. Advisories concerning the suitability of fish for human consumption will be issued as necessary.

Monitoring Objective 3: Determine statewide trends in the occurrence and concentrations of toxic contaminants in fish.

Monitoring for toxicant concentrations in whole fish from the same locations over a period of several years can provide important information concerning whether toxicant concentrations in fish are increasing or decreasing. This information may be useful as an early indicator of pollution problem areas and in directing further sampling efforts to identify specific sources of pollution. Long-term fish tissue monitoring may also provide documentation of improvements in water quality attributable to the implementation of pollution management efforts.

4.8.2.3 Data Needs and Usage

In conducting fish tissue sampling, reasonable objectives must be set. If human health is the prime consideration, fish fillets (edible portion) should be analyzed. If aquatic life impacts of "early warning" screening is the prime consideration, whole fish samples should be analyzed.

A single fish sample, consisting of 2-5 fish is collected from each site as part of the RAFTMP effort. Both benthic and predatory species are targeted. Carp (*Cyprinus Carpio*) and channel catfish (*Icatalurus punctatus*) are the preferred benthic feeding species for sampling in Nebraska. Targeted predatory species include walleye (*Stizostedion vitreum*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), crappie (*Pomoxis spp.*), and bluegill (*Lepomis machrochirus*).

Fish sampled for suitability for human consumption consist of common game fish species. Fillets (edible portion) are taken from the collected fish for analyses. Follow-up sampling automatically occurs the following year at RAFTMP screening sites where risk criteria are exceeded. Three samples comprised of 2-5 fish per sample are required for follow-up sampling. If 2 of 3 samples and the overall 3-sample mean exceed criteria, a health advisory is issued regarding fish consumption. Sites under fish consumption advisory are sampled in accordance with the NDEQ's *Basin Monitoring Approach*, once every 5 years. If this single sample is above criteria, the advisory will remain in effect. If the sample is below risk criteria, the advisory will remain and a triplicate sample consisting of 3 fish per sample will be collected the next year. The site will be removed from advisory status if 2 of the 3 samples and the 3-sample mean fall below the risk criteria. However, if 2 of the 3 samples and the 3-sample mean exceed criteria, the site will remain under an advisory, and will only be sampled again as part of the basin monitoring.

4.8.3 Data Collection Approach

4.8.3.1 Long-Term Fixed Station Ambient Monitoring

Long-term fixed station ambient monitoring will address Monitoring Objective 3.

4.8.3.2 Rotating Basin Monitoring

Rotating basin monitoring will help address Monitoring Objectives 1 and 3.

4.8.3.3 R-EMAP

R-EMAP monitoring will address Monitoring Objectives 1 and 3.

4.8.3.4 Site-Specific Assessments

Monitoring for site-specific assessments is needed to meet Monitoring Objectives 1 and 2.

4.9 MONITORING STRATEGY FOR INVESTIGATION OF FISH KILLS AND COMPLAINTS

4.9.1 Program/Activity Description

Each year a number of surface water pollution complaints and fish kills are reported to the NDEQ, and depending on the situation, an investigation into the situation may be initiated. Investigative monitoring will be conducted if it is suspected that the complaint or fish kill is due to a water pollution event.

4.9.2 Overview of Monitoring Needs

4.9.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to credibly assess surface water quality conditions and trends statewide.
- Collect credible data to support enforcement actions regarding water quality regulations.

4.9.2.2 Monitoring Objectives

Monitoring Objective 1: Investigate citizen complaints and fish kills and determine if a violation of state water quality regulations has occurred.

The purpose of this monitoring is to determine if a surface water pollution event has occurred and is the cause of the complaint or fish kill. If a pollution event has occurred, information will be collected to document the situation and determine if any surface water quality regulations have been violated.

Monitoring Objective 2: Collect the necessary information to document the extent of the surface water quality problem and any associated environmental damage, and identify, if possible, the "responsible party".

If it has been determined that a surface water pollution event has occurred, additional monitoring will be conducted in an attempt to determine the cause of the event. If the pollution event is attributable to an illegal discharge or other man-induced activity, an attempt will be made to identify the *responsible party*.

4.9.2.3 Data Needs and Usage

Each reported surface water pollution complaint and fish kill is unique to its specific situation. Investigative monitoring needs will also tend to be unique and will be determined on a case-by-case basis.

4.9.3 Data Collection Approach

4.9.3.1 Investigative Monitoring

Investigative monitoring will be used to meet the needs of Monitoring Objectives 1 and 2.

4.10 MONITORING STRATEGY FOR IMPLEMENTATION OF WASTEWATER FACILITIES OPERATOR ON-SITE ASSISTANCE TRAINING

4.10.1 Program/Activity Description

Section 104(g)(1) of the federal CWA provides for the development of an on-site assistance program to aid small communities in identifying and solving wastewater treatment facility NPDES permit noncompliance problems. On-site facility evaluation and operator training are provided to alleviate problems limiting performance including operator skills, laboratory test techniques, modes of operation, financial and budgetary constraints, and administrative activities. Approximately ten communities are assisted through on-site visits, telephone communication, and continued follow-up during a year.

4.10.2 Overview of Monitoring Needs

4.10.2.1 State Surface Water Quality Monitoring Goals Addressed

- Collect the data necessary to determine if regulated entities are in compliance with specified permit conditions regarding surface water discharges.

4.10.2.2 Monitoring Objectives

Monitoring Objective 1: Obtain accurate influent, effluent, and in-plant flow and organic loading data that can be used to evaluate the operations of selected treatment facility.

Systematic sampling errors by operators can affect the representativeness of accumulated data for a treatment facility and render that data unacceptable for assessing the operations of a treatment facility. This information is utilized to compare existing total loading of selected wastewater treatment facilities to their original design loading and compliance history.

Monitoring Objective 2: Determine loading on each treatment unit of selected facilities during average and peak flow conditions.

This information is utilized to assess treatment plant operations. It can be used to calculate treatment efficiencies of individual units and possibly account for periods of noncompliance.

4.10.2.3 Data Needs and Usage

A diagnostic evaluation of the wastewater treatment facility is necessary to determine performance limiting factors. This evaluation requires data such as flow, BOD, suspended solids, grease, etc. Data needs depend on treatment processes along with operational control tests. This data will assist the trainer in evaluating the facility and shape the on-site training.

4.10.3 Data Collection Approach

4.10.3.1 Discharge Monitoring Reports (DMRs) – Self Monitoring

DMR data is initially reviewed to identify possible wastewater treatment plant problems. It is also compared to additionally collected data to determine if the DMR data is representative of the treatment plant operations. DMR data is used to facilitate Monitoring Objective 1.

4.10.3.2 Compliance Monitoring

Compliance monitoring would usually be conducted by the NDEQ. It could be used to evaluate the accuracy of submitted DMR data. Depending where and when the compliance sampling occurred, it could be used to evaluate in-plant conditions and operations. Compliance monitoring could be used to address Monitoring Objectives 1 and 2.

4.10.3.3 Special Studies

A special study could be conducted when available data doesn't allow for an adequate evaluation of the operation of a selected wastewater treatment plant. Pre-sampling contact with the facility operator and a site visit would be made by NDEQ staff to obtain site-specific information. Additional sampling needs would then be determined.

5. OVERVIEW OF THE PROCESS FOR IDENTIFYING MONITORING NEEDS, ESTABLISHING PRIORITIES, AND TRACKING IMPLEMENTATION OF SURFACE WATER QUALITY MONITORING ACTIVITIES

The process for identifying annual monitoring needs, establishing priorities, and tracking implementation is depicted in Figure 5.1.

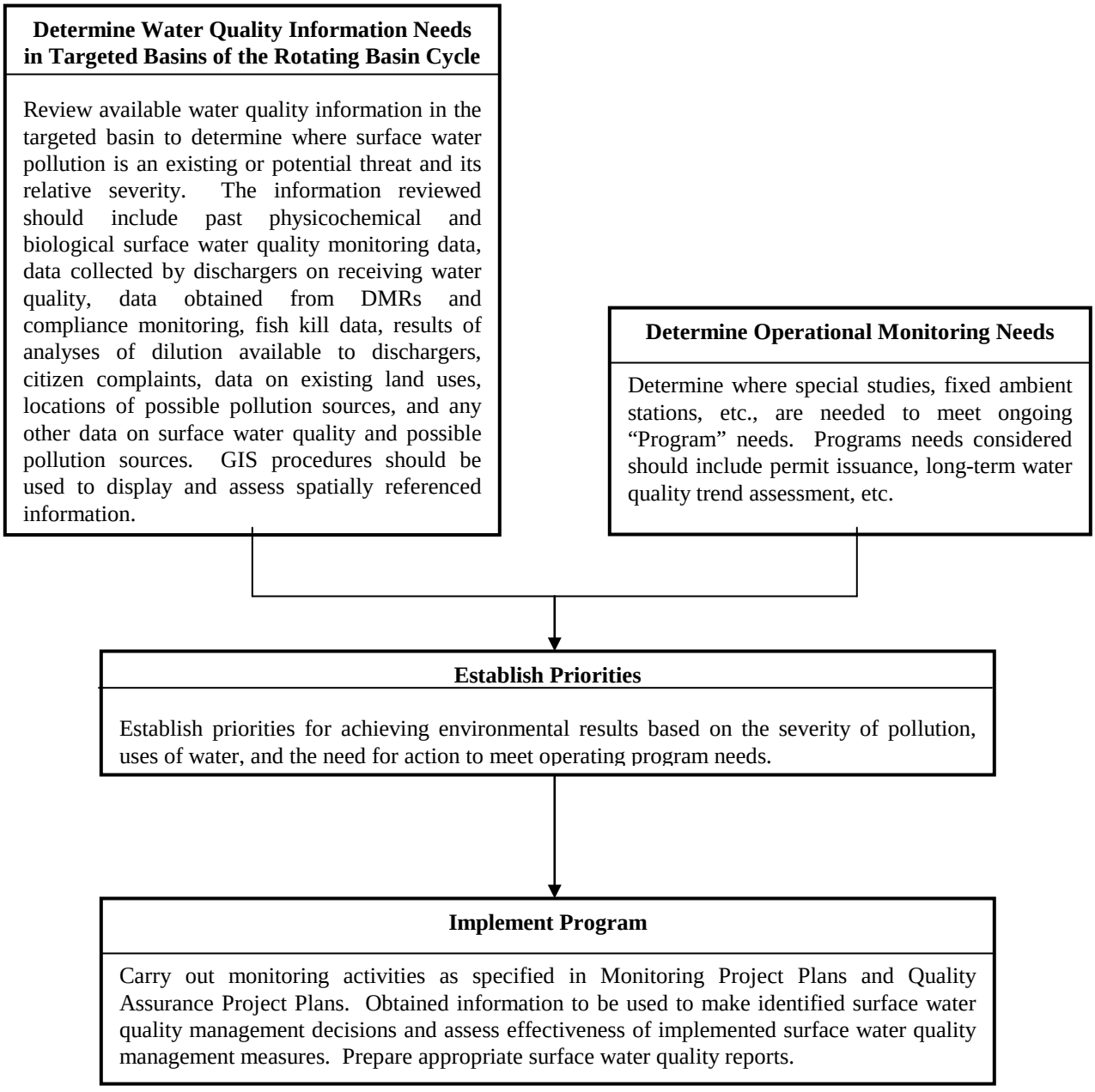

Figure 5.1. Annual process for establishing monitoring priorities and tracking implementation.

5.1 DETERMINE SURFACE WATER QUALITY DATA NEEDS WITHIN THE BMA TARGETED RIVER BASINS

As discussed earlier, the NDEQ is currently utilizing a Basin Management Approach to improve its efficiency and effectiveness in implementing surface water quality management activities by geographically focusing water quality planning activities on a 5-year rotating basis among the state's 13 major river basins. Key components of the BMA include assessing surface water quality conditions; identifying, quantifying, and prioritizing surface water quality problems and critical issues; development and implementation of surface water quality management strategies, and compilation of the above information into *Basin Management Plans*.

A first step in implementing the BMA is to review available water quality information in the targeted basin to determine where surface water pollution is an existing or potential threat and its relative severity. The information reviewed could include past physicochemical and biological surface water quality monitoring data, data collected by dischargers on receiving water quality, data obtained from DMRs and compliance monitoring, fish kill data, results of analyses of dilution available to dischargers, citizen complaints, data on existing land uses, locations of possible pollution sources, and any other data on surface water quality and possible pollution sources. GIS procedures should be used to display and assess spatially referenced information.

To reliably evaluate the severity of existing or potential pollution threats, surface water quality evaluations need to be based on information with a known level of accuracy and representativeness. Available data should initially be screened to identify potential areas and issues of concern. If the available data is sufficient, detailed assessments should be completed to describe and quantify the pollution concern and appropriate management actions should be initiated (e.g., 303(d) listing, etc.). Where the available information is insufficient to evaluate an identified pollution concern, the needed data should be identified. As appropriate, these data needs should be addressed through rotating basin monitoring and special studies.

5.2 IDENTIFY SURFACE WATER QUALITY PROGRAM OPERATIONAL DATA NEEDS

Operational monitoring needs are requirements for water quality data that exist for reasons that may not be based entirely on water quality. They may be based on state incentives or program priorities such as monitoring to support development of "WLAs" to reissue expiring permits, to conduct NPS BMP effectiveness evaluations, to facilitate on-site operator assistance training, development of TMDLs, etc. In addition, these monitoring needs could be for special lake surveys, trend monitoring, key surface water quality projects, or other state program requirements.

5.3 ESTABLISH SURFACE WATER QUALITY MONITORING PRIORITIES

After competing needs for monitoring have been identified and available surface water quality data have been evaluated, the monitoring requirements of each activity and the effect on NDEQ resources is estimated. Where needs exceed available resources, alternatives such as cooperative monitoring projects may be considered to consolidate or "contract" monitoring activities with other federal, state, or local agencies. Agreements with "dischargers" may also be established as a source of data on receiving waters with controls may be needed or have been implemented.

Based on the severity of pollution, public need or interest, and actions needed to satisfy operational monitoring needs, the appropriate NDEQ managers determine where monitoring activities are most needed. In determining these priority activities, the NDEQ will consider its 303(d) and 319 lists of priority waterbodies and watersheds, the timely development and implementation of *Basin Management Plans*, and the timely issuance of NPDES permits within the context of meeting the long-term goal of restoring and protecting the physical, chemical, and biological integrity of all the state's surface waters. Decisions will be made to facilitate achievement of this goal. Overtime, it is expected that monitoring activities will emphasize monitoring needed for environmental results and deemphasize monitoring for short-term operational needs.

5.4 COMPLETE MONITORING PROJECT PLANS AND QUALITY ASSURANCE PROJECT PLANS

After the monitoring priorities have been set by the NDEQ, the development of Monitoring Project Plans and Quality Assurance Project Plans for the appropriate activities can be initiated. The development of these documents shall be in accordance with the NDEQ's Quality Management Plan (QMP). No monitoring activities shall commence until the appropriate documents have been prepared, reviewed, and signed by the appropriate QA reviewers and designated staff.

5.5 IMPLEMENT SURFACE WATER QUALITY MONITORING PROGRAM

Surface water quality monitoring activities are implemented as specified in their respective Monitoring Project Plan to facilitate water quality assessments and program management decisions. As monitoring information is generated, it will be managed and utilized as identified in the appropriate Monitoring Project Plan.

5.6 SUMMARY OF SURFACE WATER QUALITY MONITORING OBJECTIVES, PRIORITIES, AND DATA COLLECTION APPROACHES

Table 5.1 summarizes the monitoring objectives, priorities, and data collection approaches identified to address the NDEQ's surface water quality information needs. This information will be utilized in establishing the NDEQ's annual surface water quality monitoring program.

Table 5.1. Monitoring objectives, priorities, current status, and data collection approaches identified to address NDEQ's surface water quality information needs.

Surface Water Quality Monitoring Objectives	Monitoring Priority	Is Monitoring Objective Currently Being Met	Long-Term Fixed Station Ambient Monitoring	Rotating Basin Monitoring	Detailed Watershed Assessments	DMRs – Self Monitoring	Compliance Monitoring	Investigative Monitoring	Special Studies								Volunteer Monitoring
									Pre-Project NPS Assessments	Post-Project NPS Assessments	Lake Sedimentation Assessments	Statewide Lake Classification	Lower Kansas River Basin Atrazine Study	R-EMAP	Ambient Wetlands Assessment	Site-Specific Assessments	
NPDES Program Implementation																	
1) Determine the need to establish water quality-based effluent limits within NPDES discharge permits.	H	2	○	●												●	
2) Where water quality-based permit limits are required for a facility and a TMDL isn't needed, develop WLAs for appropriate pollutants and receiving water.	H	1	○	●												●	
3) Determine compliance of facilities with their permit limits.	M	3				●	●										
4) Determine if submitted DMRs are reflective of the facility's effluent quality.	M	3				●	●										
5) Initiate and support needed enforcement actions against facilities that are exceeding their permit limits.	H	1				●	●									●	
Pretreatment Program Implementation																	
1) Determine compliance with pretreatment permit conditions and state regulations.	L	3				●	●										
2) Determine if industrial dischargers are causing interference, upset conditions, or the pass through of pollutants at a POTW.	L	2				●	●									●	
3) Determine if a POTWs' existing design loading criteria are being exceeded.	L	2				●	●									●	
4) Determine sources of wastewater sludge contamination that would limit disposal options.	L	2				●	●									●	
Nonpoint Source Management Program Implementation																	
1) Identify waterbodies, and their corresponding watersheds, where surface water quality and/or beneficial uses are impaired or imminently threatened by NPS pollution. *[Section 319 Priority "Watershed" Listing]*	H	2	○	●					●		●	○	○				○
2) Determine the extent and severity of surface water quality and/or beneficial use impairment or threat for targeted waterbodies and watersheds. *[Watershed Mgmt. Plan Development]*	H	2	○	●	●				●		●		○				
3) Identify contributing NPS pollutants and their sources within targeted watersheds. *[Watershed Mgmt. Plan Development]*	H	2	○	○	●				●		○		○				
4) Determine the loading capacity of targeted waterbodies for identified NPS pollutants of concern. *[Watershed Mgmt. Plan Development]*	H	2	○	●	●						●		○				
5) Estimate the current watershed loadings to targeted waterbodies for identified NPS pollutants of concern. *[Watershed Mgmt. Plan Development]*	H	2		○	●						●		○				
6) Identify critical NPS areas for application of BMPs in targeted watersheds. *[Watershed Mgmt. Plan Development]*	H	1			●								○				
7) Calibrate and validate water quality and watershed models used to assess and predict NPS pollution occurrence and response to management measures. *[Watershed Mgmt. Plan Development]*	H	0		○	●				●			●					
8) Evaluate the effectiveness of implemented NPS control practices (i.e., BMPs) within targeted NPS pollution control areas. *[Watershed Mgmt. Plan Implementation]*	M	2							●	●	●						○

Table 5.1. (Continued).

Surface Water Quality Monitoring Objectives	Monitoring Priority	Is Monitoring Objective Currently Being Met	Long-Term Fixed Station Ambient Monitoring	Rotating Basin Monitoring	Detailed Watershed Assessments	DMRs – Self Monitoring	Compliance Monitoring	Investigative Monitoring	Special Studies								Volunteer Monitoring
									Pre-Project NPS Assessments	Post-Project NPS Assessments	Lake Sedimentation Assessments	Statewide Lake Classification	Lower Kansas River Basin Atrazine Study	R-EMAP	Ambient Wetlands Assessment	Site-Specific Assessments	
TMDL Development and Implementation																	
1) Determine the extent of impairment and existing loadings for the pollutants causing impairment for 303(d) listed waterbodies. *[TMDL Development]*	H	1	○	●	●	○	○		●		●	○				●	
2) Determine the allowable waterbody loading/assimilative capacity for pollutant(s) impairing beneficial uses for 303(d) listed waterbodies. *[TMDL Development]*	H	1	○	●	●	○	○		○		●	○				●	
3) Determine the sources of pollution contributing to beneficial use impairments for 303(d) listed waterbodies and quantify the contributions from individual sources or source category (point or nonpoint source). *[TMDL Development]*	H	0	○	●	●	●	●		○		○					●	
4) Calibrate and validate water quality models used in the TMDL process. *[TMDL Development]*	H	0	○	●	●	○	○									●	
5) Determine the effectiveness of implemented TMDLs in improving water quality. *[TMDL Implementation]*	M	2	○	●	●	●	●			●						●	
Water Quality Standards Development and Implementation																	
1) Identify waterbodies meeting the definition of State Resource Water Class B. *[Antidegradation Policy Implementation]*	L	0														●	
2) Define baseline water quality conditions for each designated State Resource Water Class A and B. *[Antidegradation Policy Implementation]*	L	0	○	●													
3) Obtain representative range of concentrations and loadings for total N, total P, chlorophyll *a*, and turbidity (or secchi depth) from waterbodies in each ecoregion of Nebraska for future nutrient criteria development.	H	2	○	●								●					
Water Quality Assessment – Status and Trends (305b Report)																	
1) Characterize the broad-scale geographic and seasonal distribution of the water quality conditions of the state's surface water resources.	H	2	●	○								●			●		
2) Evaluate geographic and seasonal distributions of water quality conditions of the state's surface water resources in relation to the sources, transport, fate, and effects of contaminants.	H	1	●	●								●	●		●		
3) Assess surface water conditions in the state to accurately determine if individual waterbodies are supporting their designated beneficial uses.	H	2	○	○					○		○		○	●			
4) Determine if surface water quality conditions in the state are improving, degrading, or staying the same over time.	H	1	●	●										●	●		

Table 5.1. (Continued).

Surface Water Quality Monitoring Objectives	Monitoring Priority	Is Monitoring Objective Currently Being Met	Long-Term Fixed Station Ambient Monitoring	Rotating Basin Monitoring	Detailed Watershed Assessments	DMRs – Self Monitoring	Compliance Monitoring	Investigative Monitoring	Special Studies								Volunteer Monitoring
									Pre-Project NPS Assessments	Post-Project NPS Assessments	Lake Sedimentation Assessments	Statewide Lake Classification	Lower Kansas River Basin Atrazine Study	R-EMAP	Ambient Wetlands Assessment	Site-Specific Assessments	
Basin Management Planning – Identification and Quantification of Water Quality Problems and Issues within River Basins																	
1) Identify waterbodies (streams, lakes/reservoirs and wetlands) where desiganted beneficial uses are impaired or imminently threatened by point source, nonpoint source or a combination of point and nonpoint source pollutants or pollution. *[303(d) Impaired Waters Listing]*	H	2	○	●							●	●					
2) Identify the pollutant(s) or pollution, and its source(s), that is contributing to beneficial use impairment. *[303(d) Impaired Waters Listing]*	H	1	○	●	○	○	○		●		●	○				●	
3) Estimate the existing instream loads for targeted pollutants and waterbodies. *[Basin Mgmt. Plan Development]*	M	0	○	●		○	○		○							●	
4) Determine the pollution loading/assimilative capacity for targeted pollutants and waterbodies based on hydrologic conditions (i.e., by 10th percentile flows). *[Basin Mgmt. Plan Development]*	M	0	○	●					○								
5) Characterize the seasonal/temporal and if possible the spatial variation associated with pollution loads for targeted pollutants and waterbodies. *[Basin Mgmt. Plan Development]*	H	1	○	●		○	○		○		○					●	
6) Determine the pollution load contributed by individual point sources, nonpoint sources, and natural background loading for targeted pollutants and waterbodies. *[Basin Mgmt. Plan Development]*	M	1	○	●	●	●	●		○							●	
7) Determine appropriate design conditions for pollution management within the River Basin. *[Basin Mgmt. Plan Development]*	H	1	○	●												●	
8) Calibrate and validate water quality models used in basin management planning for each River Basin. *[Basin Mgmt. Plan Development]*	M	0	○	●	●	○	○		○		○						
Fish Tissue Program – Human Consumption Risk Assessment																	
1) Identify the presence and concentrations of toxic residues in indicator fish species from waterbodies in Nebraska.	M	2	○	●										●		●	
2) Determine the suitability of fish for human consumption in targeted waterbodies, based on the concentrations of toxic contaminants in fish and public health concerns.	M	2														●	
3) Determine statewide trends in the occurrence and concentrations of toxic contaminants in fish.	M	1	●	●										●			
Investigation of Fish Kills and Complaints																	
1) Investigate citizen complaints and fish kills and determine if a violation of state water quality regulations has occurred.	H	3						●									
2) Collect the necessary information to document the extent of a surface water quality problem and any associated environmental damage, and identify, if possible, the "responsible party".	H	3						●									
Wastewater Facilities Operator On-Site Assistance Training																	
1) Obtain accurate influent, effluent, and in-plant flow and organic loading data that can be used to evaluate the operations of selected treatment facilities.	H	0				●	●									●	
2) Determine loading of each individual segment of selected facilities during average and peak flow conditions.	H	0					●									●	

Key to Symbols and Abreviations:

● Primary Data Use
○ Secondary Data Use

Priorities: L = Low, M = Medium, H = High

Degree to Which Monitoring Objective Being Met:
0 = Not being met, 1 = Being met to a limited degree, 2 = Somewhat being met, 3 = Largely being met, 4= Completely being met.

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GROUND WATER QUALITY MONITORING STRATEGY

CPP Document Number 2.2

Being Developed by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director **Date**

REVIEW AND REVISION OF SURFACE WATER QUALITY STANDARDS (TITLE 117)

CPP Document Number: 3.1

Being Developed by:

Water quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

USE ATTAINABILITY ANALYSIS PROCEDURES AND WATER BODY CLASSIFICATIONS FOR NEBRASKA SURFACE WATERS

CPP Document Number 3.2

Being Revised by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

March 1998

The attached document is being revised for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Title 117 - Nebraska Surface Water Quality Standards are the cornerstone of water quality management in the State. They define beneficial uses for the State's waters and specify water quality criteria necessary to protect those uses. Designated uses and associated water quality criteria serve to define the water quality management goals for a water body. It is therefore imperative that the beneficial uses assigned to a water body accurately reflect uses that are attainable. Procedures for conducting use attainability analyses (UAA) are necessary to consistently designate appropriate beneficial uses in Title 117.

The water quality standards regulations (40 CFR 131.3(g)) define a use attainability analysis as a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological and economic factors as described in 40 CFR 131.10(g). EPA regulations at 40 CFR 131.10(g) state:

> "States may remove a designated use[1] which is *not* an existing use[2], as defined in §131.3 or establish subcategories of a use if the State can demonstrate that attaining the designated use is not feasible because:
>
> 1. Naturally occurring pollutant concentrations prevent the attainment of the use; or
>
> 2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met; or
>
> 3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or
>
> 4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use; or
>
> 5. Physical conditions related to the natural features of the water body, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or
>
> 6. Controls more stringent than those required by sections 301(b)[3] and 306[4] of the Act would result in substantial and widespread economic and social impact[5]."

[1] Designated uses are those uses specified in Water Quality Standards for each water body or segment whether or not they are actually being attained.

[2] Existing uses are those uses actually attained in the water body on or after November 28, 1975, whether or not they are designated in the water quality standards.

EPA regulations regarding use attainability studies further state in 40 CFR 131.10(h)

> "States may not remove designated uses if:
>
> 1. They are existing uses, as defined in §131.3, unless a use requiring more stringent criteria is added; or
>
> 2. Such uses will be attained by implementing effluent limits required under sections 301(b) and 306 of the Act and by implementing cost-effective and reasonable best management practices for nonpoint source control."

and in 40 CFR 131.10(j) that:

> "A State must conduct a use attainability analysis as described in §131.3(g) whenever:
>
> The State designates or has designated uses that do not include the uses specified in section 101(a)(2)[6] of the Act, or
>
> 1. The State wishes to remove a designated use that is specified in section 101(a)(2) of the Act or to adopt subcategories of uses specified in section 101(a)(2) of the Act which require less stringent criteria."

EPA's water quality standards regulations at 40 CFR 131.10 and the Water Quality Standards Handbook (USEPA, 1994) discuss use the attainability analysis procedures that must be conducted in order to remove or not designate a use specified by 101(a)(2) of the Clean Water Act. In Nebraska the 101(a)(2) uses are aquatic life and recreation. However, for the purposes of this document, those procedures used for designation of all beneficial uses in Title 117 including the 101(a)(2) uses will collectively be referred to as use attainability analyses.

The basic steps of this process are outlined in Figure 1. If a use is existing, it must be assigned (Step 1). If a use is not existing, a determination as to whether the use is attainable and what subuse should be assigned is made (Steps 2 through 4). A UAA (as defined by EPA) is performed whenever changes to 101(a)(2) use designations (recreation or aquatic life) are under

---

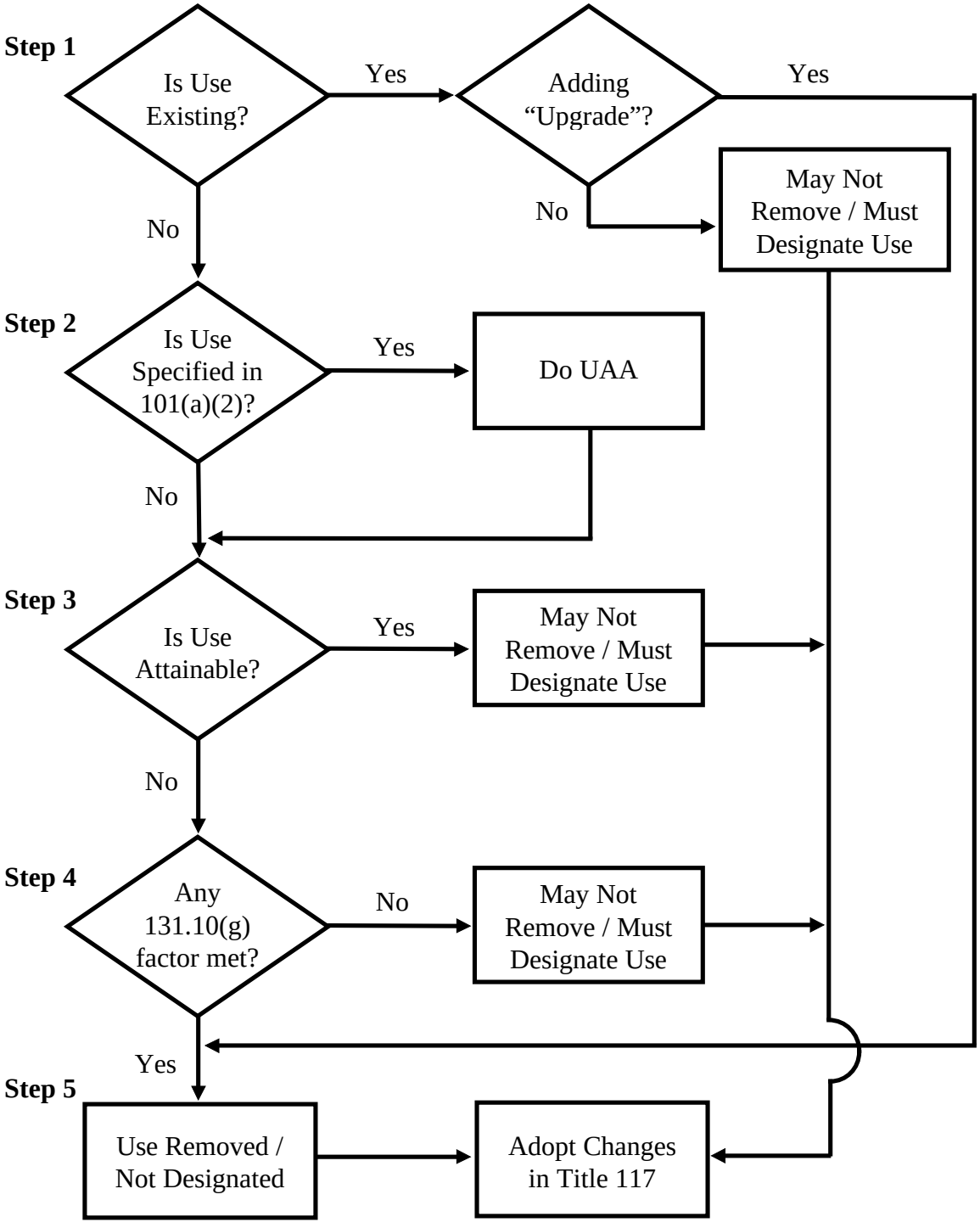
[3] Section 301(b) refers to Effluent Limitations.

[4] Section 306 refers to National Standards of Performance.

[5] Guidance on determining social or economic impact is found in "Economic Guidance for Water Quality Standards Workbook (draft)" (U.S. EPA, Office of Water; 1993) and Nebraska's "Antidegradation Implementation Procedures (1994)"

[6] Section 101(a)(2) states: "It is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983."

Figure 1. Process for Assigning or Removing Beneficial Uses. (Adapted from Water Quality Standards Handbook, Second Edition. USEPA, 1994)



consideration (Step 2). If the use is not attainable (Step 3), a determination must be made that attainment is not feasible because of one of the six 131.10(g) factors (Step 4). Taken together with use specific requirements for categorization into subclasses, these steps outline Nebraska's procedures for assigning beneficial uses.

Title 117 - Nebraska Surface Water Quality Standards define the beneficial uses for which surface water quality is protected in Nebraska. Beneficial uses may be assigned to stream segments, lakes, impounded waters, or wetlands depending on the characteristics of each surface water body. The uses defined in Title 117 for surface water quality protection include:

Beneficial Uses Assigned to Streams, Lakes, and Impounded Waters:

- Primary Contact Recreation
- Aquatic Life

  Coldwater (Class A and B)

  Warmwater (Class A and B)
- Water Supply

  Public Drinking Water

  Agricultural

  Industrial
- Aesthetics

Beneficial Uses Assigned to Wetlands:

- Aquatic Life
- Wildlife
- Agricultural Water Supply
- Aesthetics

In addition to these beneficial use designations, surface waters may also be classified as State Resource Waters (Class A or B). Although this classification is not a designated beneficial use, its assignment to a waterbody has important implications through the antidegradation provisions of Title 117.

METHODOLOGY

The procedures used to conduct use attainability analyses and classify beneficial uses and State Resource Waters in Title 117 are defined below. These procedures include both quantitative measures and qualitative guidelines that are conducted both in the field and at the desktop level.

PRIMARY CONTACT RECREATION

Primary contact recreation includes activities where the body may come into prolonged or intimate contact with the water, such that water may be accidentally ingested and sensitive body organs (e.g., eyes, ears, nose, etc.) may be exposed. The primary contact recreation use applies to surface waters that are used, or have a high potential to be used, for primary contact recreational activities. This use is assigned to all publicly owned or open-to-public-access lakes and impounded waters in Chapter 7 of Title 117. All of these waters are considered to have sufficient size and depth to provide an attainable use for primary contact recreation. Public access to these waters encourages their use for this purpose.

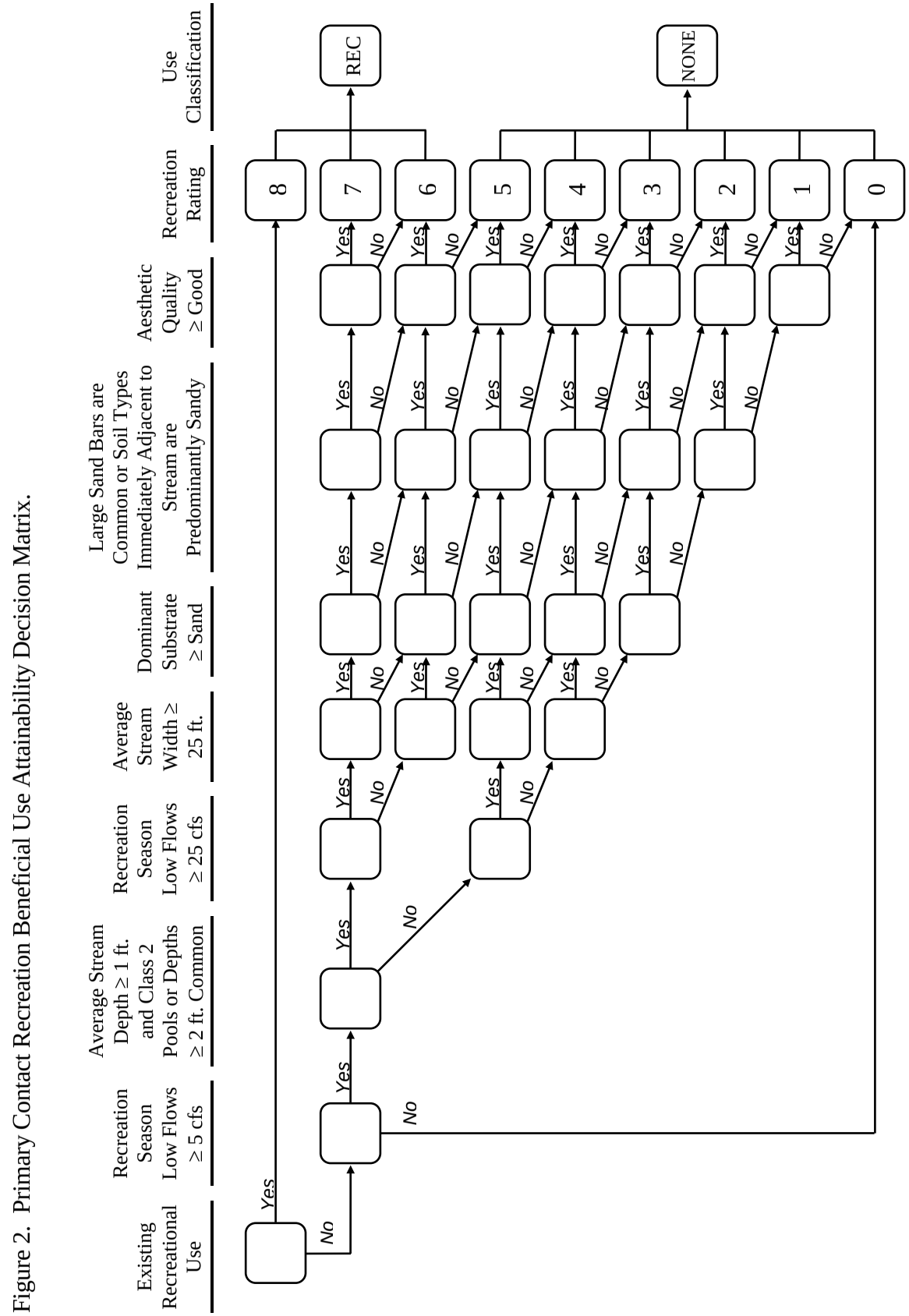
The primary contact recreation use attainability of stream segments is determined according to the procedures shown in Figure 2. The following is a discussion of the factors used in assessing attainability of the primary contact recreation use.

Existing Use:

If a Primary Contact Recreation beneficial use was attained in a stream segment on or after November 28, 1975, it is deemed an existing use. An existing primary contact recreational use is considered to be present on a stream segment if high public use for recreation is known to occur. The following river reaches are considered to have existing or attained primary contact recreation beneficial uses:

- North Platte River, from the Wyoming/Nebraska border to the Platte River;
- Platte River, from the confluence of the North and South Platte Rivers to the Missouri River;
- Missouri River, from the South Dakota/Nebraska border to the Kansas/Nebraska border;
- Elkhorn River, from the Cedar Creek to the Platte River; and
- stream segments identified by the Nebraska Game and Parks Commission (NGPC) as a State Canoe Trail.

Figure 2. Primary Contact Recreation Beneficial Use Attainability Decision Matrix.



The NGPC has identified the following river reaches as state canoe trails:

- Calamus River, from Nebraska Highway 7 to Nebraska Highway 183;
- Dismal River, between Nebraska Highway 97 and Dunning;
- Elkhorn River, between West Point and Dead Timber State Recreation Area;
- North Platte River, from the Wyoming/Nebraska border to the Bridgeport State Recreation Area;
- Platte River, between Fremont and Nebraska Highway 77-75;
- Republican River, from the Harlan County Dam to the Guide Rock Diversion Dam; and
- Missouri River, from the South Dakota/Nebraska border to Niobrara.

The following factors were evaluated for the Primary Contact Recreation beneficial use attainability decision matrix.

Recreation Season Low Flows > 5 cfs:

If mean daily low flows during the period May 1 through September 30 are normally greater than 5 cfs, a "Yes" decision is made.

Average Stream Depth and Class 2 Pool Occurrence:

Each stream is categorized by depth class, and frequency and depth of pools. A "Yes" decision at this point in the matrix is made when the stream in question has a depth greater than 1.0 foot or Class 2 pools are common. Class 2 pools are of moderate size and depth. Their greatest pool depth is two feet or more. Pool depth and size are sufficient to provide a recreational bathing area for at least one person or a low velocity resting area for several adult fish of a larger sized species.

Recreation Season Low Flows:

Each stream is categorized by a flow class. If the stream in question has a low flow during the recreation season of greater than 25 cfs, a "Yes" decision will be made at this point.

Average Stream Width:

The average width of each stream segment is categorized by a width class. If the average stream width of the stream in question is greater than 25 feet then a "Yes" decision is made at this point in the matrix.

Dominant Substrate:

Substrate composition is characterized by the dominant (10 percent or more) substrate types present. From the smallest particle size to the largest, the substrate types are: Organic detritus; Silt/clay (unconsolidated) (particle size < 0.062 mm); Hardpan silt/clay (consolidated)(particle size < 0.062 mm); Sand (particle size ≥ 0.062 mm and < 2.0 mm); Gravel (particle size ≥ 2.0 mm and < 64 mm); Cobble (particle size ≥ 64 mm and < 128 mm); Boulders (particle size ≥ 128 mm); and Bedrock. A dominant substrate of materials larger than Sand calls for a "Yes" decision in the matrix.

Sand Bars or Sandy Adjacent Soils:

Sand bars are characterized according to their potential for use (e.g., sun bathing, resting areas) in water-based recreational activities. Large sand bars are defined as long, wide areas of sand along stream banks or within a stream, which are capable of serving as a recreational area for several bathers. Streams are categorized according to the observed occurrence frequency of large sand bars during normal annual low flow conditions. Aerial photographs and designated sandy areas shown on USGS topographic maps will be used to aid decisions concerning the common occurrence of large sand bars throughout the length of a stream segment.

Sandy streambank soils are important for water-based recreational activities by providing "sunning" or resting" areas for bathers, particularly in the absence of sand bars. Stream bank soils along each segment are characterized by one of two general soil types: "sandy" or "other". Natural Resources Conservation Survey soil survey maps are used to identify the dominant soil types adjacent to each stream segment. "Sandy" soils are defined as any of the following soil types: sand, fine sand, very fine sand, sandy loam, fine sandy loam, very fine sandy loam, gravely sandy loam, loamy sand, loamy fine sand, loamy very fine sand, dune sand, sandy alluvial lands gravely alluvial land, riverwash, and sand pits and quarries. "Other" soils include silty or clayey soil types or soils composed of larger materials (e.g., unweathered bedrock, boulders).

Common large sand bars or sandy streambank soils lead to a "Yes" decision at this step.

Aesthetic Quality:

The aesthetic quality of a stream is judged on five factors: channel configuration, water clarity, forest character, bank erosion, and flow character. These five factors are described below.

1. Channel Configuration: Natural stream channels are considered to be aesthetically more pleasing than straightened channels, which significantly reduce the scenic quality of a stream. A stream segment is categorized as unchannelized and receives one point for aesthetics if less than half of its length has been straightened. If at least half of its length has been straightened, it is listed as channelized and receives no points.

2. Water Clarity: Clear water or water with low turbidity generally increases the aesthetic quality of a stream. Water clarity is determined from historic suspended solids or turbidity data

measured during the recreation season, May through September, at monitoring stations located on or immediately upstream or downstream from a stream segment. Clear water is defined as having median suspended solids concentrations of 100 mg/l or less (110 mg/l for depth-integrated samples) or median turbidity values of 30 JTU or less. The parameter with the greatest number of observations during the most recent period of record is used to characterize water clarity. Streams with clear water receive one point for aesthetics while streams that exhibit higher suspended solids or turbidity receive no points.

3. Forest Character: Forested stream banks are considered to greatly enhance the scenic quality of a stream. Forest character is determined from aerial photographs or USGS 7 1/2 minute topographic maps that display riparian forests as green areas adjacent to streams. A stream segment is categorized as having predominately forested streambanks and receives one point for aesthetics if at least half of the combined lengths of the riparian areas along both sides of a stream are forested. If less than half of the combined lengths of the riparian areas are forested, the stream is classified as being predominately unforested and receives no points.

4. Bank Erosion: Streams with exposed bank areas greater than 30 percent are considered to have moderate to severe erosion and greatly reduced aesthetic appeal for recreational activities. Bank erosion is determined from field observations and photographs taken during stream surveys. If the percentage of bare ground or unvegetated areas along the streambanks is documented as being 30 percent or less of the total streambank area on both sides of the stream, the stream is considered to have good bank vegetation and minor erosion. These streams receive one point for aesthetics. Streams with greater than 30 percent of the total streambank area having no vegetation are considered to have an erosion problem and these streams receive no points. Stream survey sites with bank erosion due to cattle damage are not included in the assessment of bank erosion unless these conditions are determined to be representative of the segment.

5. Flow Character: Turbulent flow conditions are considered to greatly enhance the scenic quality of a stream and increase its desirability for recreational activities such as canoeing, rafting, and tubing. Flow character is based on the turbulent or laminar nature of the stream flow and determined from field observations, photographs, water velocity measurements taken during stream surveys, and stream gradient measurements taken from USGS 7 1/2 topographic maps. Streams are described as having turbulent flow if average stream velocity is at least 1.5 feet/second or average stream gradient is at least 15 feet/mile in association with substrates of sand or larger particles. Turbulent streams receive one point for aesthetics while non-turbulent streams receive no points.

Each of these factors is evaluated and given points according to the rating for each factor. The points are added up at the end and measured against the following ranking:

Aesthetic Quality	Points	Inventory Code
Excellent	4 or 5	1
Good	3	2
Fair	2	3
Poor	0 or 1	4

Those streams with Aesthetic Quality Ranking of Good or Excellent earned a "Yes" decision in the decision matrix. Lower aesthetic quality streams earned a No.

The decisions made concerning all of these elements of the Primary Contact Recreation beneficial use decision matrix lead to a numerical recreation rating. Streams with ratings of 0 through 5 are not assigned the Primary Contact Recreational beneficial use. Streams with rating of 6, 7 or 8 are judged to have an attainable Primary Contact Recreational beneficial use.

AQUATIC LIFE

The assessment procedures for determining use attainability and classification of a stream segment for aquatic life uses is depicted in the decision matrix shown in Figure 3. The following is a description of the decision matrix options for assessing the attainability of aquatic life uses.

Summer Water Temperature:

If the maximum daily temperature of a stream segment during the months of May, June, July, August, and September does not exceed 25°C (77°F), a "Yes" decision is made at the first step of this decision matrix.

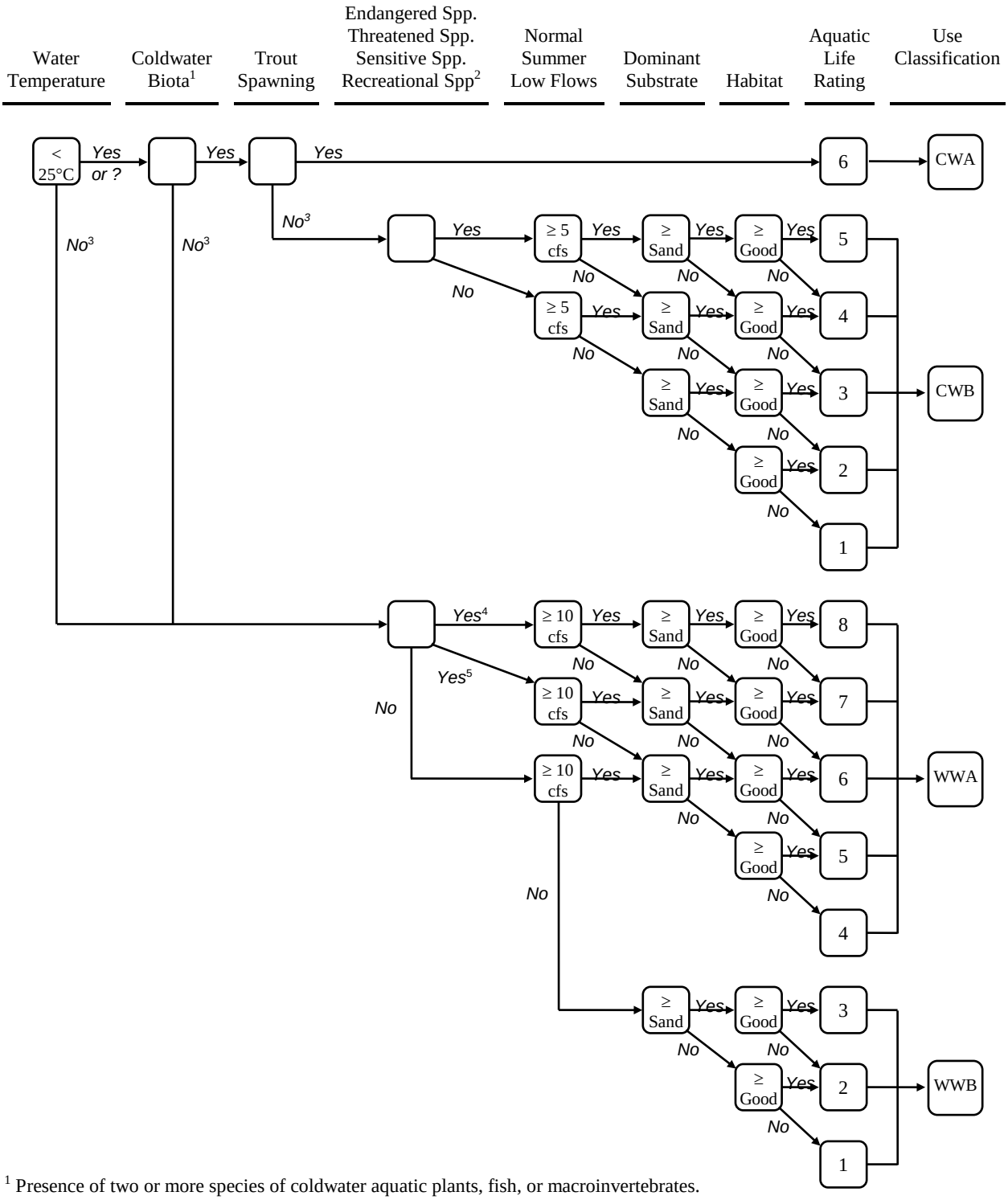
Coldwater Biota:

Coldwater biota are considered to be life forms that require or prefer waters where temperatures do not exceed a maximum daily temperature of 25°C (77°F). If two or more species of coldwater aquatic plants, fish or macro- invertebrates, as identified in the Nebraska Stream Inventory (NDEQ 1992) and in Table 1, inhabit the stream segment, a "Yes" decision is made at this point.

Trout Spawning:

The ability of a stream segment to support salmonid spawning is evaluated based on existing or historical salmonid populations or existing physical habitat. If the stream segment supports a viable population of salmonids with juveniles present, salmonid spawning is considered to be occurring and the "Yes" decision is selected. If historical records document the occurrence of successful salmonid reproduction on or after November 28, 1975, the "Yes" decision is selected. If the physical habitat (e.g., substrate, flow, cover, etc.) of the stream

Figure 3. Aquatic Life Beneficial Use Attainability Decision Matrix.



[1] Presence of two or more species of coldwater aquatic plants, fish, or macroinvertebrates.

[2] As identified in Title 117 - Nebraska Surface Water Quality Standards.

[3] Waters used for Salmonid migration will be seasonally designated as Coldwater Aquatic Life Class B.

[4] One or more endangered, threatened, or sensitive species; or three or more recreationally important species of adult size.

[5] One or two recreationally important species of adult size.

Table 1. Aquatic Biota Representative of Coldwater Habitats in Nebraska.

FISH

Brook trout	*Salvelinus fontinalis*
Rainbow trout	*Oncorhynchus mykiss*
Brown trout	*Salmo trutta*
Pearl dace	*Semotilus margarita*
Northern redbelly dace	*Phoxinus eos*
Finescale dace	*Phoxinus neogaeus*
Lake chub	*Couesius plumbeus*
Longnose dace	*Rhinichthys cataractae*
Brook stickleback	*Culaea inconstans*
Longnose sucker	*Catostomus catostomus*

MACROINVERTEBRATES

PLECOPTERA (Stoneflies)
- *Malenka sp.*
- *Isoperla patricia*
- *Nemoura sp.*
- *Amphinemura sp.*
- *Acroneuria sp.*
- *Perlesta placida*

Trichoptera (Caddisflies)
- *Leucotrichia sp.*
- *Hydroptila sp.*
- *Brachycentrus americanus*
- *Glossosoma sp.*
- *Moselyana comosa*
- *Helicopsyche sp.*
- *Agraylea sp.*
- *Oxyethira sp.*
- *Mayatrichia sp.*
- *Oecetis sp.*
- *Ceraclea sp.*

TURBELLARIA (Flatworms)
- *Cura foremanii*

EPHEMEROPTERA (Mayflies)
- *Paraleptophlebia sp.*
- *Epeorus sp.*
- *Leptophlebia sp.*
- *Ephemerella sp.*
- *Pseudocleon sp.*

DIPTERA (Flies)
- *Pentaneura sp.*
- *Diamesa sp.*
- *Eukiefferiella sp.*
- *Odontomesa sp.*
- *Parakiefferiella sp.*
- *Pesudosmittia sp.*
- *Potthastia sp.*
- *Paraphaenocladius sp.*
- *Paralauterborniella sp.*
- *Hydrobaenus sp.*
- *Brillia sp.*
- *Parametriocnemus sp.*
- *Corynoneura sp.*
- *Prodiamesa sp.*
- *Heterotrissocladius sp.*
- *Paracladius sp.*

FLORA

Water Cress	*Nasturtium officinale*
Monkey flower	*Mimulus glabratus*
Water weed	*Elodea canadensis*
Buttercup or Crowsfoot	*Ranunculus longirostris*
Aquatic moss	*Philonotis sp.*
Aquatic moss	*Orepanocladus sp.*
Brook grass	*Catabrosa aquatica*

segment, excluding human-caused pollution, is capable of supporting of salmonid reproduction, the "Yes" decision is selected.

Presence of Key Species:

Key species are defined as identified endangered, threatened, sensitive, or recreationally-important aquatic species associated with a particular water body and its aquatic life use class (Title 117 - Nebraska Water Quality Standards for Surface Waters of the State 1991). If one or more endangered, threatened or sensitive species, or three or more recreationally-important species are present in the stream segment, the "Yes" decision is selected.

Normal Annual Low Flows:

The "Yes" decision is selected for the stream segment if the mean daily flows during the year are normally greater than 1 cfs.

Dominant Substrate:

The substrate composition of the stream segment is estimated from visual observation. If the substrate is dominated ($\geq$ 50%) by sand or larger material (0.062 mm or larger particle size), the "Yes" decision is selected. If silt or clays ($<$ 0.062 mm particle size) comprise more than 50% of the substrate, the "No" path is followed.

Habitat:

The habitat rating of each stream segment is categorized based on watershed and riparian conditions, instream cover, and habitat types. Each category is given a point rating corresponding to excellent, good, fair, or poor. The "Yes" decision is made if a stream segment receives a habitat rating of good or excellent.

Aquatic Life Rating:

The cumulative decisions in this matrix result in an Aquatic Life numerical rating. The top half of the matrix constitutes the Coldwater Aquatic Life category. A rating of 6 results in a use classification of Coldwater Class A Aquatic Life. Ratings of 1 through 5 result in a Coldwater Class B Aquatic Life classification. The bottom half of the matrix constitutes the Warmwater Aquatic Life category. Ratings of 4 through 8 result in a use classification of Warmwater Class A Aquatic Life. Ratings of 1 through 3 result in a Warmwater Class B Aquatic Life classification.

WATER SUPPLY

There are three separate sub-uses within the water supply classification. These uses are public drinking water supply, agricultural water supply, and industrial water supply. None of the sub-uses are considered 101(a)(2) uses by the Clean Water Act and do not require analyses as set forth in 40 CRF 131.10. Each sub-use has different qualifiers for designation that are discussed below and displayed in Figure 4.

Public Drinking Water

These are surface waters that serve as a public drinking water supply. If there is direct use of surface waters, a public drinking water rating of 2 is assigned and the Public Drinking Water Supply beneficial use is assigned. This information is obtained from water rights appropriations filed with the Nebraska Department of Water Resources. If the water is used indirectly (e.g. through recharge of alluvial aquifers that supply public drinking water wells) a rating of 1 is assigned and the beneficial use is not assigned at this time. Currently, there are surface water rights applications with the Nebraska Department of Water Resources for domestic water supply through the recharge of alluvial aquifers. If these water rights applications are approved, the indirect use of surface waters will result in the assignment of the Public Drinking Water Supply beneficial use. If neither direct nor indirect use of surface waters is made for public drinking water, the beneficial use is not assigned.

Agricultural

The Agricultural Water Supply beneficial use is assigned to all surface waters in Nebraska. To determine which subclass of the use is suitable for a waterbody, conductivity is measured. Median conductivity of less than 2000 μmhos/cm qualifies the waterbody for a Class A Agricultural beneficial use designation. Streams with this use designation have an attainable use of crop irrigation or livestock watering.

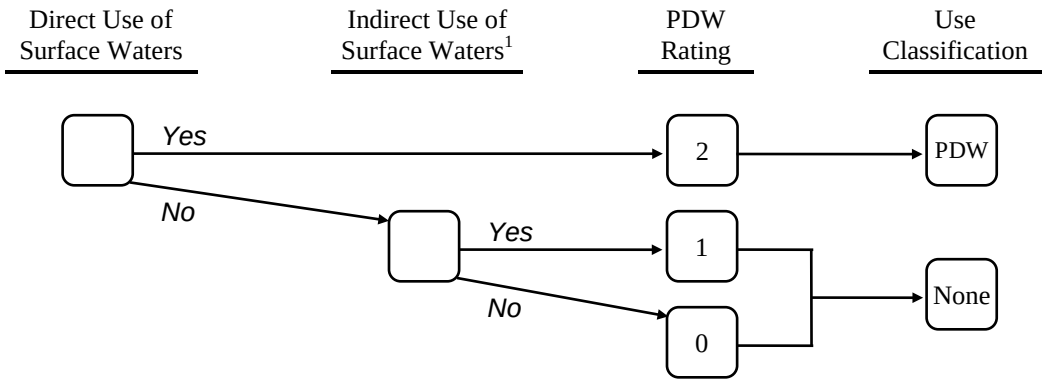
Median conductivity greater than 2000 μmhos/cm due to natural causes, (e.g. high salinity in aquifer supplying base flow, brackish wetlands) results in a Class B Agricultural beneficial use classification. The natural background water quality in these waterbodies limits their use for agricultural purposes. No water quality criteria are assigned to protect this use.

Industrial

Waterbodies where existing uses include cooling water, hydroelectric power generation, or nonfood processing water, in commercial or industrial activities, receive an industrial rating of 1 and are assigned the Industrial Water Supply beneficial use. This information is obtained from water rights appropriations filed with the Nebraska Department of Water Resources. Water quality criteria to protect this beneficial use vary with the type of industry involved. Site-specific criteria are developed as needed.

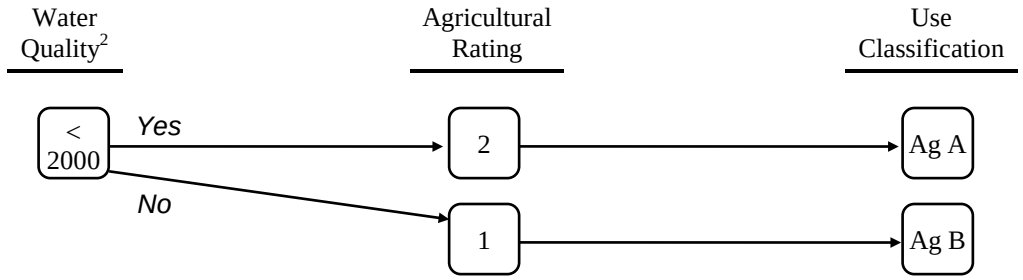
Figure 4. Water Supply Beneficial Use and Sub-uses Attainability Decision Matrix.

Public Drinking Water



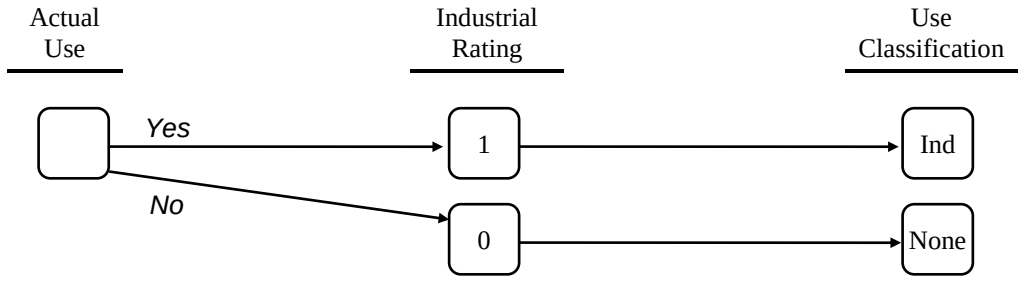
[1] Stream directly recharges a groundwater aquifer that is extensively used as a public drinking water supply.

Agricultural



[2] Conductivity.

Industrial



AESTHETICS

All surface waters of the state are assigned the Aesthetics beneficial use. Title 117 - Nebraska Surface Water Quality Standards spell out the narrative "free from" criteria that apply to this beneficial use. Additional information on the implementation of Aesthetics criteria is found in "Implementation Procedures for Narrative Water Quality Criteria in Title 117: Nebraska Surface Water Quality Standards" (NDEQ, 1994).

STATE RESOURCE WATERS

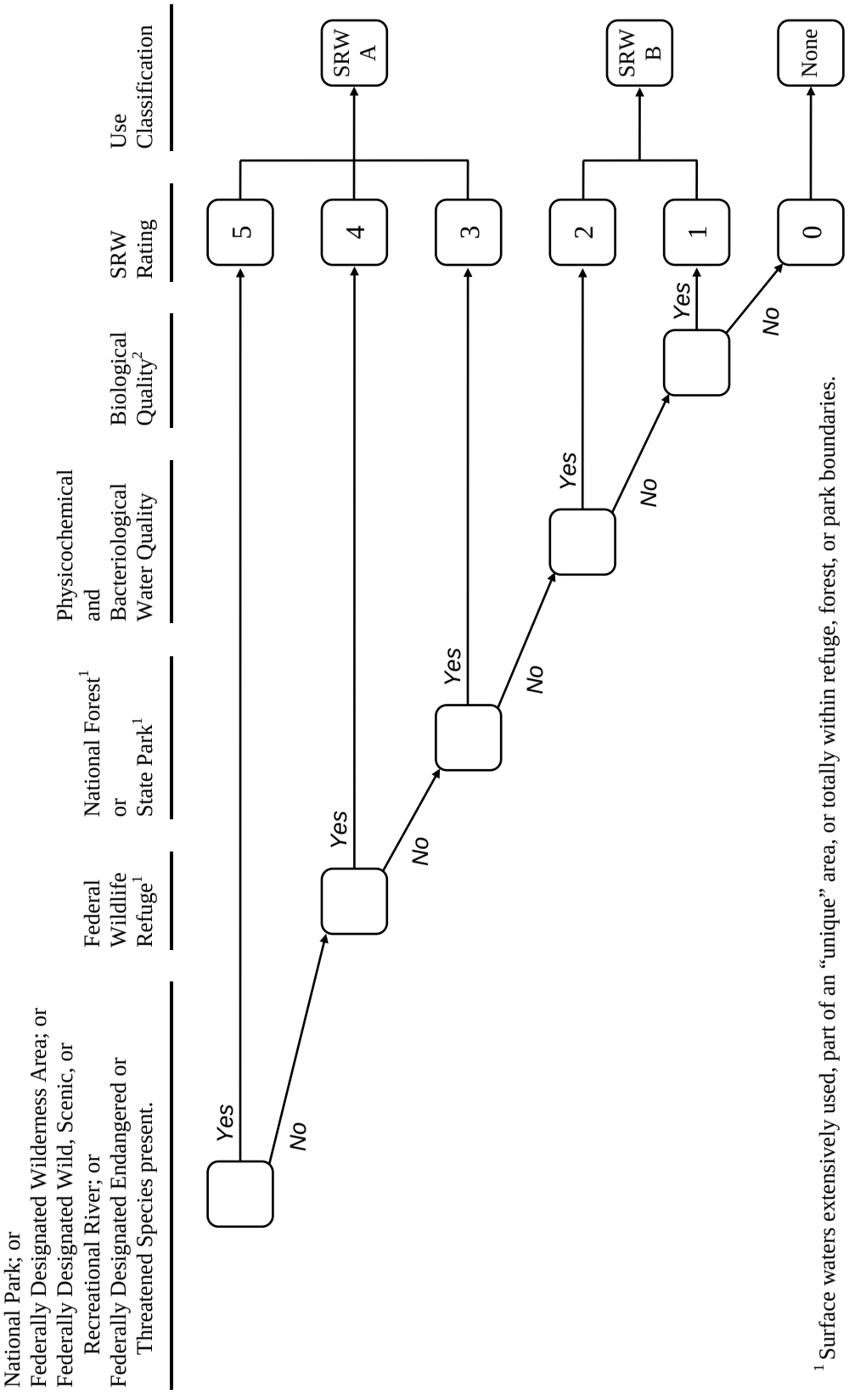
Although State Resource Water designation is not considered a beneficial use, this classification has significance in Title 117 due to the level of antidegradation protection that is afforded to these waters. State Resource Waters (both Class A and Class B) receive a much greater level of protection than other waterbodies. Existing water quality, which is generally better than the levels set by water quality criteria, must be maintained and protected in State Resource Waters. Other waterbodies are only protected at levels defined by beneficial use water quality criteria. A more comprehensive discussion can be found in "Antidegradation Implementation Procedures for Title 117: Nebraska Surface Water Quality Standards" (NDEQ, 1994).

Designation of State Resource Waters is determined using the decision matrix shown in Figure 5. If the waterbody is within a National Park or a federally designated Wilderness Area, or has been designated a component of the federal Wild and Scenic Rivers System, or is critical habitat for federally designated endangered or threatened species (aquatic species only), it receives a SRW rating of 5. If the waterbody does not qualify for a SRW rating of 5 but is wholly within a National Wildlife Refuge, it receives a SRW rating of 4. If the waterbody does not qualify for a SRW rating of 5 or 4 but is wholly within a National Forest or a State Park, it receives a SRW rating of 3. Waterbodies with SRW ratings of 3, 4, or 5 are designated Class A State Resource Waters.

Waterbodies that do not qualify as Class A State Resource Waters but have documented exceptional physicochemical and bacteriological water quality, receive a SRW rating of 2. This documented water quality must meet all of the following criteria and be based on a minimum of 30 observations over a two-year sample period.

1. 90 percent or more of the fecal coliform samples were less than or equal to 400 colonies/100 ml.
2. 95 percent or more of the pH values ranged from 6.5 to 9.0 standard units.
3. 95 percent or more of the un-ionized ammonia values were less than or equal to 0.015 mg/l as N.
4. 90 percent or more of the dissolved oxygen values were greater than 8.0 mg/l.
5. 90 percent or more of the suspended solids values were less than 100 mg/l.
6. 90 percent or more of the turbidity values were less than 50 JTU.

Figure 5. State Resource Water Decision Matrix.



[1] Surface waters extensively used, part of an "unique" area, or totally within refuge, forest, or park boundaries.

[2] Based on biotic index of macroinvertebrates and fish communities.

If insufficient physicochemical and bacteriological data have been collected to determine whether a waterbody should receive a SRW rating of 2, exceptional water quality can be determined based on biological data and would result in a SRW rating of 1. This determination is made using biotic indices of macroinvertebrate and fish communities that reside in the waterbody. Calibration of these indices has not been completed at this time; therefore, threshold values for biotic indices that indicate exceptional water quality have not been defined. Waterbodies with SRW ratings of 1 or 2 are designated Class B State Resource Waters.

REFERENCES

Nebraska Department of Environmental Quality. 1992. Nebraska Stream Inventory. Surface Water Section, Water Quality Division.

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ANTIDEGRADATION IMPLEMENTATION PROCEDURES FOR TITLE 117: NEBRASKA SURFACE WATER QUALITY STANDARDS

CPP Document Number: 3.3

Being Revised by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

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The attached document is being revised for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

CONTENTS

SURFACE WATER QUALITY STANDARDS
ANTIDEGRADATION IMPLEMENTATION PROCEDURES

BACKGROUND

EPA's water quality standards regulation requires each State to adopt an antidegradation policy and specifies the minimum requirements for such a policy (40 CFR § 131.12). The policy is a basic regulatory component of a State's water quality program that strives to attain the objective of the Clean Water Act (Section 101(a)), which states in part:

> . . . to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

The purpose of an antidegradation policy is to limit activities or discharges such that they will not significantly affect water quality and not threaten or impair beneficial uses of surface waters. The policy provides a "base" level of protection consistent with adopted water quality criteria and higher levels of protection for identified waterbodies which are either of high quality or resources of special value.

The federal antidegradation policy guidance presents a three-tiered approach to maintaining and protecting various levels of water quality and uses.

1. The first tier provides a "floor" which protects all existing uses. The level of water quality necessary to protect those uses must be maintained and protected. Any actions that would lower water quality below that necessary to protect uses, especially where water quality is already limited, are prohibited.

2. The second tier provides protection for high quality waters whose water quality is better than criteria associated with assigned uses. Limited water quality degradation is allowed in high quality waters if the degradation is necessary to accommodate important economic or social development, but only if beneficial uses are still fully protected, and only after extensive public involvement.

3. The third tier provides special protection for outstanding resource waters, such as Wild and Scenic Rivers, National and State Park, wildlife refuges, and other waters of exceptional recreational or ecological significance. Although limited activities that may cause temporary or short-term water quality disturbance are allowed, any actions that would permanently lower water quality in these waters are prohibited.

The federal requirements of 40 CFR § 131.12 are contained in Appendix A along with EPA's explanation of the policy and questions about antidegradation.

Nebraska's antidegradation policy is contained in Chapter 3 of Title 117 - Nebraska Surface Water Quality Standards. This Antidegradation Clause states:

001 The water quality of surface waters, consistent with uses applied in these Standards, shall be maintained and protected. Water quality degradation which would adversely affect existing uses will not be allowed.

002 State Resource Waters - Class A - These are surface waters, whether or not they are designated in these Standards, which constitute an outstanding State or National resource, such as waters within national or state parks, national forests or wildlife refuges, and waters of exceptional recreational or ecological significance. Waters which provide a unique habitat for federally designated endangered or threatened species and rivers designated under the Wild and Scenic Rivers Act are also included. The existing quality of these surface waters shall be maintained and protected.

003 State Resource Waters - Class B - These are surface waters, whether or not they are designated in these Standards, which possess an existing quality which exceeds levels necessary to maintain recreational and/or aquatic life uses. The existing water quality of these surface waters shall be maintained and protected. However, the State may choose, in accordance with Neb. Rev. Stat. § 81-1513, to allow lower water quality as a result of important and necessary economic or social development in the area. There shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. In cases where potential water quality impairment associated with a thermal discharge is involved, the method of implementation of this antidegradation policy shall be consistent with Section 316 of the Clean Water Act.

004 In implementing this policy, the Department will follow the procedures outlined in the State's Continuing Planning Process.

Nebraska's antidegradation policy is consistent with the direction provided by EPA in its water quality standards regulations. Paragraph 001 is aligned with EPA's first tier to provide the "base level" of water quality protection. Paragraph 003 provides the protection to "high quality waters" required by EPA's second tier. Although EPA does not recognize Nebraska as having a true "tier 3" level of protection because Nebraska's policy does not use the term "Outstanding National Resource Waters" (ONRW), paragraph 002 provides this level of protection to waters meeting the criteria of what EPA considers ONRW.

Procedures for implementing the policy are to be contained in the State's Continuing Planning Process as stated in paragraph 004. This document is to be incorporated into the State's Continuing Planning Process as the section dealing with Antidegradation Policy Implementation.

DEFINITIONS

"Degradation" and "Water Pollution" are equivalent terms as used in the context of this antidegradation policy and are defined as a human-induced, measurable change in the existing chemical, physical, biological, or radiological characteristics of a waterbody that results in the statistically significant lowering of water quality.

"Existing quality" in the context of the antidegradation policy shall be determined by monitoring appropriate parameters, which measure the chemical, physical, biological, and radiological characteristics of a waterbody. This monitoring should attempt to collect enough data to insure a level of statistical confidence in its results.

"Maintaining and protecting existing quality" in the context of the antidegradation policy means that no permanent statistically significant lowering of water quality, as measured by changes in chemical, physical, biological, or radiological characteristics of a waterbody, will be allowed.

CLASSIFICATION OF SURFACE WATERS

Title 117 has classified surface waters based on the tier of antidegradation that is applicable. Waterbodies listed as "Class B State Resource Waters" are subject to tier 2 or paragraph 003 of the antidegradation policy. Waterbodies listed as "Class A State Resource Waters" are subject to tier 3 or paragraph 002 of the antidegradation policy. Although every attempt has been made to identify "State Resource Waters", waterbodies not identified should be assessed periodically to determine if they qualify as such. Criteria used to determine whether a waterbody should be classified as a "State Resource Water" are presented in Appendix B.

When the antidegradation policy is consulted for a waterbody not listed as "State Resource Waters", a cursory assessment should be made to reaffirm that it does not qualify as such. If it is determined that the waterbody does qualify, it will be treated as a "State Resource Water" despite the fact that Title 117 does not identify it as being one. Title 117 will be amended to include the correct classification at the next opportunity for revision. If the waterbody does not qualify as a "State Resource Water", tier 1 or paragraph 001 of the antidegradation policy will be followed.

APPLICATION OF POLICY

Water quality programs, which are affected by the antidegradation policy, involve both regulatory and nonregulatory activities involving point and nonpoint sources of pollution. These programs include the NPDES Permit Program under § 402 of the Clean Water Act, the Water Quality Certification Program under § 401 of the Clean Water Act, the Clean Lakes Program under § 314 of the Clean Water Act, and the Nonpoint Source Program under § 319 of the Clean Water Act. The antidegradation policy is to be considered when actions are taken by these programs that would involve either allowing activities that could degrade water quality or implementing measures to improve or protect water quality. It should be emphasized that this policy is only to involve human-induced activities that impact water quality through the discharge or control of pollutants. Projects involving only surface water appropriations or water quantity are not to be considered under the antidegradation policy.

When applied to regulatory programs, the antidegradation policy will focus on the regulated activity's impacts to water quality from both singular and cumulative impacts perspective. When applied to nonregulatory programs, the antidegradation policy will be used to define high priority areas for projects such as nonpoint source controls or Clean Lakes projects. When nonregulatory priorities are made, the focus should favor "State Resource Waters" and waterbodies that are not supporting assigned beneficial uses.

Basic Steps of Implementing the Policy

The following steps should be followed in implementing the antidegradation policy in programs conducted by the Department.

1. Determine the appropriate classification of the waterbody in question (i.e. tier 1 waterbody, Class A State Resource Water, or Class B State Resource Water).

A. If the waterbody is tier 1 (not a State Resource Water), program specific actions will be based on assigned beneficial uses and associated water quality criteria to protect those uses (e.g. water quality based NPDES permits via the Standards to Permit Process). Documentation of tier 1 status should be provided in an activity's file when regulatory programs are involved. The intent of the antidegradation policy is met and implementation of the policy is completed for the activity.

B. If the waterbody is a State Resource Water (Class A or B), proceed to step 2.

2. Determine if the activity has the potential to lower water quality of the State Resource Water. The aspects of existing water quality that may be affected in the waterbody must be established and documented.

A. If no significant (statistical or otherwise) lowering of water quality can be determined, the intent of the antidegradation policy is met and implementation of the policy is completed for the activity. Short-term degradation may be allowed if existing

uses are not adversely affected. Documentation of the lack of impacts to water quality should be provided in an activity's file when regulatory programs are involved.

B. If a significant lowering of water quality is determined, further analysis is needed. Proceed to step 3.

3. Determine whether the waterbody is classified as a Class A State Resource Water or Class B State Resource Water.

A. If the waterbody is classified as a Class A State Resource Water, no permanent degradation can be allowed and existing water quality, as determined in step 2, must be maintained and protected. Measures must be taken to implement controls to prevent permanent degradation or an activity must be denied authorization to occur. Short-term degradation may be allowed if existing uses are not adversely affected. Documentation of measures needed to maintain and protect existing water quality, and actions within the jurisdiction of the Department to do so, must be included in an activity's file.

B. If the waterbody is classified as a Class B State Resource Water, it must be determined if the activity will lower water quality below criteria associated with assigned beneficial uses.

i. If assigned water quality criteria would be violated, the activity must be denied authorization to occur as planned. Documentation of measures needed to maintain and protect existing water quality, and actions within the jurisdiction of the Department to do so, must be included in an activity's file. If the activity is redesigned to insure that water quality criteria associated with assigned beneficial uses are not violated, proceed to step 3.B.ii.

a) If the violated water quality criteria are more stringent than necessary to support the assigned beneficial use, the permit or project applicant may petition for site-specific water quality criteria pursuant to Chapter 4 of Title 117 - Nebraska Surface Water Quality Standards. This petition is the responsibility of the applicant and is done outside of the antidegradation policy. If site-specific water quality criteria are adopted, antidegradation review would continue with the steps outlined in Step 4.

ii. If assigned water quality criteria would not be violated, a review of social and economic impacts that would occur with or without the activity must be conducted. This review will only be done at the request of the permit or project applicant and the costs of preparing the review documents are the applicant's responsibility. Guidelines for such a review can be found in "Economic Guidance for Water Quality Standards Workbook (draft)" (U.S. EPA, Office of Water; 1993). Proceed to step 4.

a) Without this review, no degradation can be allowed and existing water quality, as determined in step 2, must be maintained and protected.

Measures must be taken to implement controls to prevent degradation or the activity must be denied authorization to occur. Documentation of measures needed to maintain and protect existing water quality, and actions within the jurisdiction of the Department to do so, must be included in an activity's file.

4. Determine the social and economic impacts that would occur as a result of allowing the activity to degrade water quality and those that would result if the activity was denied authorization to degrade water quality. Because this step will lead to a decision which is not based solely on water quality considerations, the results of this step must be put before the public for their input and assistance in making the decision on whether to allow the degradation. Public notice of the action and an opportunity for public hearing is required. All public comment will be considered in determining whether degradation is justified.

A. If water quality degradation cannot be justified based on the review of social and economic impacts, no degradation can be allowed and existing water quality, as determined in step 2, must be maintained and protected. Measures must be taken to implement controls to prevent degradation or an activity must be denied authorization to occur. Documentation of measures needed to maintain and protect existing water quality, and actions within the jurisdiction of the Department to do so, must be included in an activity's file.

B. If water quality degradation is justified based on the review of social and economic impacts, the following actions must be taken:

i. The water quality degradation may not be allowed to violate criteria associated with assigned beneficial uses.

ii. The water quality degradation must be minimized to the extent practicable.

iii. Documentation of:

a) the decision resulting from the social and economic impacts review,
b) the amount of degradation allowed to occur,
c) measures needed to minimize the allowed degradation,
d) and actions within the jurisdiction of the Department to do so must be included in an activity's file.

SOCIAL AND ECONOMIC IMPACTS REVIEW

The burden of preparing a document that details the social and economic impacts associated with an activity that would degrade the water quality of a Class B State Resource Water must be assumed by the sponsor of the activity. The Department will be responsible for reviewing this document and may solicit independent experts in determining its validity. Guidance for the preparation and review of the necessary information can be found in "Economic Guidance for Water Quality Standards Workbook (draft)" (U.S. EPA, Office of Water; 1993).

Once the validity of the social and economic impacts have been determined, the Department will conduct a public interest review of the activity to assist in making the decision on whether to allow water quality degradation. This public interest component will involve a public hearing in the vicinity of the proposed activity as well as solicitation of written public comments regarding the activity. The issue to be decided in this process is not whether the activity will cause water quality degradation, but whether the public's interest is served by allowing the degradation to occur.

There are many factors that should be considered in the decision of whether an activity that would degrade water quality is necessary, justifiable, and economically or socially important enough to be allowed. However, no one set of factors can apply to every situation because of varying environmental, social, and economic conditions throughout the state. Site-specific decisions should be made based on evidence presented by the activity's sponsor and the public. The benefits of the project must be weighed against the costs to the community and the environment.

The following guidance should be followed in the decision making process to demonstrate important social and economic considerations.

1. The sponsor of the activity must demonstrate that the lowering of water quality is necessary because maintaining existing quality is not practicable. This may be because the activity involves a new discharge, because of community growth, or because a no-discharge option is not feasible.

2. The sponsor of the activity must describe and analyze the current state of economic and social development in the affected area to identify "baseline" conditions. The area's dependence on the waterbody affected by the proposed activity should also be included, so that it can be determined if the lowering of water quality is in the public interest. The following factors should be included in the baseline analysis:

- Population
- Area employment
- Area indirect or direct income, and/or community tax base

3. The sponsor of the activity must demonstrate the extent to which the proposed decrease in water quality would create an increase in the rate of economic or social

development, and specifically why the water quality change is necessary to achieve such development. Factors to be included in the analysis of incremental effects to result from the water quality degradation include:

- Expected employment growth
- Expected income effects
- Increases in the community tax base

The requirements for a given analysis will be site-specific, depending on factors such as data availability, conditions specific to the affected waterbody, and the boundaries of the affected area (local, city, county, or state-wide). The relative costs of all the treatment alternatives, or implementation of best management practices should also be included. In the case where precise or detailed social or economic information is not available, professional judgment must be exercised in accepting demonstrations based on reasonable estimates derived from existing data sources.

If this information is provided, then an opportunity for public comment must follow, with a review and a decision made by the Department. Incorporating this public participation component into the decision making process is an essential element of the antidegradation implementation procedures when degradation of a Class B State Resource Water is proposed. Potential participants must be explicitly aware of the antidegradation policy issues and the potential impact of lowering water quality. The public participation requirement will be met by holding one or more public hearings in the area affected by the proposed degradation.

A public notice related to the potential lowering of water quality should address the following topics:

- A description of the antidegradation policy.
- Specific identification of substances that may enter the waterbody, and known and suspected environmental effects.
- A determination that uses will be maintained and protected.
- A description of the current water quality and the level that it exceeds criteria associated with assigned beneficial uses.
- A description of the impact that the proposed activity will have on water quality.
- A summary of other actions that have lowered water quality and a determination of cumulative impacts.
- A determination that important social and economic development will be impacted if lowered water quality is not allowed.
- A determination that there has been achieved the highest statutory and regulatory requirements for all new and existing point sources, and all cost-effective and reasonable best management practices for nonpoint sources.

These topics will be the basis for discussion and testimony at the public hearings. Any verbal or written testimony relating to the public interest of allowing or prohibiting the proposed

degradation will be allowed into the record and be used by the Department in making a final decision.

DATA REQUIREMENTS

In order to establish "baseline" conditions for classified State Resource Waters and to review whether non-State Resource Waters should be classified as Class B State Resource Waters, periodic monitoring should be conducted to establish a statistically sound database from which valid decisions can be made. Much data have been collected for State Resource Waters (Appendix C). However, these data should be supplemented to increase the statistical reliability of the database.

Monitoring should follow the Department's Surface Water Quality Monitoring Strategy and include biological metrics as well as traditional chemical and physical parameters. Priorities for acquiring data for use in implementing the antidegradation policy should be as follows:

1. Data acquisition (especially biological) for streams designated as "State Resource Waters". While a large amount of data exists, much of it is old and the amount of data would not produce very tight statistical confidence intervals. Ideally, water quality data should be obtained which can document parameter levels that occur at different flow regimes for a given waterbody (e.g. 10th, 25th, 50th, 75th, 90th percentile flow). The rationale for making these waterbodies highest on the list for data acquisition is that they are most likely to be involved in antidegradation issues where existing quality needs to be known (discharges are prohibited into lakes).

2. Data acquisition for wetlands. Because the Department has no water quality database for wetlands, it is important to establish a monitoring effort to gather information for use in antidegradation issues. Data from all types of wetlands (tier 1 wetlands and "State Resource Waters") need to be gathered because many water quality criteria are based on natural background conditions (existing quality). Their high priority for data acquisition is based on the lack of data for these waterbodies.

3. Data acquisition for streams suspected to be candidates for Class B State Resource Water designation. These waterbodies should be periodically reviewed for this designation. Their priority for data acquisition is based on the belief that, if they qualify as Class B State Resource Waters, they are more likely to be involved in antidegradation issues where existing quality needs to be known.

4. Data acquisition for lakes designated as "State Resource Waters". While the Department has only a limited database of water quality information for SRW lakes, these waterbodies should not receive extra consideration for monitoring based on the antidegradation policy. This is because point source discharges are mostly prohibited into lakes and because SRW lakes that could be involved in §314 or §319 projects are scheduled into the ambient lakes monitoring program. Data acquired from existing lake monitoring programs should be compiled to determine the existing quality of these waterbodies.

PROGRAM SPECIFIC EXAMPLES

The following examples are meant to be a guide of how antidegradation policy is implemented. The examples are not totally inclusive and other scenarios exist.

§ 402 NPDES Permits

If a waterbody is not a "State Resource Water" (Class A or B), the extent of antidegradation implementation is to calculate water quality based permit limits using water quality criteria associated with assigned beneficial uses. If such water quality based limits are more restrictive than technology based limits, they are to be incorporated as a permit requirement.

If a waterbody is designated a Class A State Resource Water, antidegradation will require either 1) water quality based permit limits using existing water quality as determined from monitoring of the waterbody, or 2) alternative means of disposing the wastewater in order to achieve no discharge.

If a waterbody is designated a Class B State Resource Water, antidegradation will require either 1) water quality based permit limits using existing water quality as determined from monitoring of the waterbody, 2) alternative means of disposing the wastewater in order to achieve no discharge, or 3) if the first two options would cause adverse social or economic impacts to the area around the proposed discharge, water quality based effluent limits less restrictive than those of option 1, but no less restrictive than those that would result from using assigned water quality criteria, may be justified using the process described in the section on Social and Economic Impacts Review.

§ 401 Water Quality Certification

If a waterbody is not a "State Resource Water" (Class A or B) and the waterbody is not fully supporting assigned beneficial uses, the certification will consider the reasons for non-attainment. If future full support of beneficial uses would be impaired by impacts from the proposed activity (e.g. channelization), the certification will be conditioned or denied to remove the obstacle to full support from the proposed project.

If a waterbody is not a "State Resource Water" and assigned beneficial uses are fully supported, the certification will consider impacts from the proposed activity that would potentially impair beneficial uses. The certification will be conditioned or denied to insure that full support of assigned beneficial uses continues.

If a waterbody is designated a Class A State Resource Water, antidegradation requires that existing water quality be maintained and protected. No generic certifications for Nationwide § 404 will be issued. All certifications must go through a public interest review involving a public notice of the activity. Temporary water quality impacts may be allowed but no long-term or permanent lowering of water quality will be allowed. Review of an activity's impacts will follow EPA's § 404(b)(1) Guidelines to determine if adverse impacts to the waterbody's

chemical, physical, or biological integrity will occur. If adverse impacts are identified, the certification will be conditioned or denied to insure that existing water quality is maintained and protected.

If a waterbody is designated a Class B State Resource Water, antidegradation will require that the activity be reviewed following EPA's § 404(b)(1) Guidelines to determine if adverse impacts to the waterbody's chemical, physical, or biological integrity will occur. When adverse impacts are identified, either 1) the certification must be conditioned or denied to insure that existing water quality is maintained and protected or 2) if conditions or a denial to maintain and protect existing water quality would cause adverse social or economic impacts to the area around the proposed activity, conditions less restrictive than those of option 1, but no less restrictive than those that would result from protecting the assigned beneficial uses, may be justified using the process described in the section on Social and Economic Impacts Review.

§ 314 Clean Lakes and § 319 Nonpoint Source Projects

The role of antidegradation policy in these programs is one of focusing priorities. Waterbodies not designated "State Resource Waters" will be considered for projects based on an assessment of beneficial use impairment. However, "State Resource Waters" will be considered for projects based on assessments that indicate whether existing water quality has been lowered in addition to any use impairment. Thus, "State Resource Waters" should be given extra consideration for projects if they are experiencing water quality degradation. For "State Resource Waters" these projects should be designed to eliminate the cause of water quality degradation by achieving all cost-effective and reasonable best management practices for nonpoint source control.

APPENDIX A

FEDERAL REQUIREMENTS AND EXPLANATION OF ANTIDEGRADATION

This appendix consists of the U.S. Environmental Protection Agency document entitled "Questions & Answers on: Antidegradation". This document was published in August, 1985 by the Office of Water, Regulations and Standards, Washington, DC and serves as Appendix A to Chapter 2 of EPA's Water Quality Standards Handbook.

APPENDIX B

CRITERIA FOR CLASSIFICATION OF STATE RESOURCE WATERS

State Resource Waters are classified based on criteria utilized during the Use Attainability Analysis (UAA) procedures applied to all surface waters. A drop-out chart depicting the characteristics which qualifies a waterbody as a State Resource Water is presented in Figure B-1.

A waterbody qualifies as a State Resource Water - Class A if it has exceptional recreational or ecological significance. Exceptional recreational or ecological significance currently means the waterbody occurs totally within a National Park, a federally designated wilderness area, a National Wildlife Refuge, a National Forest, a State Park, or is a component of a federally designated Wild, Scenic, or Recreational River. If a waterbody provides critical habitat for a federally designated endangered or threatened aquatic species, it qualifies as having exceptional ecological significance. It should be noted that for a waterbody (stream segment, lake, or wetland) to qualify as a State Resource Water - Class A based on a geographic association with parks, wilderness, forest, or refuge, it must be totally contained within the boundaries of the associated area.

A waterbody qualifies as a State Resource Water - Class B if it has water quality which exceeds levels necessary to protect assigned beneficial uses. Currently, this is defined as meeting all of the following criteria:

1. 90 percent or more of the fecal coliform samples were less than or equal to 400 colonies/100 ml.

2. 95 percent or more of the pH values ranged from 6.5 to 9.0 standard units.

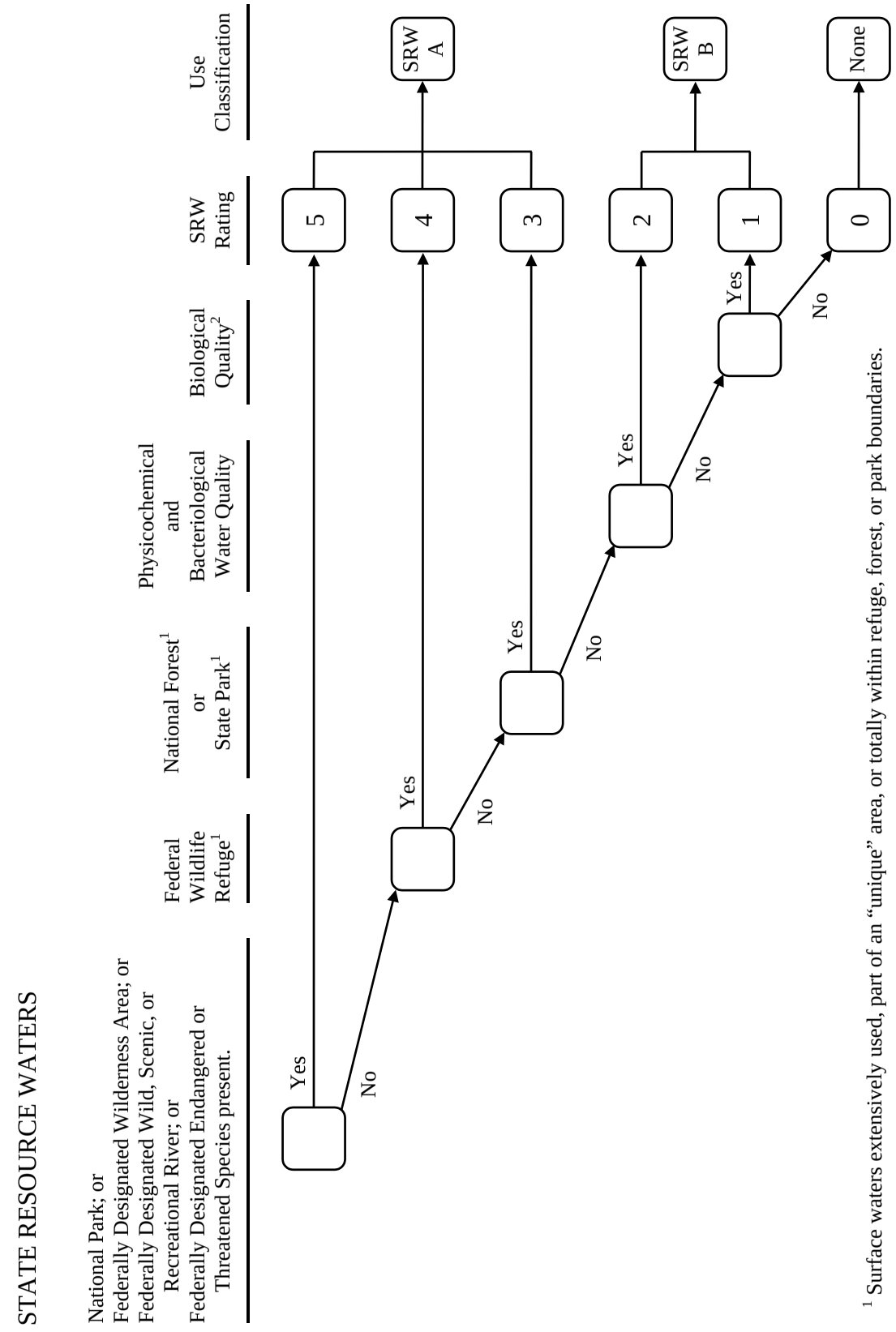
3. 95 percent or more of the un-ionized ammonia values were less than or equal to 0.06 mg/l as N.

4. 90 percent or more of the dissolved oxygen values were greater than 8.0 mg/l.

5. 90 percent or more of the suspended solids values were less than 100 mg/l.

6. 90 percent or more of the turbidity values were less than 50 JTU.

For a waterbody to be considered using the above criteria, a minimum of 30 observations for these parameters was required over a recent two year sample period. High quality based on biological parameters will be defined in the future utilizing biotic indices.



[1] Surface waters extensively used, part of an "unique" area, or totally within refuge, forest, or park boundaries.

[2] Based on biotic index of macroinvertebrates and fish communities.

Figure B-1. Drop-out chart depicting characteristics of State Resource Waters.

APPENDIX C

EXISTING WATER QUALITY OF STATE RESOURCE WATERS

This appendix contains computer printouts that summarize existing water quality for Class A and Class B State Resource Waters. These summaries are based on available data and will be updated periodically as new data become available. The date on the header of this page will indicate the last update of these summaries.

Data are too voluminous to be included the CPP. They are compiled in a separate document.

IMPLEMENTATION PROCEDURES FOR NARRATIVE WATER QUALITY CRITERIA IN TITLE 117: NEBRASKA SURFACE WATER QUALITY STANDARDS

CPP Document Number 3.4

Prepared by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

June 1994

This document is approved for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

CONTENTS

NARRATIVE WATER QUALITY CRITERIA IMPLEMENTATION PROCEDURES

INTRODUCTION

Narrative water quality criteria are an integral part of Title 117 - Nebraska Surface Water Quality Standards. Unlike numerical criteria, which specify a quantifiable measurement of discrete components of water quality, narrative criteria specify qualitative statements that determine the acceptability of water quality. These statements are valuable because they are able to cover aspects of water quality where there is no scientific basis for numerically quantifiable measurements or such measurements are not practical to implement (e.g. free-froms on toxic pollutants that have had no research to quantify their toxicity, parameters which are subject to human judgment on acceptability, etc.). However, because narrative criteria are qualitative statements, they are subject to interpretation. The purpose of this document is to remove much of the subjectivity of narrative criteria interpretation and to define objective measures to determine compliance with the statements.

EXISTING NARRATIVE CRITERIA

Narrative criteria in Title 117 are as follows:

Chapter 4, 003.01C Toxic Substances.

> Surface waters shall be free from toxic substances, alone or in combination with other substances, in concentrations that result in acute or chronic toxicity to aquatic life, except as specified in Chapter 2. Toxic substances shall not be present in concentrations that result in objectionable tastes or significant bioaccumulation or biomagnification in aquatic organisms which renders them unsuitable or unsafe for consumption. (In implementing these criteria, the Department will follow procedures outlined in the State's Continuing Planning Process which comply with the federal water quality standards, 40 C.F.R. § 131.11 (1987)).

Chapter 4, 003.01F Biological Criteria.

> Any human activity which would significantly impact or displace an identified "key species" shall not be allowed.
>
> 003.01F1 Key species.
>
> Key species are identified endangered, threatened, sensitive, or recreationally-important aquatic species. Key species are designated by stream segment (Chapter 6). The following list defines the aquatic species considered by the Department to be key species.

COMMON NAME	SCIENTIFIC NAME
Endangered Species:	
Pallid sturgeon	Scaphirhynchus albus
Threatened Species:	
Lake sturgeon	Acipenser fulvescens
Northern redbelly dace	Phoxinus eos
Pearl dace	Semotilus margarita
Finescale dace	Phoxinus neogaeus
Blacknose shiner	Notropis heterolepis
Sensitive Species[1]:	
Lake chub	Couesius plumbeus
Brook stickleback	Culea inconstans
Iowa darter	Etheostoma exile
Johnny darter	Etheostoma nigrum
Orangethroat darter	Etheostoma spectabile
Blacknose dace	Rhinichthys atratulus
Grass pickerel	Esox americanus
Pumpkinseed	Lepomis gibbosus
Golden shiner	Notemigonus crysoleucas
Common shiner	Notropis cornutus
Recreationally-Important Species:	
Shovelnose sturgeon	Scaphirhynchus platorynchus
Paddlefish	Polyodon spathula
Brook trout	Salvelinus fontinalis
Brown trout	Salmo trutta
Rainbow trout	Oncorhynchus mykiss
Northern Pike	Esox lucius
Muskellunge	Esox masquinongy
Blue catfish	Ictalurus furcatus
Channel catfish	Ictalurus punctatus
Flathead catfish	Pylodictis olivaris
Striped bass	Morone saxatilis
White bass	Morone chrysops
Rock bass	Ambloplites rupestris
Largemouth bass	Micropterus salmoides
Smallmouth bass	Micropterus dolomieui
Spotted bass	Micropterus punctulatus
Redear sunfish	Lepomis microlophus
Bluegill	Lepomis macrochirus
Black crappie	Pomoxis nigromaculatus
White crappie	Pomoxis annularis
Yellow perch	Perca flavescens
Sauger	Stizostedion canadense
Walleye	Stizostedion vitreum vitreum

[1]Endangered, threatened, and recreationally-important aquatic species are not included.

Chapter 4, 004.01 Public Drinking Water.

004.01A General Criteria.

Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in humans) shall not be allowed.

Chapter 4, 004.02 Agricultural.

004.02A General Criteria.

Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in crops or livestock) shall not be allowed.

Chapter 4, 004.03 Industrial.

These are waters used for commercial or industrial purposes such as cooling water, hydroelectric power generation, or nonfood processing water; with or without treatment. Water quality criteria to protect this use will vary with the type of industry involved. Where water quality criteria are necessary to protect this use, site-specific criteria will be developed.

Chapter 4, 005 Aesthetics.

This use applies to all surface waters of the state. To be aesthetically acceptable, waters shall be free from human-induced pollution which causes: 1) noxious odors; 2) floating, suspended, colloidal, or settleable materials that produce objectionable films, colors, turbidity, or deposits; and 3) the occurrence of undesirable or nuisance aquatic life (e.g., algal blooms). Surface waters shall also be free of junk, refuse, and discarded dead animals.

Chapter 8, Water Quality Standards for Wetlands.

These criteria are specific to wetlands although their intent and implementation may parallel the criteria contained in Chapter 4 for streams and lakes.

003.01 Surface-Water Overflow Wetlands.

. . . Water quality criteria associated with assigned beneficial uses of adjacent waterbodies (Chapter 4) shall apply to surface-water overflow wetlands in addition to the criteria associated with wetland beneficial uses. When numerical criteria associated with wetland aquatic life beneficial uses differ with aquatic life criteria associated with the adjacent stream or lake, the more stringent criteria shall apply.

004.01A Aquatic Life General Criteria.

Water quality criteria are established to protect assigned beneficial uses. However, traditional water quality parameters in wetlands such as pH, temperature, dissolved oxygen, un-ionized ammonia, and conductivity may naturally vary outside accepted ranges for other surface waters. Water quality criteria for specific wetlands or wetland complexes, except numerical criteria for toxic substances (paragraph 004.01C1, petroleum oil (paragraph 004.01D), and residual chlorine (paragraph 004.01E), shall be based on natural background values for traditional water quality parameters.

004.01B Aquatic Life Biological Criteria.

The biological integrity of wetlands shall be maintained and protected. Any human activity causing water pollution which would significantly degrade the biological integrity of wetlands is a violation of these Standards. Upland soil and water conservation practices or normal farming, silviculture, and ranching activities involving tilling, seeding, cultivating, harvesting, and grazing for the production of food, fiber, and forest products, shall not be considered to cause significant degradation of biological integrity in wetlands.

004.01B1 Any human activity causing water pollution which would cause a significant adverse impact to an identified "key species" is a violation of these Standards.

004.01B1a Key Species.

Key aquatic species are identified endangered or threatened species. The following list defines the aquatic species considered by the Department to be key species. In addition to this list, any key species listed in Chapter 6 for a waterbody adjacent to a surface-water overflow wetland will be considered a key species for the wetland.

COMMON NAME	SCIENTIFIC NAME
Threatened Species:	
Western Prairie Fringed Orchid	Platanthera praeclara

004.01C Aquatic Life Toxic Substances.

Wetlands shall be free from toxic substances, alone or in combination with other substances, in concentrations that result in acute or chronic toxicity to aquatic life, except as specified in Chapter 2. Toxic substances shall not be present in concentrations that

result in bioaccumulation or biomagnification in aquatic organisms which renders hem unsuitable or unsafe for consumption.

004.02A Wildlife General Criteria.

Because wildlife utilizing wetlands rely on aquatic biota in many cases for food and habitat, general criteria and toxic criteria listed for the protection of aquatic life (paragraphs 004.01A and 004.01C) shall also apply for the protection of wildlife.

004.02B Wildlife Biological Criteria.

Any human activity causing water pollution which would cause a significant adverse impact to an identified "key species" is a violation of these Standards.

004.02B1 Key Species.

Key wildlife species are identified endangered or threatened species. The following list defines the wildlife species considered by the Department to be key species.

COMMON NAME	SCIENTIFIC NAME
Endangered Species:	
Bald Eagle	Haliaeetus leucocephalus
Peregrine Falcon	Falco peregrinus
Eskimo Curlew	Numenius borealis
Whooping Crane	Grus americana
Interior Least Tern	Sterna antillarum athalassos
River Otter	Lutra canadensis
American Burying Beetle	Nicrophorus americanus
Threatened Species:	
Piping Plover	Charadrius melodus

004.03A Agricultural Water Supply General Criteria.

Wastes or toxic substances introduced directly or indirectly by human activity in concentrations that would degrade the use (i.e., would produce undesirable physiological effects in crops or livestock) shall not be allowed. Where natural background water quality limits the use of a wetland for agricultural purposes, water quality criteria for conductivity and selenium shall be based on the natural background condition.

004.04 Aesthetics.

This use applies to all wetlands of the state. To be aesthetically acceptable, wetlands shall be free from human-induced pollution which causes: 1) noxious odors; 2) floating, suspended, colloidal, or settleable materials that produce objectionable films, colors, turbidity, or deposits; and 3) the occurrence of undesirable or nuisance aquatic life (e.g., algal blooms). Wetlands shall also be free of junk, refuse, and discarded dead animals.

INTERPRETATION OF KEY WORDS

Several words contained in narrative criteria pose problems in interpreting whether or not the criteria are met. These words include "objectionable, significant, significantly, unsuitable, undesirable, noxious, and nuisance" and involve human perception rather than quantifiable measurements. Although strict interpretations that eliminate subjectivity for these terms cannot be defined, guidelines can be established to determine whether the intent of these terms is met.

Webster's II New Riverside Dictionary (1984) provides the following definitions for these descriptive modifiers.

Objectionable means "provoking disapproval or opposition: offensive (disagreeable to the senses (i.e., sight, smell, taste))."

Significant and Significantly mean "having or expressing a meaning: momentous (of utmost importance) or important (characterized by great value or consequence)". When used with numerical measurements, statistical procedures should be used to determine if the observation is significant or has meaning.

Unsuitable means, "not appropriate to a given purpose."

Undesirable means "not of such quality as to be worth seeking: not pleasing or not valuable."

Noxious means "injurious to physical health."

Nuisance means "inconvenient or vexatious (causing or creating irritation or annoyance): bother (to cause trouble)."

These definitions will be used in the application of these terms when narrative criteria are utilized. Although these definitions do not provide a specific answer as to whether criteria are violated or not, they are useful in determining the context of the intent of the criteria.

APPLICATION OF NARRATIVE CRITERIA

As stated in the introduction, narrative criteria are intended to cover aspects of water quality that are not easily quantifiable into numbers. Their use depends on the situation and the aspect of water quality being addressed. A discussion of each criterion's application follows.

Aquatic Life Criteria for Toxic Substances

These criteria are one of the "free-from" statements intended to cover toxicity from substances where no numerical criteria exist. The application can take place in two ways.

First, narrative limitations are written into NPDES permits which prohibit a discharge that causes toxicity. Monitoring of compliance with these statements is conducted with whole effluent toxicity (WET) testing requirements by the permittee and through periodic rapid bioassessments by the Department. In addition, the narrative criteria provide a mechanism for incorporating new EPA recommendations on numerical criteria for toxicity into an NPDES permit even though such recommendations have not yet been adopted into Title 117.

Second, the narrative criteria may be applied via a complaint/investigation process. If a complaint of toxicity to aquatic life is received by the Department, an investigation is conducted to determine the validity of the complaint and the source of the toxicity. If a source of toxicity can be determined, action can be taken to remediate the damage and violation of Title 117 can be pursued. The Department's ongoing biological monitoring program, rapid bioassessments, and fish tissue monitoring provide information that may be useful in determining whether these criteria are met.

Aquatic Life Biological Criteria

The current criteria focus primarily on aquatic habitat degradation associated with physical modification of a waterbody although NPDES type activities could cause violations of the criteria. In cases where an NPDES discharge is proposed or occurs in a waterbody that provides unique habitat for "key species", the mixing zone considerations for the permit must take into account the biological criteria. Such considerations may result in a smaller mixing zone or no mixing zone being allowed in the permit. Information from rapid bioassessments on existing discharges may be used to initiate action to support biological criteria. Unpermitted discharges will be handled through a complaint/investigation and enforcement process (e.g. fish kills).

For activities which cause physical modifications of unique habitat for "key species" (e.g. § 404 activities), the extent to which the "key species" would be impacted must be assessed before issuing any approval of the activity (e.g. § 401 certification). Such considerations must take into account the uniqueness of the habitat and the relative impact of the activity on the future survival of the population of the "key species". The biological expertise of the Nebraska Game and Parks Commission (both the Fisheries and Non-game Programs) should be consulted.

Public Drinking Water Supply Criteria

Application of these criteria is similar to the application of narrative criteria for toxic substances. These criteria are primarily a back-up for the numerical criteria, which reflect Safe Drinking Water Act maximum contaminant levels (MCLs). If a pollutant is introduced into a waterbody designated for Public Drinking Water Supply and the pollutant does not have current numerical criteria to protect the use, action may be taken by the Department to have the pollutant removed based on current information that indicates the pollutant's ability to impair the use. Such action may be in the form of remedial steps or NPDES permit limits to bring concentrations of the pollutant in line with current Safe Drinking Water Act recommendations. In general, action will be initiated through a complaint/investigation process.

Agricultural Water Supply Criteria

Application of these criteria is similar to that for Public Drinking Water Supply. If a pollutant is introduced into a waterbody designated for Agricultural Water Supply beneficial use and current scientific information indicates that the pollutant impairs the use (i.e. livestock watering or irrigated crops), action may be taken by the Department to remedy the situation. In general, such action will be initiated through a complaint/investigation process.

Industrial Water Supply Criteria

Because the quality of water required for this use may vary from site to site, application of the narrative criteria is intended to lead to the development of site-specific numerical criteria based on the needs of a given industrial user. Such criteria development is initiated through a request from a specific industrial user and will be limited to human-induced pollutants.

Aesthetics Criteria

These criteria are the other "free-from" statements intended to cover water quality impacts where no numerical criteria exist. As with the toxic substances narrative criteria, these criteria can be applied in two ways.

First, narrative limitations are included in NPDES permits, which prohibit aesthetically displeasing aspects of a discharge such a foaming. Monitoring of these conditions is generally through periodic compliance inspections by the Department.

Second, these criteria may be applied through the complaint/investigation process. If a complaint regarding aspects of the aesthetics criteria is received by the Department, an investigation is conducted to determine the validity of the complaint and the source of the problem. If a human-induced source of the problem can be determined, action can be taken to remediate the problem and violation of Title 117 can be pursued.

Wetlands Narrative Criteria

Many of the narrative statements for wetlands (aquatic life and wildlife biological criteria, toxic substances narrative criteria, agricultural water supply narrative criteria, and aesthetics criteria) have parallel statements for other waterbodies. Therefore, they are intended to be applied in the same manner as their counterparts for other waterbodies. The one difference in narrative criteria for wetlands is the general criteria for aquatic life and wildlife.

The narrative general criteria replace those numerical criteria for traditional water quality parameters found for other waterbodies. Their application relies on establishing valid natural background values for these various parameters in the wetland of concern. Once these values are established, application of the criteria is the same as if numerical criteria were assigned to protect the use. For surface-water overflow wetlands, a comparison must be made between these values and the numerical criteria associated with the adjacent waterbody. The more protective numerical value will be used for surface-water overflow wetlands.

Although the Department will have limited data from its ambient monitoring program to establish background values for certain wetlands, application of these criteria will most likely need to occur on wetlands with no previous data. In this case, the wetland will have already been impacted and establishment of background values through sampling of the wetland will not be possible. Similar nearby wetlands which have not been impacted will be monitored to establish valid background values that can be assumed to apply to the impacted wetland. The extent of the monitoring will depend on whether the data will be used to establish criteria for an enforcement case, permit development, pollution control project, or pollution prevention project. Quality Assurance Monitoring Project Plans will be developed for each monitoring project and detail the extent of monitoring needed.

PROCEDURES TO REDUCE SUBJECTIVITY

As stated above, subjective factors in application of narrative criteria cannot be totally eliminated. This is especially true for the "free-from" aesthetics statements and the biological criteria. However, best professional judgment will be used by the Department in determining whether possible violations of the criteria have or will occur.

When investigating a complaint that involves the aesthetics statements, the Department will document the water quality conditions alleged by the complainant and those conditions observed in its on-site investigation. These findings will be prepared as a statement of fact to be judged as to whether the criteria have been violated. The question of whether the conditions are noxious, objectionable, undesirable, or nuisance is partially answered by the fact that a complaint was received by the Department. The water quality condition is assumed to be noxious, objectionable, undesirable, or nuisance to the complainant because they initiated a complaint. The Department's investigation will also include the investigator's perceptions of the condition to support or refute the complaint. Administrative review of the details of the investigation will determine if action to correct the problem is necessary. If action is taken against a violator, Title 115 - Rules of Practice and Procedure specifies avenues of appeal available to the violator.

These include hearings and judicial review of the case as a last check of the Department's determination.

The findings of the Department's investigation are critical in pursuing action against a violator of aesthetics criteria. Two distinct components must be prepared. First, a statement of facts must be documented. These facts involve the allegations of the complainant and the physical conditions found by the investigator. Physical conditions to be documented involve whether the condition was human-induced, presence of odors; presence of floating, suspended, colloidal, or settleable materials that produce films, colors, turbidity, or deposits; presence of unnatural or unexpected aquatic life; and presence of junk, refuse, or discarded dead animals. The second component of the investigation involves the perceptions of the investigator. This is the component of the investigation where best professional judgment of a water quality professional is exercised. It is equally important to the case as it either supports or refutes the complainant’s allegations as to whether the condition is noxious, objectionable, undesirable, or nuisance.

In situations involving biological criteria, best professional judgment of biologists and water quality professionals is required to determine whether a "key species" has been significantly impacted or displaced. Biological data from the Department, the Nebraska Game and Parks Commission, and any other reliable sources will be reviewed to establish the status of the key species that should be expected in a waterbody. Professional opinions from these same sources will be relied on to determine whether a violation of the criteria could or has occurred. Separate documentation of facts and opinions are required. Administrative review of these findings will determine whether action by the Department is required. As with the aesthetics criteria, Title 115 - Rules of Practice and Procedure specifies avenues of appeal available to the violator. These include hearings and judicial review of the case as a last check of the Department's determination.

In any other situations involving narrative criteria where subjectivity may confuse the issue, these same principles will be followed. Facts will be documented. Opinions and perceptions of professionals involved in water quality and fields related to the beneficial use protected by the criteria will be recorded. Best professional judgment by the Department, including administrative review, will be conducted to determine a course of action. Avenues of appeal specified by Title 115 - Rules of Practice and Procedure will be made available to violators as a last check of the Department's determination.

SECTION 401 CERTIFICATION PROCEDURES

CPP Document Number: 3.5

Prepared by:

Water quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

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This document is approved for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

TABLE OF CONTENTS

INTRODUCTION

AUTHORITIES

The Nebraska Department of Environmental Quality, created under the Nebraska Environmental Protection Act of 1971 (NEPA), has among its responsibilities:

"To conserve the water in this state and to protect and improve the quality of water for human consumption, wildlife, fish and other aquatic life, industry, recreation, and other productive, beneficial uses" (NDEQ, 2000b).

As part of this obligation, Nebraska has accepted 401 **water quality certification** authority under Section 401 of the Clean Water Act (33 U.S.C. 1341) and Title 120 - Procedures Pursuant to Section 401 of the Federal Clean Water Act, 33 U.S.C. Subsection 1251 et seq., for Certification by the Department of Activities Requiring a Federal License or Permit Which May Result in a Discharge (NDEC, 1986). Water quality certification is required to ensure that a discharge will be in compliance with all applicable provisions of the Federal Water Pollution Control Act of 1972 (FWPCA), and Title 117 - Nebraska Surface Water Quality Standards (WQS)(NDEQ, 2000a). This document details the protocols followed in the water quality certification process.

The U.S. Army Corps of Engineers (COE) is designated as the **permitting** authority under FWPCA, and the COE published its initial regulations for implementation of Section 404 of the Clean Water Act in April 1974. Authority and responsibility to regulate discharges of dredged or fill materials was initiated to comply with amendments contained in the FWPCA.

The U.S. Environmental Protection Agency (EPA) is charged with establishing overall environmental guidance under the program as well as supervising and assisting in overall 404 enforcement.

GENERAL DESCRIPTION OF PROGRAM

The purpose of the Section 401 Water Quality Certification program is to protect the water quality of the waters of the United States and waters of the State of Nebraska by allowing state oversight of activities that would potentially affect water quality, and state input into the permit process by way of conditions that may be applied to certain permits, or state denial of water quality certification. Before a 404 permit can be issued by the COE for a project that would have an impact on the quality of a waterbody or waterway of the state of Nebraska, the project must be granted water quality certification by NDEQ. This certification is not a permit in itself. It states that the project, either as proposed or with suitable conditions met, will comply with Nebraska Surface Water Quality Standards. Whether the project has impact to a stream, lake, or wetland, water quality certification affirms that the project will not violate the Antidegradation Clause of WQS, Title 117, Chapter 3, Paragraph 001. This clause states: "The

water quality of surface waters, consistent with uses applied in these Standards, shall be maintained and protected. Water quality degradation which would adversely affect existing uses will not be allowed."

In brief, the 404/401 process follows this stepwise process:

1. An applicant submits a completed Form 4345 (Appendix, Figure 1) to the COE, outlining the proposed project location and purpose, and describing the activities involved.

2. The COE acknowledges the receipt of the application, and commences permit application processing as delineated in 33 CFR Part 325. If state water quality certification will be required, a copy of the application is sent to NDEQ for review. (If the activity is already covered by an existing General Nationwide, Regional, or Statewide Permit, water quality certification has by definition already been granted.) Procedures followed by NDEQ in 401 processing are detailed in the Program Procedures section.

3. The COE issues a Public Notice as part of the 404 process. If an existing General Nationwide or Regional Permit already covers the activity, no public notice is issued. Normally the Public Notice sets a 21-day comment period for the COE, agencies, organizations, and individuals to review the application and make comments on its likely impacts. Other federal and state agencies that are involved in the commenting process are EPA, U.S. Fish & Wildlife Service (USFWS), the Natural Resources Conservation Service (NRCS), Nebraska Game & Parks Commission (NGPC), Nebraska State Historical Society (NSHS), the Nebraska Department of Natural Resource (NDNR), and others as appropriate.

4. One or more Public Hearings may be held on the project proposal when necessary for making a decision on the permit application, or when it is proposed to modify or revoke a permit. Further, "Unless the public notice specifies that a public hearing will be held, any person may request, in writing, within the comment period specified in the public notice...that a public hearing be held to consider the material matters at issue in the permit application." The District Engineer may, upon receiving such a request, promptly endeavor to resolve the issues informally. Otherwise, the District Engineer arranges for the public hearing and publicizes the meeting according to the rules set forth in 33 CFR 327.4(b).

5. After the comment period expires, and any public hearings have been conducted, the COE evaluates the project according to their regulatory mandate (see 33 CFR Part 320.4) and the comments received.

6. If the state has issued a water quality certification letter, the COE can proceed to issue the 404 permit, adding any conditions they and the NDEQ find necessary to bring the project into compliance with federal and state regulations. If state water quality certification has been denied, the COE has these options: If the COE's preliminary review determines that the proposed project was in compliance with 404 (b)(1) guidelines and was not contrary to the public interest, they would issue a "denial without prejudice", meaning that the 404 evaluation process [33 CFR 230.10 (a, b, c, & d)] would have continued on its normal course and a 404 permit

might have been issued if state water quality certification had not been denied. If, however, COE's preliminary review of the proposed project showed that it would have either not complied with the 404(b)(1) guidelines **or** it would have been contrary to the public interest, then a "full denial" would be issued.

TYPES OF FEDERAL PERMITS

There are several types of federal permits with which the 401 process is associated. Permits arising from the 404 process are General Permits (there are several types) and Individual Permits. The Federal Energy Regulatory Commission may need 401 water quality certification in the process of licensing or re-licensing certain power plants in Nebraska.

1. A General Permit is defined in Federal Register 33 CFR 323.2(h) as "a Department of the Army authorization that is issued on a nationwide or regional basis for a category or categories of activities when: (1) those activities are substantially similar in nature and cause only minimal individual and cumulative environmental impacts; or (2) the general permit would result in avoiding unnecessary duplication of regulatory control exercised by another Federal, State, or local agency provided it has been determined that the environmental consequences of the action are individually and cumulatively minimal."

   a. "General Nationwide Permits (NWPs) are a type of general permit issued by the Chief of Engineers and are designed to regulate with little, if any, delay or paperwork certain activities having minimal impacts. The NWPs are proposed, issued, modified, reissued, extended, and revoked from time to time after an opportunity for public notice and comment." (Federal Register, 33 CFR Parts 330.1) Nebraska commented upon the most recent revision of the NWPs, and state requirements for mitigation and other conditions were incorporated into the NWPs for Nebraska.

   b. Regional General Permits (GPs) are applicable only within state or other, sub-national, geographic boundaries, or to a single industry or agency. A General Permit may pertain to types of activities statewide or in a particular ecosystem.

2. An Individual Permit (IP) is "a Department of the Army authorization that is issued following a case-by-case evaluation of a specific project involving the proposed discharge(s) in accordance with the procedures of this part and 33 CFR Part 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR Part 320," according to the definition given in 33 CFR 323.2(g). The exact sequence of steps the COE is to follow in the case-by-case evaluation of the project is spelled out in the regulations mentioned.

3. Federal Energy Regulatory Commission Permits for projects such as licensing or re-licensing hydropower dams may require 401 water quality certification.

GENERAL PROGRAM PROCEDURES

FEDERAL PERMIT APPLICATION PROCESSING PROCEDURES

When a 404 application or Federal Permit application-related material is received (they usually arrive in batches), it is date-stamped and passed on to either the Surface Water Quality Standards Coordinator or the Section 401 Program Coordinator. (The former will look them over and pass them to the latter for processing.) The State is required to act on applications which require 401 water quality certification within 1 year of date of receipt, or the COE can assume the State has waived water quality certification and proceed to issue or deny a 404 permit without it.

We store data from Federal Permit applications in a database program called "SW401", created by NDEQ computer services staff for the sole purpose of 401 data storage and retrieval. SW401 was created using the state-purchased data management program SQL (Standard Query Language). It is housed in the state mainframe computer. Reports can be generated from the SW401 data bank using the QMF (Query Management Facility) in SQL.

New applications are sorted and separated from auxiliary materials (i.e., comment letters from resource agencies on a pending permit application). The auxiliary materials can be set aside and matched with their appropriate 401 files later. Using the SW401 program, the PC checks each new application's COE-assigned number against the current data bank to be sure that 1) duplicate numbers or typographic errors have not occurred, and 2) this is the first time this application has been processed.

Using county maps and the Nebraska Surface Water Quality Standards (online at http://deq.ne.gov/RuleAndR.nsf/pages/117-TOC), the PC identifies the stream segment or wetland location for each application. The identification number consists of the basin name, sub-basin number, and stream segment where appropriate. The PC marks the stream or wetland identification number on the front of each application. An example would be LB1-20000, for stream segment #20000 in the 1st sub-basin of the Little Blue Basin, or BB3-x for a wetland in the 3rd sub-basin of the Big Blue Basin (wetlands have no "segment" number). If the stream segment is not a designated stream in the Standards, the number would be LB1-xxxxx. The basin names and sub-basin numbers are found in the Standards manual's listing of designated streams.

To access SW401, a computer terminal or PC that is connected to the NDEQ LAN or the state mainframe must be used. At the entry screen to the system, type in your access code. You will be asked for your password, and you type it in at this point. You will be presented with the main menu of SW401. Press "1" or "2" to access the database screen and begin entering or editing information from Federal Permit applications.

CRITERIA FOR ON-SITE VISITS

Due to the lack of time and resources, it is not possible for NDEQ personnel to inspect every project site in person. Those projects which require pre-project on-site inspections will be obvious due to the magnitude of the project and its impacts, its ecological or political ramifications, its anticipated impacts on the water quality, or other reasons. Usually in very large projects, there are many governmental agencies involved, often there are professional consultants, and the COE or applicants and their representatives often arrange site visits.

In smaller projects, COE personnel often work in the field with applicants, and COE personnel can be called upon for detailed observations of those sites they have visited. Oftentimes other agencies' personnel, such as USFWS or NGPC biologists, have been on-site, and they also can provide narrative descriptions, sketches, and/or photos of the locale, as well as assessments concerning the impacts of the project. However, generally when an applicant requests a site visit, NDEQ will make every effort to accept the invitation.

SPECIFIC PROGRAM PROCEDURES BY TYPE OF FEDERAL PERMIT

SECTION 404 PERMITS

General Nationwide Permits

As mentioned in the Introduction, "General Nationwide Permits (NWPs) are a type of general permit issued by the Chief of Engineers and are designed to regulate with little, if any, delay or paperwork certain activities having minimal impacts. The NWPs are proposed, issued, modified, reissued, extended, and revoked from time to time after an opportunity for public notice and comment." (Federal Register, 33 CFR Part 330.1) Following is a list of the Nationwide Permit numbers and brief descriptions of the projects they cover:

1. Aids to Navigation (1997)
2. Structures in Artificial Canals (1997)
3. Maintenance (2000)
4. Fish and Wildlife Harvesting, Enhancement, and Attraction Devices and Activities (1997)
5. Scientific Measurement Devices (1997)
6. Survey Activities (1997)
7. Outfall Structures and Maintenance (2000)
8. Oil and Gas Structures (1997)
9. Structures in Fleeting and Anchorage Areas (1997)
10. Mooring Buoys (1997)
11. Temporary Recreational Structures (1997)
12. Utility Line Activities (2000)
13. Bank Stabilization (1997)
14. Linear Transportation Crossings (2000)
15. U.S. Coast Guard Approved Bridges (1997)
16. Return Water from Upland Contained Disposal Areas (1997)
17. Hydropower Projects (1997)
18. Minor Discharges (1997)
19. Minor Dredging (1997)
20. Oil Spill Cleanup (1997)
21. Surface Coal Mining Activities (1997)
22. Removal of Vessels (1997)
23. Approved Categorical Exclusions (1997)
24. State Administered Section 404 Programs (1997)
25. Structural Discharges (1997)
26. Reserved
27. Stream and Wetland Restoration Activities (2000)
28. Modifications of Existing Marinas (1997)
29. Single-Family Housing (1997)
30. Moist Soil Management for Wildlife (1997)
31. Maintenance of Existing Flood Control Projects (1997)
32. Completed Enforcement Actions (1997)

33. Temporary Construction, Access and Dewatering (1997)
34. Cranberry Production Activities (1997)
35. Maintenance Dredging of Existing Basins (1997)
36. Boat Ramps (1997)
37. Emergency Watershed Protection and Rehabilitation (1997)
38. Cleanup of Hazardous and Toxic Waste (1997)
39. Residential, Commercial and Institutional Developments (2000)
40. Agricultural Activities (2000)
41. Reshaping Existing Drainage Ditches (2000)
42. Recreational Facilities (2000)
43. Stormwater Management Facilities (2000)
44. Mining Activities (2000)

When the COE reauthorizes the General Nationwide Permits, they publish them in a 60 day Public Notice. NDEQ must analyze each one for water quality standards compliance. They are analyzed by the 401 Program Coordinator, the Surface Water Quality Standards Coordinator, and the Section Supervisor, in consultation with other staff with technical expertise in relevant subjects. The NDEQ may choose among several options for each new NW: certify it as written, certify it with conditions, or deny certification. Once the decisions for all the NW's have been made, they are written up in a 30-day Public Notice informing the public how we are going to respond, and soliciting comment. If there is no compelling public opposition, we then write the COE a letter detailing which new General Nationwide Permits we will certify, which will be certified with conditions, and which will be denied by the State of Nebraska.

The usual first step in the 401 procedure involving applicants is that the COE sends NDEQ a copy of the initial letter that they sent to the applicant in response to the application. Usually, but not always, this will be the letter granting the applicant a 404 NW permit. This letter is the starting point for the procedures outlined in File Development and Tracking, above. In all but a few cases, NDEQ's action will be "No Action." In those few remaining cases, analysis of the proposed project is done (when enough information has been included with the letter. This is not always the case, but you can call the COE for more information.) In particular, channelization projects are examined for their effects upon water quality, endangered species, and downstream flooding or erosional effects. (See Individual Permits - Channelizations, below.)

Denying Water Quality Certification for a General Nationwide Permit

If a project's impacts to the water quality of Nebraska's waters would be absolutely, irretrievably unacceptable, NDEQ has the option of denying water quality certification. The procedure is more complicated and lengthy than for the denial of an Individual Permit, because the General Nationwide Permits were already certified, and denial of a particular project's certification therefore is in effect rescinding that certification for a particular application. The first step is to develop in writing the rationale for denial, the final product to be the paragraph that will be inserted into the form denial letter. In the process, put into writing the facts and figures and references used in developing the rationale, on separate sheets, for storage in the file.

When you have covered all the relevant points, there should be a conference with the Water Quality Standards Coordinator and Section Supervisor. If they concur, they may have additional materials or thoughts to incorporate into the rationale.

The next step is to draft a Public Notice of Intent to Deny. The template for the Intent to Certify (Appendix, Figure 2) can be used with appropriate textual changes (e.g., change "Intent to Certify" to "Intent to Deny.") The notice must list the specifics of where, when and how the project is to be done, as well as the impacts it will have upon water quality. The PN must explain the rationale (based upon Surface Water Quality Standards) for denial, and ask for comments from the public and interested parties. It has to include the address of NDEQ. When it is typed, send the file around the usual routing for signature. When it has been signed (there may be further alterations on its way through the process) you can issue the Public Notice. The Public Notice must be published at least once in a newspaper of general circulation in the county where the project is to be done. The public comment period lasts 30 days. The cover letter to the publishing newspaper (Appendix, Figure 3) should request 3 affidavits of publication of the Notice to be sent to the 401 Coordinator upon publication. One copy goes into the project file and the other two go to the Fiscal Services Section of NDEQ.

After the comment period has expired, the Director of NDEQ must decide if a hearing is appropriate (when someone has requested a hearing). If a hearing is considered justified, Legal Counsel for NDEQ will be assigned the duty of presiding as Hearing Officer (HO). After considering all written and oral testimony, and the Department's view of the case, the Hearing Officer in conference with NDEQ staff prepares a Statement of Findings. Whether the decision made by the HO in the Statement of Findings is to deny or to drop the denial, the Department Director can override the decision. If the HO cannot reach a decision, the Department must take the case and start over again to reach a decision.

If the Department decides to continue with the denial, there must be a Public Notice of Denial issued. It describes the project, its impact, and the rationale for the denial, and allows 30 days for public comment. If there is no overwhelming comment on the matter, the permit is denied and then the standard denial letter is issued to the applicant.

Pre-Construction Notices

Certain General Nationwide Permit projects meet COE criteria for Pre-Construction Notification (PCN). Because NDEQ has already issued water quality certification for the Nationwide Permits, comments from this agency are not necessary. The COE, however, is receptive to suggestions should a project appear to raise questions concerning its water quality impacts. Therefore, PCNs are reviewed when they arrive at NDEQ. These notices generally have a very short window, often only 5 working days, so if NDEQ needs an extension for reviewing the project, be sure to call the COE within the notice period.

Regional General Permits

As mentioned in the Introduction to this manual, Regional General Permits are applicable only within state or other sub-national geographic boundaries, or to a single industry or agency. A Regional General Permit may pertain to types of activities statewide or in a particular ecosystem.

Presently active General Permits in Nebraska are listed in Table 1.

Table 1. Currently Active General Permits

GP Number	Permit Holder	Activity	Location	Expires
GP 79-01	NGPC	Fish habitat	Nebraska lakes	3/31/05
GP 79-02	NGPC	Fish habitat	Streams in Nebraska	10/31/05
GP 88-04	Papio-Missouri R. NRD	Bank stabilization	Papillion Creek & tribs., PMR-NRD, Nebraska	8/31/04
GP 89-01	NGPC	Bank stabilization	NE recreational waters	5/31/02
GP 89-05	General Public	Duck Blinds	Platte River & wetlands, Nebraska	8/31/05
GP 91-02	USFWS, NGPC	Wetland enhancement	Wetlands and non-navigable streams in Nebraska	11/30/01
GP 92-03	General Public	Minor fills	Waters of the U.S. in Nebraska	05/31/97
GP 96-04	General Public	Flood repair	Waters of the U.S. located within flooded areas of Nebraska	11/30/01
GP 98-05	General Public, Government Agencies	Lake maintenance	Manmade lakes and ponds in Nebraska	7/31/03

Regional General Permits are usually developed and agreed upon by the interagency array of regulatory and commenting agencies. Once the cooperating agencies have reached agreement on the terms of the GP, it is put out on Public Notice for 30 days' comment period, and assuming there is no overriding negative comment, thereafter adopted with a finite effective period. A Water Quality Certification letter is required for that original Public Notice, then any projects which comply with the terms of the GP are processed by the COE just like the Nationwide Permits, and all the NDEQ staff have to do is treat the separate applications as the NW's are treated in terms of analysis, data entry, and storage.

Individual Permits

As mentioned in the Introduction of this manual, an Individual Permit is "a Department of the Army authorization that is issued following a case-by-case evaluation of a specific project involving the proposed discharge(s). The discharge(s) must be in compliance with the procedures of this part and 33 CFR Part 325 and a determination that the proposed discharge is in the public interest pursuant to 33 CFR Part 320," according to the definition given in 33 CFR 323.2(g). Individual Permits also go through analysis by NDEQ. Water quality certification can either be granted unconditionally, or with conditions, and the conditions will be tailored to each project. It can also be denied, and there is a form letter for this outcome also. The rationale for denial should be carefully documented in the file, and succinctly summarized with the appropriate segments of the Nebraska Surface Water Quality Standards quoted and referenced in the letter. Discussion with superiors is necessary; it helps shape the legally valid arguments and helps ensure the denial's passage through approval channels.

The following procedures are some that are used frequently or regularly. The particularities of any Individual Permit application may invoke other analyses instead of or in addition to these.

Channelizations

"Channelization includes those stream alterations designed to increase the conveyance of water for preventing floods, increase arable land for agriculture, increase navigability of waterborne commerce and recreational boating, and restore hydraulic efficiency of streams following unusually severe storms. Examples of channelization include channel straightening, deepening, and widening by excavation, clearing, snagging, riprapping, and lining." (Simpson, et. al., 1982)

Analysis methods

An unofficial form (Appendix, Figure 4) is provided for calculating the change in slope caused by a proposed channelization, or you can design your own. Fill in the information at the top so if the sheet gets separated from the rest of the file it can be returned to the correct file.

Old channel length: It is best to measure this yourself, although you can use the measurements provided by the applicant if you believe they are reasonably accurate, or those of the COE staff, if they have provided them. To measure them yourself, you can either use a manual planimeter or the Calcomp digitizer located on the 4th floor. For either method you will need to use a topo map, found in the map cabinets in our section. Someone will show you how to find the right map and to use either instrument. Measure the length between the beginning point of the proposed project, along the existing or old channel length, to the end point of the proposed project. When you have measured the length of the existing (or old) channel, write it on the worksheet. The planimeter gives you centimeters, which will have to be converted to miles. To do this, use a calculator to convert cm to inches (or divide the number of cm by 2.54). For example, say the

planimeter measured 10.5 cm. (The digitizer gives you the number of feet and miles; the planimeter does not.) There are 2.54 cm per inch so 10.5 cm divided by 2.54 cm/in = 4.13 in. (It helps a lot to write each of these answers down on the worksheet. You may have to come back later and recalculate, or see how you did it.) On the 7.5 minute topo maps, 2.64 inches = 1 mile, so you then divide 4.13 by 2.64 to get miles, 4.13/2.64 = 1.56 mile. 1.56 mi x 5280 ft/mi = 8260 feet.

Old Slope: You will have to find the contour lines that cross the stream in at least 2, and preferably 3, places, along a stream length that includes the proposed project site. Check at the bottom of the topo map to find the contour scale; usually it's 10 feet per contour line, sometimes it's 5 or 20. If it is 10, for example, and you find 3 lines that cross the stream, you will be measuring a total elevation change of 20 feet. In that case, you should write "20 ft per" on the worksheet. To find out "per what", you have to measure the stream length between the first and last of your selected contour lines. Again, you can use either the manual planimeter, the digitizer, or the information provided in the 404 application for this, but it is best if you use the same method for all of, or as many as possible of, the measurements you will be taking. When you have determined how many feet long the stream is between the first and last selected contour line, convert feet to miles (5280 feet/mi) and write that number down as the denominator in your 20 ft per/ blank. Say it's 0.53 miles long. You would calculate 20 ft/ 0.53 mi = 37.74 ft/mi. That's your existing or old slope.

Absolute Drop: To ascertain this value, multiply your old channel length by the old slope: 1.56 mi x 37.7 ft/mi = 58.8 ft. That's how many feet the stream bottom actually drops from the beginning point of the proposed project to its end point.

New Channel Length: Measure the course the new stream channel will take, from the end points where the project actually begins and ends. Say for our example that this distance is .14 mile (calculated as above).

New Slope: Divide the Absolute Drop by the New Channel Length. 58.8/.14 = 420 feet/ mile (this example is far steeper than 99% of the projects you will see in Nebraska).

Soils: This information is obtained from the NRCS County Soil Survey Manuals. You will want to note what types of soils are found on the streambed, and immediately adjacent to the stream, especially at the upstream end. Look up the narrative descriptions of the soil types in the front of the manual to see if the soils on-site are mentioned as highly erodible; there may also be a K value and/or T value listed in tables in the body of the manual. Quote any of these items on your worksheet for future reference. In some cases, it may be advisable to discuss the project with a soil scientist from NRCS so that confidence in your conclusions will be strong.

Data Form: Check the appropriate blanks to show how you arrived at your figures.

Other Considerations

Keep in mind that this is a desktop assessment procedure, and just because you may end up with units to the .1 or .10 decimal place does not mean it necessarily mirrors ground truth. Instead, you should use the numbers you get as rough estimates, always acknowledging that they can be in error by large margins. COE data (where COE staff have been on-site to inspect the project location) may be the most reflective of real conditions at the project site.

Decisions on Channelizations

While it is widely recognized among water resource specialists that straightening of stream meanders is a detrimental practice (to name a few of many reasons: it aggravates downstream flooding problems, reduces linear feet of stream habitat, increases sediment loading, bank destabilization and head-cutting, and can drain and destroy adjacent wetland habitat when such habitat has been present) there has been no Nebraska legislative action or guidance on the subject, and no direct addressing of the issue in state regulations. When water quality impacts, or impacts upon threatened and or endangered species, or flooding impacts on the health and public safety are likely, Surface Water Quality Standards are invoked as a basis for denial. Staff of COE, NDEQ, USFW, NGPC, NRCS, EPA, and other concerned agencies often confer informally on a project's impacts.

There is a form letter for denying Individual Permit (IP) applications for water quality certification. **The rationale must be developed in the same way** as for denying a Nationwide Permit, but for IP's the process is reduced to sending the applicant the denial letter, and sending copies to the commenting agencies as well. The letter must include any definitions, regulations or other material pertinent to the rationale from the Nebraska Water Quality Standards, and give the Chapter and paragraph numbers of the citations.

In cases where the stream impacted is intermittent or it is a < 5 cfs stream according to COE, commonly NDEQ will certify the project, but add conditions to the certification which the COE must incorporate into their permit. The increase in slope, considered together with the soil characteristics, may require a grade stabilization structure to be constructed to prevent channel down-cutting. It is standard to require vegetated buffer strips, to designate side and bottom slopes and required bottom area in the new channel, and restricting heavy equipment work to certain times of the year if threatened or endangered species' mating, nesting, or feeding occurs in the vicinity. (To see examples of denials of Individual Permits, go to the CMS SW401 program and enter QMF, do a search for **Act_Ty_: DE** to find files of denied permits.)

The Interagency 404/401 Technical Working Group is in the process of developing a commonly agreed-upon policy regarding the handling of channelizations for the state of Nebraska.

Wetlands

There are few wetlands so distinct as to be named. However, they are still waters of the State, and as such are protected by the Antidegradation Clause. Wetlands water quality standards have been adopted and are addressed in Chapter 8 of the WQS. Further, as with streams and lakes, any wetlands "whether or not they are designated in these Standards, which constitute an outstanding State or National resource, such as waters within national or state parks, national forests or wildlife refuges, and waters of exceptional recreational or ecological significance," are automatically designated State Resource Waters Class A, and "The existing quality of these surface waters shall be maintained and protected." (NDEQ, 2000a)

There are twelve wetland complexes in the state: Missouri River Wetlands, the Lower North Platte River Wetlands, the Niobrara River Wetlands, the Southwest High Plains Wetlands, the Western Saline Wetlands, the Todd Valley Wetlands, the Platte/Nance/Merrick County Sandhills Wetlands, the Rainwater Basin Wetlands, the Platte River-Big Bend Reach Wetlands, and the Eastern Saline Wetlands. Study of these wetlands complexes, their unique functions and values and present condition, is ongoing, but they all have the designated beneficial uses of Aquatic Life and Aesthetics. Projects which place fill in wetlands are subject to analysis for beneficial use impacts just as are projects affecting streams and lakes.

The COE, in their analysis of a 404 project, must consider whether the applicant has avoided impacts to waters of the U.S. to the maximum extent possible and practicable, then whether the applicant has minimized the project's impacts to the maximum extent possible and practicable, and only then can the COE consider compensatory mitigation plans.

Mitigation is required in projects that are allowed to impact wetlands. NDEQ's Antidegradation Clause is clear: "Water quality degradation which would adversely affect existing uses will not be allowed." Therefore, water quality certification should not be issued until the applicant has submitted an acceptable mitigation plan. It is best to get the plan in writing, to be sure to date-stamp the plan, and to reference it by date in the water quality certification letter. If the plan was sent to the COE, you can reference it that way: "According to the plan submitted to the COE on February 1, 1999." That way, if the applicant fails to execute the plan or changes the plan, s/he has rendered the certification invalid, and NDEQ must be notified or the project is in violation of water quality standards.

Restoring an impaired wetland that still has some functions and values is preferred over creating new wetlands because of the higher likelihood of success of the wetland. Use the COE calculations of acres of impact, or the functional assessment method specified by the Corps. Mitigation efforts are "in-kind" and take place on-site so that functions and values, as near the same as possible to the original wetlands, will be replaced nearby. Lacking a suitable on-site mitigation location, it should be implemented within the same watershed and on the same soil types where feasible. The soil from the impact site often can be saved to spread on the new site, so the wetland seed bank is ready-made. Acreage of mitigation is determined on a case-by-case basis for Individual Permits, depending upon the quality of the impacted (original) wetland, but is related to the mitigation ratio used. The most usual ratio invoked is 1.5 acres restored or

created to every 1.0 acre of impact, but this could be increased depending upon the functions and values of the impacted wetland and the likelihood of achieving successful mitigation. The additional 0.5 acre per acre is imposed to take into consideration the time lag between the date of loss of the existing functions in the impacted wetland and the date when the replacement wetland is fully functioning.

State Resource Waters

The Antidegradation Clause of the WQS, Chapter 3, Paragraph 002, states: "State Resource Waters – Class A: These are surface waters, whether or not they are designated in these Standards, which constitute an outstanding State or National resource, such as waters within national or state parks, national forests or wildlife refuges, and waters of exceptional recreational or ecological significance. Waters, which provide a unique habitat for federally designated endangered or threatened species and rivers designated under the Wild and Scenic Rivers Act, are also included. The existing quality of these surface waters shall be maintained and protected." Proposed projects that would negatively impact these waters will be denied certification on this basis.

Occasionally a project proposed for a site within a State Resource Water – Class A will satisfy the Corps' requirements to fall under a NW permit. However, because of the Antidegradation Clause, NDEQ must issue a Public Notice of Intention to Certify, of 30 days' duration, in a publication of general distribution in the region of the project. The Public Notice of Intent to Certify template is kept on diskette. The applicant's name, the name and location of the waterbody and project site, and the county name should be included. A clear and succinct description of the project, drawn from the 404 application, should be included. The template includes information for how to submit comments. A cover letter to the newspaper (Appendix, Figure 3) should request 3 affidavits of publication of the Notice to be sent to the 401 Coordinator upon publication. One copy goes into the project file and the other two go to the Fiscal Services Section of NDEQ. If during the public comment period no information is received that indicates the water quality impacts of the project would be unacceptable, the Department may proceed with issuance of Water Quality Certification.

Paragraph 003 continues: "State Resource Waters – Class B: These are surface waters, whether or not they are designated in these Standards, which possess an existing quality which exceeds levels necessary to maintain recreational and/or aquatic life uses. The existing water quality of these surface waters shall be maintained and protected. However, the State may choose, in accordance with Neb. Rev. Stat. par. 81-1513, to allow lower water quality as a result of important and necessary economic or social development in the area. There shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. In cases where potential water quality impairment associated with a thermal discharge is involved, the method of implementation of this antidegradation policy shall be consistent with Section 316 of the Clean Water Act." Projects that would impact these waters will be analyzed on a case-by-case basis.

Nebraska Department of Roads Projects

A Memorandum of Agreement (MOA) was signed by NDOR and NDEQ (July 1992) whereby different categories of NDOR projects that impact wetlands would require different mitigation ratios. As of this date (Feb. 1, 1999), however, it is not technically in effect, because the arrangement was contingent upon the Corps of Engineers' developing a General Permit which would at a minimum encompass the same categories and situations as the NDEQ-NDOR MOA. In spite of this situation, NDEQ and NDOR have proceeded in good faith as if it was in effect, with close coordination and information exchange between the two agencies. The details of the agreement should be studied to understand the use of the various ratios. Any Nationwide permit applications that invoke this agreement are certified automatically and they receive, instead of the usual NW form letter, a letter that certifies the project for water quality standards compliance while reiterating that the project will adhere to the rules set out in the MOA.

Civil Works

The COE is the applicant on Civil Works projects. They issue a 30-day Public Notice of the project, and NDEQ analyzes each project in the same way as any Individual Permit. Any decision reached by NDEQ must also be Public Noticed before Water Quality Certification can be issued.

FEDERAL ENERGY REGULATORY COMMISSION PERMITS

If a Federal Energy Regulatory Project in Nebraska will result in discharge to waters of the State, the project must receive Water Quality Certification before it can proceed. Projects are analyzed for water quality effects on the same basis as any other project in the 401 program. The decision reached by NDEQ must go out on 30 day Public Notice of Intent before certification can be issued. The same procedures apply as in the Individual Permit process; if a hearing is found to be necessary, a NDEQ Legal Counsel is designated Hearing Officer, and their duties are the same for hearings and outcomes of any 401-covered project. The final decision reached will go out on 30 day Public Notice also. An example of this type of project is the Central Platte Power and Irrigation District and Nebraska Public Power District FERC re-licensing process.

INTRA-AGENCY CONSISTENCY REVIEW

In the process of analyzing 401 permit applications, the projects should be watched for elements that might require permitting or oversight by other programs administered by NDEQ. In the past, other programs which have been involved or interested in certain 401 projects have been: National Pollutant Discharge Elimination System, Permits and Compliance Section (e.g., dredging of marinas, feedlot operations); Underground Injection Control Ground Water Section (e.g., see Ferret Exploration, COE #92-50240); Solid Waste Program, Integrated Waste Management Section (e.g., NGPC's proposed Missouri River Nutrient Enrichment project, COE #92-51128).

REFERENCES

NDEC. 1986. Title 120 - Procedures Pursuant to Section 401 of the Federal Clean Water Act, 33 U.S.C. § 1251 et seq., for Certification by the Department of Activities Requiring a Federal License or Permit Which May Result in a Discharge. Effective Date: October 29, 1986. Nebraska Department of Environmental Control.

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Simpson, P.W., J.R. Newman, M.A. Kearn, R.M. Matter, and P.A. Guthrie. 1982. Manual of Stream Alteration Impacts on Fish and Wildlife. USDI, FWS, Kearneysville, WV. FWS/OBS-82/24.

APPENDIX A

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT. ENG FORM 4345

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT (33 CFR 325)	OMB APPROVAL NO. 0710-003 Expires October 1996

Public reporting burden for this collection of information is estimated to average 5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Service Directorate of Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302; and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003), Washington, DC 20503. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authority: 33 USC 401, Section 10; 1413, Section 404. Principal Purpose: These laws require permits authorizing activities in, or affecting, navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Routine Uses: Information provided on this form will be used in evaluating the application for a permit. Disclosure: Disclosure of requested information is voluntary. If information is not provided, however, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETED

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE *(an agent is not required)*
6. APPLICANT'S ADDRESS	7. AGENT'S ADDRESS
7. APPLICANT'S PHONE NOS. W/AREA CODE	10. AGENT'S PHONE NOS. W/AREA CODE
a. Residence b. Business	a. Residence b. Business

11. STATE MENT OF AUTHORIZATION

I hereby authorize _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____

APPLICANT'S SIGNATURE DATE

NAME, LOCATION AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE *(see instructions)*

13. NAME OF WATERBODY, IF KNOWN *(if applicable)*	14. PROJECT STREET ADDRESS *(if applicable)*
15. LOCATION OF PROJECT _____ _____ COUNTY STATE	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

17. DIRECTIONS TO THE SITE

ENG FORM 4345, Feb. 94 EDITION OF SEP 91 IS OBSOLETE (Proponent: CECW-OR)

18. Nature of Activity *(Description of project, include all features)*

19. Project Purpose *(Describe the reason or purpose of the project, see instructions)*

USE BLOCKS 20-22 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled *(see instructions)*

23. Is Any Portion of the Work Already Complete? Yes _____ No _____ IF YES, DESCRIBE THE COMPLETED WORK

24. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

25. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

*Would include but is not restricted to zoning, building and flood plain permits

26. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT	DATE	SIGNATURE OF AGENT	DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

APPENDIX B.

EXAMPLE PUBLIC NOTICE

Notice of Intent to Certify
Department of Environmental Quality
Water Quality Division
Lincoln, Nebraska

In accordance with Section 401 of the federal Clean Water Act (33 U.S.C. Par. 1251 et seq.), certification that State water quality standards (Title 117, Nebraska Administrative Code) will not be violated has been applied for to the Nebraska Department of Environmental Quality by the persons listed below for discharges requiring federal permits or licenses.

Nebraska Game and Parks Commission, Box 725, Alliance, NE 69301, has applied for a Section 404 permit from the U.S. Army Corps of Engineers to place dredged or fill material in waters of the United States. Project location: Southeast ¼, Section 20, Township 21 North, Range 44 West, Garden County.

Repair a road through a subirrigated meadow (Roberts Meadow. Approximately 27 cubic yards of soil will be borrowed from the side of the road and placed on the roadway using a crawler tractor. Purpose: The road becomes impassable during wet weather.

In order to evaluate the impacts of this project on the water resources of the State, the Department of Environmental Quality encourages interested citizens to submit favorable or unfavorable written comments. Persons may request information about the application, may comment upon or object to the application, or may request a public hearing by writing Pat Rice, NDEQ, P.O. Box 98922, Lincoln, NE 68509-8922, within 30 days after this publication date. Please notify the Department of Environmental Quality if alternate formats of materials are needed. Contact phone number is 402/471-2186. TDD users please call 800/833-7352 and ask the relay operator to call us at 402/471-2186.

A request of petition for hearing must state the nature of the issues to be raised and all arguments and actual grounds supporting such position. Such comments shall be considered prior to making a final decision regarding the application. Copies of all materials are available for inspection and copying at NDEQ offices, the Atrium, 4th Floor, 1200 N Street, Lincoln, NE between 8:00 a.m. and 5:00 p.m., weekdays.

APPENDIX C.

EXAMPLE LETTER REQUESTING PUBLICATION OF PUBLIC NOTICE

July 17, 1997

Christopher Spencer, Editor
Chadron Record
P.O. Box 1141
248 West 2nd Street
Chadron, NE 69337

Dear Mr. Spencer,

Enclosed please fine a legal notice to be published one in the next edition of your newspaper. Please bill us at the State rate. We would appreciate receiving three (3) affidavits of publication sent to the attention of Terry Hickman, Surface Water Section.

We are assuming that your newspaper publishes legal notices at the rate specified in Neb. Rev. Stat. § 33-141 (Cum. Supp. 1990). If this assumption is incorrect, pleas notify us immediately and do not publish this legal notice until such time as you are further advised.

If you have any questions, please feel free to call Terry Hickman on my staff, at (402) 471-2875.

Sincerely,

Steven R. Walker
Section Supervisor
Surface Water Section
Water Quality Division

APPENDIX D.

CHANNELIZATION PROJECT EFFECTS WORKSHEET

CHANNELIZATION PROJECT EFFECTS WORKSHEET

APPLICANT'S LAST NAME:
WATER BODY NAME:
COUNTY:
COE NO.:

OLD CHANNEL LENGTH:

OLD SLOPE:

ABSOLUTE DROP:

NEW CHANNEL LENGTH:

NEW SLOPE:

SOILS:

DATA FROM: DIGITIZER_____ MANUAL PLANIMETER_____
APPLICATION_____

DISINFECTION POLICY

Procedures for Determining *E. coli* Bacteria, and Total Residual Chlorine Requirements for NPDES Permits

CPP Document Number: 3.6

Prepared by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

March 2010

This document is approved for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

FOREWORD

The State of Nebraska is responsible for protecting the health of' the public and the environment. Historically, the disinfection of wastewaters has been one of the principal means by which public health has been protected in surface waters. The policy that follows is based on the best available information on disinfection and other factors that the Department must consider in making decisions concerning the protection of public health and the environment. These procedures will be used in establishing National Pollutant Discharge Elimination System (NPDES) Title 119 permit requirements and implementing the Title 117 Nebraska Surface Water Quality Standards for *E. coli* bacteria.

TABLE OF CONTENTS

INTRODUCTION

It has long been recognized that waterborne pathogens can cause adverse impacts to public health. Thousands of waterborne illnesses have been documented annually in the United States due to the ingestion of water by the public from poorly treated surface water supplies. Several studies have established the relationship between swimming and the incidence of waterborne diseases (Kehr and Butterfield, 1943; USEPA, 1975). Disinfection of wastewater is the primary method utilized to reduce the number of pathogens discharged to surface waters in order to control the occurrence of waterborne diseases transmitted through physical contact and ingestion of water by water users. It is not practical to monitor all the numerous possible pathogens that can occur in surface waters; thus, indicators of pathogen presence are used as a monitoring tool. Nebraska uses *E. coli* bacteria as its indicator species and has established an *E. coli* criterion for the protection of the primary contact recreation (PCR) use. This criterion is a geometric mean not to exceed 126 colonies/100ml.

Nebraska's first disinfection policy was developed in 1976. In 1982, the disinfection policy was amended to include seasonal disinfection. The policy was again revised in 1993 because of the expanded classification of state streams that increased the number of recreational segments from 19 to 95 and out of concern for the use of chlorine as a disinfectant and its impact on aquatic life. This revision placed emphasis on the assessment of health risks to water-based recreation and recognized that water quality-based NPDES permit limits that would require dechlorination were the norm rather than an exception. In 2001, this policy was incorporated into the States Continuing Planning Process (CPP) as part of an effort to bring all water policies together.

Since that last revision, the Primary Contact Recreation criteria have changed from a fecal coliform basis to *E. coli* bacteria. The number of stream segments that are assigned the recreational use was expanded again in 2006 bringing the number to 308 segments, comprising about half of the classified stream miles (Nebraska Department of Environmental Quality, 2009). In addition, ultraviolet radiation has become a cost-effective disinfection alternative for new or rehabilitated wastewater treatment facilities. The changes in the policy set forth in this latest revision are in response to these developments and are not a significant deviation from the previous policy.

Some degree of risk to public health exists in all surface waters due to the potential presence of waterborne pathogens from a multitude of sources. These pathogens present a risk-based disease vector that is transmitted through ingestion or contact with the water. Some of these sources are non-point and thus not subject to regulation by the department. However, many are derived from point sources that have permit requirements. These are the sources that are addressed by this policy.

The risk-based nature of potential disease vectors has been addressed by the science behind derivation of the current *E. coli* criteria for Primary Contact Recreation. It is recognized that although this science is not perfect, it is the best that is available to the Department at this time. As new science becomes available, the Department will determine its applicability to the

criteria derivation process and propose appropriate adjustments through the rule-making process for Title 117 – Nebraska Surface Water Quality Standards. In some surface waters, the risk of pathogen transmission is so low that the Primary Contact Recreation use is not assigned and the *E. coli* criteria do not apply. However, protection of downstream uses must also be considered in deciding whether *E. coli* limits should be required. The disinfection-related requirements that follow identify the circumstances under which wastewater treatment plants may need to disinfect their wastewaters in order to protect public health and comply with Title 117 (Nebraska Department of Environmental Quality, 2009) and Title 119 (Nebraska Department of Environmental Quality, 2005) requirements.

The following goals were established for this disinfection policy:

1) Reduce discharges of *E. coli* bacteria, where necessary, to protect public health in the recreating public; and

2) Reduce discharges of chlorine and chlorinated compounds, where necessary, to protect aquatic life.

STATEMENT OF POLICY

It is the policy of the Nebraska Department of Environmental Quality that domestic sanitary and other industrial wastewaters that carry fecal waste be required to meet *E. coli* limits that would allow the receiving water to support the Primary Contact Recreation use absent other non-regulated sources of fecal contamination. Where necessary, these limits are to be met through utilization of a disinfection process in the wastewater treatment facility. When this process utilizes chlorination, it shall be performed in a manner that protects aquatic life in the receiving water and complies with State water quality criteria for total residual chlorine.

GENERAL REQUIREMENTS

Effluent limits for *E. coli* are imposed on wastewater facilities to prevent the occurrence of unacceptable risks to public health due to bacterial and viral contamination of surface waters. Wastewaters shall be treated to meet seasonal or year-round NPDES permit limits as specified below. The level of disinfection shall be that necessary to reduce the concentrations of *E. coli* in the wastewater effluent to a geometric mean of not more than 126 colonies/100 ml. In cases where categorical limits are specified by Effluent Guidelines referenced in Title 119, an *E. coli* geometric mean of 126 colonies/100 ml may be considered equivalent to the categorical limits fecal coliform geometric mean of 200 colonies/100 ml and maximum of 400 colonies/100 ml. *E. coli* water quality criteria for recreation-designated waters apply from May 1 through September 30.

SEASONAL DISINFECTION

Surface waters with existing or attainable uses for recreation are assigned a primary contact recreation (PCR) use in Title 117 – Nebraska Surface Water Quality Standards. The water quality criterion that supports this use is an *E coli* geometric mean of 126 colonies/100ml. This criterion applies during a recreation season of May 1 through September 30. Wastewater treatment facilities that discharge to PCR surface waters and produce effluents that could exceed this criterion will need to provide continuous disinfection of their wastewaters during this recreation season each year. These effluents will be required to meet the *E. coli* limit of 126 colonies/100ml. No dilution of the wastewater with the receiving water will be allowed in complying with the *E. coli* criteria, as Title 117 does not allow mixing zones for *E. coli* in surface waters designated for primary contact recreation.

Wastewater treatment plants that discharge indirectly to or upstream of PCR waters via tributaries, drainageways, or open ditches (undesignated waters) may be evaluated on a case-by-case basis as to their need for NPDES *E. coli* permit limits. *E. coli* limits, and hence disinfection, will generally not be necessary when a wastewater treatment facility discharges to stream not assigned the PCR use and the distance from the discharge to a downstream PCR water is greater than 30 stream miles. However, if the distance from the location of the discharge to the downstream PCR water is less than or equal to 30 stream miles, *E. coli* limits are presumed to be necessary to protect the downstream use.

Exceptions from the *E. coli* limits requirements listed above are allowed under some circumstances. Permittees that discharge to upstream non-PCR waters may be afforded an opportunity to conduct special studies to determine if *E. coli* limits are overly protective and document they are unnecessary in order to meet *E. coli* criteria in the downstream PCR water. Conditions that may be considered by the Department in allowing exceptions to requiring *E. coli* discharge limits include, but are not limited to the following:

1) The wastewater treatment process consists of a properly loaded wastewater lagoon treatment system that provides for a minimum of 30 days isolation of the wastewater prior to being discharged.

2) Evidence is presented to the Department that a wastewater discharge to a non-PCR stream, drainageway, or open ditch will never reach a PCR water.

3) The method of wastewater treatment employed does not allow for a discharge during the recreation season of May 1 through September 30.

4) Evidence is presented to the Department that the discharge has no reasonable potential to exceed *E. coli* limits of 126 colonies/100ml without disinfection in the wastewater treatment process.

YEAR-ROUND DISINFECTION

Wastewater treatment plants may need to provide continuous disinfection of their wastewaters on a year-round basis, as determined by the Department, based on federal and state regulations or its assessment that unacceptable risks to public health would exist in the absence of year-round disinfection. Point source categories, which may need to provide year-round disinfection, will be identified according to NPDES effluent guidelines referenced in Title 119, Chapter 27. Wastewater treatment plants for meat and poultry processing, pet food manufacturing, and animal rendering facilities are among those that have effluent guidelines for year-round fecal coliform bacteria limits. Wastewater treatment plants which primarily receive hospital wastes or wastes from laboratories which engage in the production of bacteria or virus vaccines or other blood derivatives for human or veterinary use, may also be required by the Department to meet year-round NPDES *E. coli* limits.

In addition to these categories, the Department may require other point sources to meet NPDES *E. coli* limits on a year-round basis as new information becomes available about wastewater categories that pose unacceptable risks to public health.

LAND APPLICATION OF TREATED EFFLUENT

Land application of treated wastewater is an option that allows beneficial reuse of the water and does not result in a discharge to waters of the State. This practice is allowed for domestic wastewater effluents by rule in Title 119 but may also be applied to other pathogen containing effluents under the following conditions. No disinfection is required of otherwise properly treated sanitary wastewater that is used for irrigation under the following conditions:

1) Land application cannot take place on saturated soils and must cease immediately if ponding or runoff occurs during the application event. There is a prohibition against surface run-off and hydraulic overloading to the site;

2) Application shall not occur on sites that have perennial or intermittent streams, ponds, lakes, or wetlands;

3) Applied effluent shall not be allowed to leave the application site boundaries;

4) The hydraulic application rate shall be based on weekly local crop uptake values and shall not exceed two inches per acre per week;

5) Application shall not occur on frozen ground;

6) Application shall be limited to sites having less than a 12 percent slope;

7) No wastewater shall be sprayed onto or across any public right-of-way;

8) The following separation distances are assured:
   a. A 500 foot separation from any public drinking water well;
   b. A 100 foot separation from inhabited dwellings or private drinking water wells;
   c. A 100 foot separation from any surface water of the state (streams, lakes, or wetlands);
   d. Depth to seasonal high ground water levels must be greater than four feet;

9) Application sites shall not be located within or adjacent to residential areas; and

10) Land application may occur on cropland, tree plantations, pasture, grasslands, or hay land used as a source of livestock feed. Undisinfected land application of effluents shall not occur on crops intended for distribution in their raw form for direct human consumption or on lands used for public recreation.

More restrictive setbacks and requirements may be required of certain pathogen containing effluents, depending on the source (e.g., industrial) or location, in order to be land applied without disinfection.

Sites that have unrestricted public access (e.g., golf courses, parks, ball fields, public landscapes) may also be used for land application of wastewater effluent under more restrictive conditions. Conditions 1 through 10 (above) apply to these sites. The following additional conditions shall also apply to these sites:

11) Effluents shall meet *E. coli* limits of 126 colonies/100 ml;

12) If disinfection is necessary to meet the limit of 126 colonies/100ml and chlorine or a chlorine compound us used as the disinfecting agent, the effluent must be dechlorinated prior to land application;

13) Public access to the land application site shall be prohibited during the land application event; and

14) The site shall have adequate signage informing the public that treated effluent is applied to the site and prohibiting public access during a land application event.

DISINFECTION RELATED REQUIREMENTS

Disinfection treated wastewaters can generally be accomplished by ultraviolet (UV) irradiation, chlorination, or to a lesser extent ozonation. Both UV irradiation and chlorination are common practices in Nebraska. No known application of ozone treatment currently exists in Nebraska due to its cost and operational considerations.

UV irradiation works well on well clarified effluents and has no adverse impact on the receiving waters. Thus, there are no disinfection related requirements that need to be considered at facilities that employ disinfection by UV irradiation other than the need to meet an *E. coli* limit of 126 colonies/100ml. However, chlorine and chlorinated byproducts are toxic to aquatic life at relatively low levels. The requirements that follow identify the circumstances under which additional treatment of chlorinated wastewaters are necessary.

CHLORINE RELATED GENERAL REQUIREMENTS

Total residual chlorine (TRC) criteria are stated in Title 117 for all surface waters. Dechlorination is presumed to be needed for wastewaters where chlorine is used as a disinfectant, biocide, or defouling agent unless a reasonable potential analysis (EPA, 1991) indicates that there is no potential for the effluent to cause a violation of TRC criteria. TRC limits will be established in accordance with procedures outlined in “Development of Water Quality-Based Wasteload Allocations When a TMDL is not Required" (NDEQ, 2001).

Chlorinated discharges are of particular concern in ecologically sensitive waters of Nebraska. Ecologically sensitive waters are defined as waters designated for coldwater aquatic life, waters supporting federal and state designated endangered and threatened species of aquatic life, and waters classified as State Resource Waters. Mixing zones for TRC will generally not be allowed in these waters. The Department determines the applicability of mixing zones (Title 117), and the potential risks to sensitive aquatic life in "ecologically-sensitive" waters generally outweigh the additional costs of dechlorination or disinfection methods other than chlorination. TRC water quality criteria will generally need to be attained prior to the discharge reaching an ecologically sensitive waterbody; hence, no wasteload allocation will need to be calculated for these waters. The TRC criteria will serve as the effluent limits for discharges of chlorinated effluents to ecologically sensitive waters.

IMPLEMENTATION

This policy shall be implemented through the Nebraska NPDES Permit Program (Title 119) and Title 117. New and reissued NPDES permits for point sources shall include appropriate water quality-based permit limits to assure compliance with *E. coli* and TRC water quality criteria and to assure that the assigned beneficial uses of the receiving water are maintained and protected.

REFERENCES

Kehr, R.W. and C.T. Butterfield. 1943. Notes on the Relationship Between Coliform and Enteric Pathogens. Public Health Reports, 58(15): 589-607.

Nebraska Department of Environmental Quality. 2001. Development of Water Quality-Based Wasteload Allocations When a TMDL is not Required. CPP Document Number 5.6. Lincoln, Nebraska.

Nebraska Department of Environmental Quality. 2005. Title 119 - Rules And Regulations Pertaining To The Issuance Of Permits Under The National Pollutant Discharge Elimination System. Revised Effective Date: May 16, 2005. Lincoln, Nebraska.

Nebraska Department of Environmental Quality. 2009. Title 117 - Nebraska Surface Water Quality Standards. Revised Effective Date: March 22, 2009. Lincoln, Nebraska.

United States Environmental Protection Agency. 1975. Disinfection of Wastewater - Task Force Report, EPA-430/9-75-012, March 1975. Office of Research and Development. Washington, D.C.

United States Environmental Protection Agency. 1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001, March 1991. Office of Water. Washington, D.C.

REVIEW AND REVISION OF GROUND WATER QUALITY STANDARDS (TITLE 118)

CPP Document Number 4.1

Being Developed by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

_____ _____

Patrick W. Rice, Assistant Director **Date**

DETERMINATION OF CLEAN-UP LEVELS AT CONTAMINATED GROUND WATER SITES

CPP Document Number 4.2

Being Developed by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

_____ _____

Patrick W. Rice, Assistant Director **Date**

DETERMINATION OF PRIORITIES FOR NPDES PERMIT ISSUANCE

CPP Document Number 5.1

Being Developed by:

Municipal and Industrial Section
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director **Date**

PROCEDURES FOR DETERMINING IF WATER QUALITY-BASED EFFLUENT LIMITATIONS ARE NEEDED IN AN NPDES PERMIT

CPP Document Number 5.2

Being Developed by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, NE

This document is being developed for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director **Date**

DEVELOPMENT OF TECHNOLOGY-BASED EFFLUENT LIMITATIONS AND SCHEDULES OF COMPLIANCE

CPP Document Number 5.3

Being Developed by:

Municipal and Industrial Section
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

_____ _____

Patrick W. Rice, Assistant Director **Date**

DEVELOPMENT OF WATER QUALITY-BASED EFFLUENT LIMITATIONS AND SCHEDULES OF COMPLIANCE

CPP Document Number 5.4

Being Developed by:

Municipal and Industrial Section
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

_____ _____

Patrick W. Rice, Assistant Director **Date**

PROCEDURES FOR CONTROLLING THE DISPOSITION OF RESIDUAL WASTE FROM WASTEWATER TREATMENT

CPP Document Number 5.5

Being Developed by:

Municipal and Industrial Section
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

_____ _____

Patrick W. Rice, Assistant Director **Date**

DEVELOPMENT OF WATER QUALITY-BASED WASTELOAD ALLOCATIONS WHEN A TMDL IS NOT REQUIRED

CPP Document Number 5.6

Prepared by:

Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, NE

April 2001

This document is approved for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

Patrick W. Rice, Assistant Director	**Date**

INTRODUCTION

The goals of the Clean Water Act (CWA) can be stated as: "To provide for the protection and propagation of fish, shellfish and wildlife and provide for recreation in and on the water whenever attainable." In more simple terms the CWA seeks to provide "fishable/swimmable" waters.

Two programs administered by the Nebraska Department of Environmental Quality (NDEQ) are aimed at the attainment of these goals: 1) Surface Water Quality Standards (Standards) that assigns beneficial uses to waterbodies and also contains the criteria needed to protect those uses and 2) the National Pollutant Discharge Elimination System (NPDES) that issues permits to point source discharges to regulate the quantity and quality of pollutants being discharged.

In the early phases of the CWA one of the main objectives was to bring all municipalities and industries up to similar levels of wastewater treatment. For these reasons, secondary treatment standards and technology-based limits were developed and promulgated by EPA as minimum treatment standards. Unfortunately, the "one size fits all" approach to water quality control falls short for some waterbodies and the point source discharges continued to impact or are suspected of contributing to water quality problems. In these cases, State agencies and EPA are required to look beyond minimal treatment technology and develop limitations that result in compliance with water quality standards and the attainment of the assigned beneficial uses. These limitations are often known as water-quality-based limits. The purpose of this document is to describe the process by which recommendations will be made for consideration in the development of NPDES permits with said recommendations being tailored to avoid the violation of water quality criteria.

Other situations arise where a waterbody is not attaining or maintaining an assigned beneficial use due to multiple point sources, non-point sources or combination of the point and non-point sources. Identification and documentation of these water quality problems is to be completed by the States during the Section 303(d) listing process. Total Maximum Daily Loads (TMDLs) may then be developed for the identified waterbodies. Procedures describing the development of TMDLs are described in a separate document. The procedures described within the context of this document are intended to be utilized in lieu of TMDL development.

By definition, a wasteload allocation (WLA) is the portion of a TMDL established to control the quantity of pollutants discharged from point sources. As stated, the purpose of this document is to address water quality problems without the calculation of a TMDL however, the term WLA will be used in the context of these procedures to describe the outcome of a process used to determine the allowable quantity of a single pollutant that can be discharged by point sources. The "WLA" values will then be used in the development of NPDES permits and permit limits

APPLICATION

As the lead entity developing and enforcing water quality protection regulations, the Department is obligated to pursue the abatement of pollution and the attainment of beneficial uses through the most efficient and effective means available. The procedures presented in this document should be considered one of the "tools" that are available for use. As with most situations, the circumstances involved should dictate which programs should be incorporated however in general these procedures should be utilized when:

- A single point source has been identified as the sole source of water quality problems.
- Multiple point sources are causing water quality problems and modification and issuance of their NPDES permits will allow water quality standards to be met.
- Future loadings from a point source(s) may lead to water quality problems and the modification of the NPDES permit is an appropriate step to take to control these loads.

As a means of providing direction in making the decision to address a water quality problem through the issuance of an NPDES permit, the TMDL Program Implementation – Procedure 1 found in Appendix A of these procedures should be one of the initial steps. This flow chart should assist both the NPDES permit writer and TMDL staff in this determination by providing a consistent approach to the TMDL/NPDES permits decision process. Any deviation from this procedure should be clearly documented in the NPDES permit administrative record.

Initially, and as explained by this document, the WLAs will be developed based on the worst-case conditions, usually low flow. Multi-flow WLAs (flow variable) can be developed if conducive to the situation and provided the data supports usage. The flow variable allocations will be handle on a case-by-case basis.

MIXING ZONES

Title 117 – Nebraska Surface Water Quality Standards (Title 117) allows for a "zone of degradation" below a point source discharge. This area is more commonly known as a mixing zone and within this zone; water quality criteria are allowed to be violated. Mixing zones for the assimilation of effluents may be necessary where the discharge has received treatment and still does not adequately meet the water quality applicable for the waterbody. The specifications, dimensions and prohibitions associated with mixing zones can be found in Title 117 Chapter 2. Rather than reiterate this language, major points of concern will be outlined below:

- The Department shall determine the applicability of a mixing zone and, if appropriate, the size, location, water quality and outfall design.
- The Department shall determine the appropriateness of establishing a mixing zone for any pollutant.
- The average dry weather or seasonal effluent flow should be used in the application of a mixing zone.
- The application of all criteria (with the exception of 30-day ammonia and acute criteria) should be used with the 7-day, 10-year low flow (7q10).

- The application of 30-day ammonia should use the 30-day 5-year low flow (30q5)
- The application of acute criteria should use the 1-day 10-year low flow (1q10).

As well as defining the flow conditions, Title 117 limits the maximum size of mixing zones with those restrictions being described below. The classification of streams (i.e. Class A and B Coldwater and Warmwater) refers to the 4 classifications within the aquatic life beneficial use.

- Chronic mixing zones in Coldwater Class A, Coldwater Class B and Warmwater Class B streams shall be designed not to exceed 2500 feet in length.
- Chronic mixing zones in Warmwater Class A streams shall be designed not to exceed 5000 feet in length.
- Acute mixing zones in Coldwater Class A, Coldwater Class B and Warmwater Class B streams shall be designed not to exceed 125 feet in length or 5% of the chronic mixing zone, whichever is more restrictive.
- Acute mixing zones in Warmwater Class A streams shall be designed not to exceed 250 feet in length or 5% of the chronic mixing zone, whichever is more restrictive.

Although Title 117 allows the mixing zones for Warmwater Class A streams to be (up to) double the length of mixing zones allowed for the 3 other stream classifications, the standard procedure for WLA development will be to initially apply a 2500-foot chronic and 125-foot acute mixing zone. Once this initial application is reviewed it may be prudent to extend the mixing zones to the maximum allowed length.

DESIGN CONDITIONS

TMDLs are developed to protect water quality criteria under any condition. Because this process will be used in lieu of a TMDL these procedures must also ensure the protection of water quality at all times. For this reason it is imperative to know the source(s) and determine under what conditions each source will exhibit the greatest impact on the waterbody. In the case of point source discharges, low flow conditions are usually targeted. The reasoning behind this is that point sources discharges often remain relatively constant and do not decrease with decreasing stream flows. As available dilution decreases, the potential impact that the effluent discharge may have on the waterbody and the assigned beneficial uses becomes greater. Therefore, these procedures will focus on low flow as the targeted design conditions.

The extreme conditions of high and low flow can and do occur in response to excessive precipitation and drought, respectively. Recognizing this, Title 117 specifies circumstances when the water quality standards criteria are no longer applicable. Narrative and numeric water quality criteria developed for the protection of the aesthetics beneficial use, general and acute toxicity criteria for the protection of aquatic life apply to all surface waters at all times. However, exemptions to the application of the remaining criteria are as follows:

- Streams assigned a Coldwater Class A (CWA), Coldwater Class B (CWB) or Warmwater Class A (WWA) aquatic life beneficial use during periods when the flow is less than 0.1 cfs or the 7q10; unless a beneficial use still exists under these conditions. Thirty day average ammonia criteria will not apply when the flow is less than 0.1 cubic feet per second (cfs) or the 30q5.
- Streams assigned the Warmwater Class B (WWB) Aquatic Life use during periods when the flow is less than 1.0 cfs, unless an assigned beneficial use still exists under these conditions.
- Undesignated surface water except as necessary to protect downstream uses. Acute criteria which are applicable to these surface waters shall include those applicable for the WWB aquatic life use.
- Streams during periods when the instantaneous flow is totally comprised of effluent or noncontact cooling water discharges, unless a beneficial use still exists under these conditions.

These exemptions along with the mixing zone regulations set forth in Chapter 2, Title 117 establish the basis for selecting design conditions. Therefore, for the purposes of calculating point source WLAs the following table should be utilized when making mixing zone and applicable design flow decisions.

Receiving Stream Aquatic Life Use Classification	**Title 117 Criteria**	**Design Flow**	**Mixing Zone Length (not to exceed)**
Coldwater A, Coldwater B and Warmwater B	30 day ammonia	30q5	2500 feet
Warmwater A	30-day ammonia	30q5	2500/5000 Feet
Coldwater A, Coldwater B and Warmwater B	All other Chapter 4 Chronic[1] Criteria	7q10	2500 feet
Warmwater A	All other Chapter 4 Chronic[1] Criteria	7q10	2500/5000 feet
Coldwater A, Coldwater B and Warmwater B	Acute[2] Criteria	1q10	125 feet or 5% of chronic mixing zone
Warmwater A	Acute[2] Criteria	1q10	125/250 feet or 5% of chronic mixing zone

1. Chronic criteria refer to a four-day average concentration.
2. Acute criteria refer to a one-hour average concentration.

When developing regulatory permits, it is preferred that site-specific data and information be utilized in an attempt to address variability and other concerns that may be associated with the receiving water. As with most decisions, the larger the database the greater the confidence level that will accompany the decisions. In Nebraska, the availability of water quality data ranges from numerous data points collected year round to the little or no data at all. In situations where data is lacking, the Department must continue to issue permits and to do so default or extrapolated values must be utilized; however, the data gap is recognized and if resources allow will be addressed. As well, if desired, the facilities will be given the opportunity to collect the data necessary to develop an accurate permit.

There are four major categories of information needed to develop a WLA: 1) receiving stream volume, 2) receiving water quality, 3) effluent volume and 4) effluent quality. The sections below describe each of these components and define the data necessary to assign a high, medium or low confidence to each. Based upon the information and associated WLA, water quality managers will then decide if it is appropriate to issue or reissue a permit or initiate the collection of site-specific water quality data and information.

Federal regulations require that TMDLs account for seasonal variation. Because these procedures will be used in lieu of TMDLs, the point source WLAs will also consider seasonal differences in both the receiving stream water quantity and quality and the effluent quantity and quality. Initially, a minimum of two seasons will be pursued; however existing data or information may be utilized to establish additional seasons. The two seasons will be labeled the "Warm season" and will encompass the months of March through October and the "Cold season" that considers the months of November through February. Whenever applicable data sets and analysis (e.g., stream parameters, design flow, effluent flow, etc.) should be segregated in the two perspective seasons.

STREAM VOLUME / DESIGN FLOWS

The design flows prescribed by Title 117 (1q10, 7q10 and 30q5) can be simply defined as flow events that have a statistical probability of reoccurrence based upon the long-term data set available for that hydrologic system. The data used in the calculations can be obtained from the Department of Natural Resources, the United States Geological Survey or any other agency or entity that operates gaging stations capable of gathering average daily stream flow information. Design flows should be calculated using the process described in the *Standard Operating Procedures for Determining Log-Pearson Type III Flow Distribution*.

While numerous, gaging stations are not located on every stream segment within the state. When the situation arises where a point source discharges to a segment and daily stream flow information is lacking, alternate methods to determine the design flow value may be pursued. Examples of flow prediction include: extrapolation from similar streams within an area, determining a correlation based on a calculated gage value, etc.

In the past, the Department of Natural Resources (Water Resources) obtained random stream volume measurements and published this information in the annual *Hydrographic Report.* While daily flow information is preferred, these measurements can indicate the general nature of the stream flow and to some extent the variability within the receiving water. Provided a sufficient number of data points exist, the stream design flow can be based upon these values. If possible, the data should be compared to a site where daily flow information is available to evaluate variability and to determine if the values could logically represent the flow and the contributing watershed. As well, it may prove beneficial to consider any available precipitation information from the contributing watershed prior to selecting a flow value that is not based upon daily flow information.

If a design flow cannot be determined by the use of empirical data, the procedure is then to default back to the minimum flows where water quality standards apply as dictated by Title 117. (The default flows are; 0.1 cfs for CWA, CWB and WWA streams and 1.0 cfs for WWB streams.) When an estimated or default flow is used rather than a gage calculated value, it should be recommended that a condition be placed in the NPDES permit requiring the collection of receiving water stream flow data. Regardless of what method is used to arrive at a design flow, documentation of the procedure should accompany the calculation of the point source WLA.

The confidence level associated with the data used to determine the stream flow volume/design flow can be found in the following table.

Data Source	High Confidence	Medium Confidence	Low Confidence
Receiving Stream Flow	• USGS or DNR gage located within close proximity to the discharge. Period of record ending should be current date or less than 25 years from the date of the evaluation. Review of the data obtained considers hydrologic modification(s) and determined to be representative of the current watershed and stream morphology • Association or correlation with a USGS or DNR gage can be determined.	• 10 or more instantaneous measurements (per season) obtained in the direct vicinity of the discharge. Review of the data obtained considers hydrologic modification(s) and determined to be representative of the current watershed and stream morphology. • DNR or USGS gage data has period ending data greater than 25 years previous to the WLA evaluation.	• Estimated using watershed ratio from adjacent watershed or stream flow gage station. • Less than 10 instantaneous measurements. • Default flows from Title 117 are utilized based on the lack of other flow information

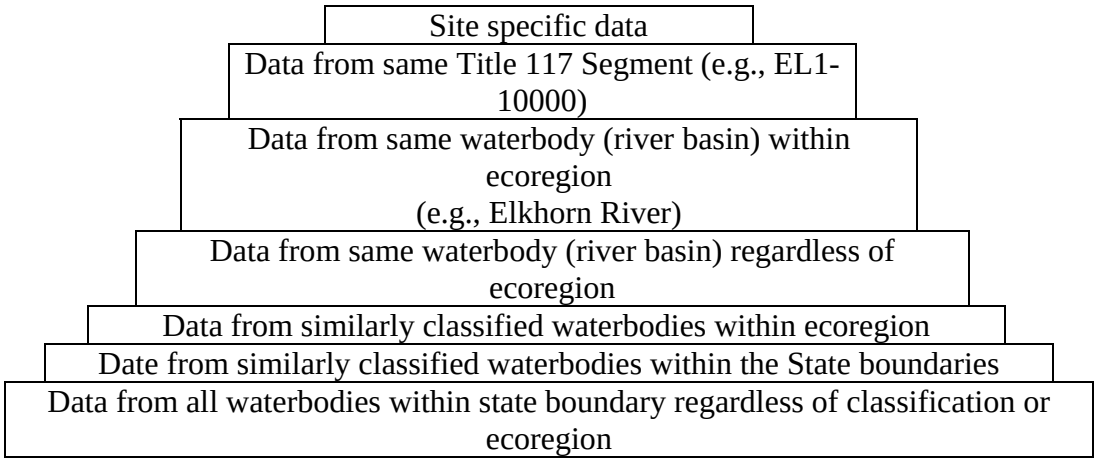
Receiving Stream Water Quality/Background Parameters

Receiving stream chemical water quality information is needed to develop a point source WLA. Both 30-day and 1-hour ammonia criteria are based upon receiving stream pH and temperature and many heavy metals are based on receiving stream hardness (as Calcium carbonate – mg/l). Also, instream chemical information is needed to define the pre-discharge or background pollutant loading conditions and to avoid overloading the stream.

Similar to flow the larger that database the more likely the selected design values will reflect the receiving water quality. Ideally, chemical and physical water quality data will be obtained directly from the receiving stream but in many cases data is lacking, and more commonly data collected under design conditions will be lacking. When developing a point source WLA, where site-specific information is lacking, default parameters will be used and a recommendation will be made to include instream monitoring in the NPDES permit. It should be noted, the inclusion of default information lowers the confidence in the accuracy of the decision.

As stated, when selecting the design parameters it would be best to use site-specific data or information. As it becomes apparent that site-specific data is insufficient to complete the process, the "pool" from which data is drawn from will need to be expanded. When taking steps to expand the data set, consideration needs to be given to the distribution and variability of the data. If deemed unacceptable, the data should be rejected or the data pool expanded further. The following pyramid diagram will be used to consider inclusion of data for definition of design parameter values.

Several agencies have collected water quality data throughout Nebraska including the NDEQ, USGS and EPA Region 7. Much of this data is available on the Department of Natural Resources data bank and is cataloged according to location. From the internet site, the data can be copied into and manipulated in the Department's current spreadsheet system.



The confidence level associated with the data used to determine the stream water quality/background parameters can be found in the following table.

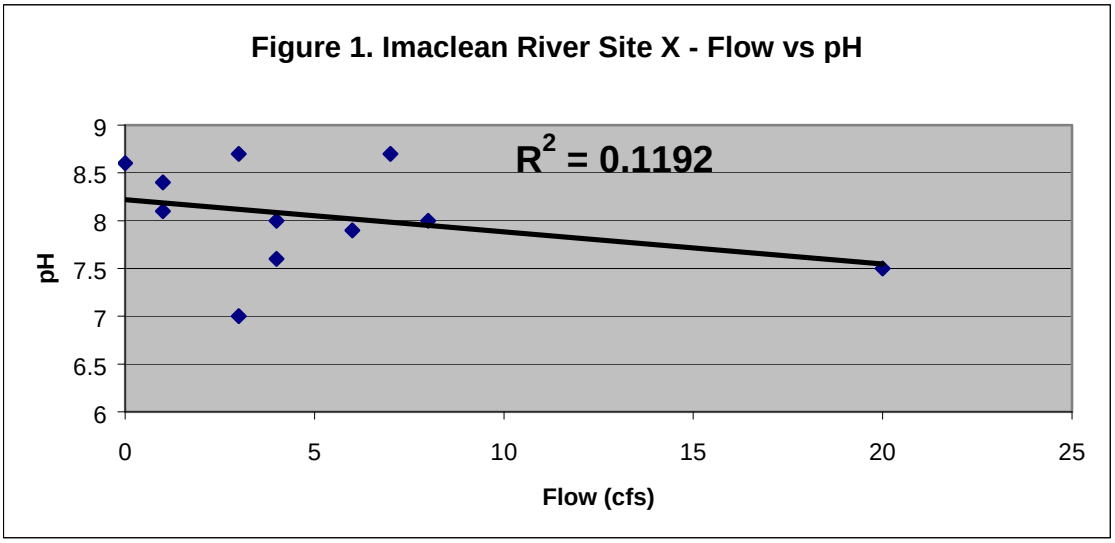
Data Source	High Confidence	Medium Confidence	Low Confidence
Stream Water Quality	• Water quality information upstream of the discharge(s) is available. Data and information is obtained from STORET, the Department of Natural Resources Data Base or other reliable source. Water quality information age should be less than 25 years and include consideration of hydrologic modifications, land use changes or other factors that may impact the physical and chemical properties. A minimum of 15 summer season and 10 winter season values must be available.	• Water quality information is available in the vicinity of the discharge but one or more point sources may be influencing the results. • Data is greater than 25 years provided no hydrologic modification or other land use changes have significantly altered the chemical or physical properties. A minimum of 5-14 measurements for the summer season and 5-9 measurements for the winter season must be available.	• Ecoregion parameters utilized. • Water quality information is available but there are less than 10 summer season and 5 winter season data points.

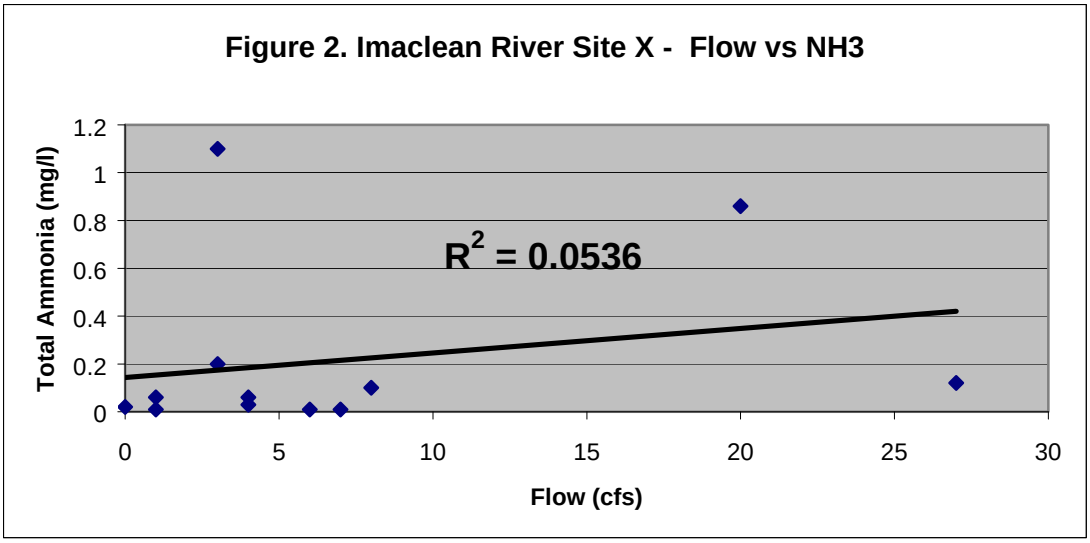
When assessing and summarizing the data to be used in the point source WLA, the flow conditions under which the data was collected and the age of the data will be considered, provided the data is available. As well, hydrologic systems change over time and data collected several years ago may no longer be representative of the current system. When evaluating data to be used, age, significant hydrologic modification (channelization, diversion, etc) will be taken into account, and any data that may not be representative of the current system will be pared from the data set. As with flow, documentation of the process will accompany the decision to use a parameter(s) value for any point source WLA.

Below is an example of a stream flow versus water quality parameters assessment. Data available for Imaclean River is as follows.

Sample Date	Flow (cfs)	pH	Temperature (°C)	Total Ammonia (mg/l)
7/1/76	4	7.6	19.5	0.03
7/22/76	8	8	23	0.1
8/11/76	4	8	20.5	0.06
9/1/76	1	8.1	23	0.01
7/14/77	7	8.7	27	0.01
8/23/77	6	7.9	20	0.01
9/15/77	3	7	17.5	1.1
4/12/78	20	7.5	13	0.86
5/3/78	1	8.4	12	0.06
7/26/78	0	8.6	27.5	0.02
8/16/78	3	8.7	23.5	0.2
8/20/93	27		23.7	0.12
N		11		12

Using Excel, the flow values were plotted against pH and total ammonia (NH3) to create Figure 1 and Figure 2.





This assessment did not yield a high coefficient of determination (R^2) value indicating that flow and pH and flow and total ammonia are not dependent variables. Therefore, for this data set, all of the data should be considered when establishing the applicable design parameters.

The accepted process is to select the median value from the selected data set to represent the chronic design condition and the 90th percentile value to represent the acute design condition (10th percentile for parameters where the lower value is critical; e.g. dissolved oxygen, hardness). Deviation from this procedure should be documented and become a part of the administrative record.

EFFLUENT VOLUME

In order to establish the allowable discharge load(s), effluent volume information is needed. If a facility has been previously issued a NPDES permit, the information is readily available, because facilities are usually required to report the flow volume being discharged. NPDES permits allow for the flow volume to be either measured directly or calculated using pump hours, etc. The data is then submitted quarterly on discharge monitoring reports (DMRs), where once received, the data is entered into EPA's Permit Compliance System (PCS). Data in PCS can then be compiled and retrieved according to facility or other grouping and statistically summarized (median, mean, etc.) using Excel. Typically, DMR flow information is reported in terms of million-gallons-per-day so it may become necessary to convert the data into cubic feet per second or other units being used.

When applying a mixing zone to a discharge, Title 117 requires that the specifications be based upon the "average dry weather or seasonal flow from a point source" using the appropriate stream design flow. For the purposes of developing a point source WLA the "average dry weather or seasonal flow" will be defined as the median flow value from the data submitted over the past three (3) years. The data should be segregated according to the applicable season. Exceptions to this would be a lack of data over the past three years or the past data does not accurately represent the effluent being discharged. In these situations an alternate flow may be utilized or the acceptable data range may be extended to the previous five-year period provided the values are representative of the current or expected discharge.

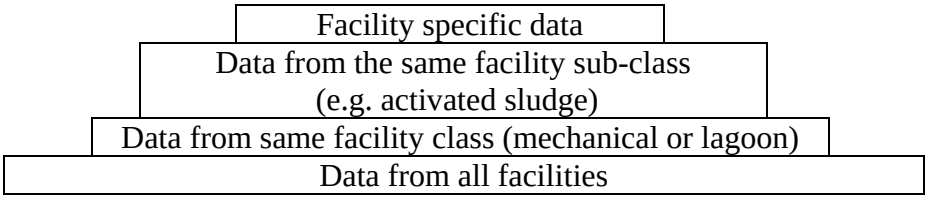
The confidence level associated with the data used to determine the effluent volume can be found in the following table.

Data Source	High Confidence	Medium Confidence	Low Confidence
Effluent Volume	• Monthly measurements obtained from the previous three-year period. Data may be discounted and discarded if the measurement is not representative of the discharge (i.e., excess flow from infiltration and inflow). The date range may be increased to 5 years provided the historic records are representative of the current population or production.	• Less than 24 summer season and 12 winter season measurements obtained over the previous three-year period.	• Facility design flow, estimation or other value that is not a direct measurement.

EFFLUENT QUALITY

Effluent water quality information may be needed to complete the WLAs. For example, applicable acute criteria utilized in the WLA can be based upon the pH and temperature of the effluent. Previous monitoring of the effluent as required by an NPDES permit or for any other reason may provide some if not all of the necessary information. If the information from a specific facility or effluent is unavailable default values may have to be utilized. Similar to streams, when selecting values to characterize the effluent, the below pyramid should be utilized. Also similar to streams, documentation of the data selection process should be provided with the point source WLA.

A concern may arise as to the credibility of the data from regulated facility. EPA requires that NPDES permitted facilities performing self-analysis, participate in the Discharge Monitoring Report-Quality Assurance (DMR-QA) program. Any data submitted by a facility that successfully complete the requirements of the DMR-QA program will be utilized. Other data should be scrutinized and quality assurance/quality control procedures reviewed prior to inclusion or usage.



The confidence level associated with the data used to determine the effluent quality can be found in the following table.

Data Source	High Confidence	Medium Confidence	Low Confidence
Effluent Quality	• Monthly measurements obtained from the previous three-year period. Data may be discounted and discarded if the measurement is not representative of the discharge (i.e., excess flow from infiltration and inflow). The date range may be increased to 5 years provided the historic records are representative of the current population or production.	• Less than 24 summer season and 12 winter season measurements obtained over the previous three-year period.	• Default measurement, ecoregion or literature value.

Similar to streams, when using effluent quality information in the WLA the median value should be selected to represent the chronic conditions and the 90^{th} (or 10^{th}) percentile value should be selected to represent the acute conditions. Deviations from this procedure should be documented in the administrative record of the NPDES permit.

DETERMINING PHYSICAL STREAM DESIGN CONDITIONS

To ascertain the amount of dilution an effluent is allocated within the mixing zone it is necessary to know the physical and hydrological characteristics of the stream at the selected design conditions. Characteristics considered include stream width, depth, velocity and lateral dispersion. Ideally, stream width, depth and velocity are measured directly under design conditions. However, because these events occur infrequently there are often no direct measurements. Data collected under other flow conditions can be used to determine the physical characteristics at the lower flows. The following equations (U.S. EPA, 1981) are used to estimate the physical conditions of stream at the selected design conditions.

$$\textbf{Eqn. 1} \quad V_t = \frac{V_k}{\left(Flow_k / Flow_t\right)^{0.5}}$$

$$\textbf{Eqn. 2} \quad D_t = \frac{D_k}{\left(Flow_k / Flow_t\right)^{0.4}}$$

$$\textbf{Eqn. 3} \quad CSA_t = \frac{CSA_k}{\left(Flow_k / Flow_t\right)^{0.5}}$$

Where:

V_t = Target velocity (at design flow)
V_k = Known velocity
$Flow_k$ = Known flow (cfs)
$Flow_t$ = Target flow (at design flow)
D_t = Target depth (at design flow)
D_k = Known depth
CSA_t = Target Cross-Sectional Area (at design flow)
CSA_k = Known Cross-Sectional Area

(In the above equations a $_k$ denotes an actual measurement, a $_t$ denotes a target value estimated under design conditions.)

Equation 1 example:

$$V_t = \frac{V_k}{\left(Flow_k / Flow_t\right)^{0.5}}$$

If the known flow = 15 cfs, the known velocity = 0.79 ft/s and the target flow or 7Q10 = 6 cfs then:

$$V_t = \frac{0.79\,ft/\sec}{\left(15cfs / 6cfs\right)^{0.5}}$$

$$V_t = \frac{0.79\,ft/\sec}{1.5811}$$

$$V_t = 0.5\,ft/\sec$$

Equation 2 example:

$$D_t = \frac{D_k}{\left(Flow_k / Flow_t\right)^{0.4}}$$

If the known flow = 15 cfs, the known depth = 1.15 feet and the target flow or 7Q10 = 6 cfs then:

$$D_t = \frac{1.15\,ft}{\left(15cfs / 6cfs\right)^{0.4}}$$

$$D_t = \frac{1.15\,ft}{1.4427}$$

$$D_t = 0.8\,ft$$

Equation 3 example:

$$CSA_t = \frac{CSA_k}{\left(Flow_k / Flow_t\right)^{0.5}}$$

If the known flow = 15 cfs, the known cross-sectional area = 14.35 ft sq. and target flow or 7Q10 = 6 cfs then:

$$CSA_t = \frac{14.35\,ft^2}{\left(15cfs / 6cfs\right)^{0.5}}$$

$$CSA_t = \frac{14.35\,ft^2}{1.5811}$$

$$CSA_t = 9.08\,ft^2$$

Target cross sectional area is used to estimate target width so:

$$W_t = \frac{CSA_t}{D_t}$$

$$W_t = \frac{9.08\,ft^2}{0.8\,ft}$$

$$W_t = 11\,ft$$

Where:

W_t = Target width (at design flow)

LATERAL DISPERSION AND POINT OF COMPLETE MIXING

The rate at which an effluent disperses across a stream width is known as lateral dispersion and is denoted by d_y. The rate of lateral dispersion is determined largely by stream channel morphology. EPA's Technical Support Document for Water Quality Based Toxics Control (TSD) (EPA, 1991) recommends using the following equation to determine lateral dispersion under design flow conditions:

$$d_y = \left(c \cdot D_t \cdot v^*\right) \pm 50\%$$

Application of the equation by NDEQ in the past has indicated the equation will predict a conservative estimate of mixing; therefore, application of the equation will utilize the upper range of the acceptable values and the equation thus becomes:

Eqn. 4 $$d_y = \left(1.5 \cdot c \cdot D_t \cdot v^*\right)$$

Where:

c = channel meander/sinuosity - The channel meander/sinuosity factor can vary from 0.1 to 1.0 depending on the type and irregularity of the channel cross-section and quality and quantity of meanders. Straight channels results in low values and channels with many curves and cross-meandering channels result in high values. The *c* coefficient will be determined using the *Standard Operating Procedures for Determining Channel Meander/Channel Sinuosity Coefficients*.

D_t = average stream depth at design flow conditions
v* = sheer velocity

The equation to calculate sheer velocity is:

Eqn. 5 $$v^* = \sqrt{g \cdot D_t \cdot s}$$

Where:

g = acceleration due to gravity (32.2 ft/s/s)
D_t = average stream depth at design flow
s = channel slope or stream gradient (feet/mile)

Equation 5 example:

If D_t = 0.8 ft and s = 4.5 ft/mile then:

$$v^* = \sqrt{32.2\ ft/s/s \cdot 0.8\ ft \cdot \left(4.5 \diagup 5280\right)}$$

$$v^* = 0.1482\ ft/s$$

(Sheer velocity and lateral dispersion are rounded to four significant digits.)

Once a value for sheer velocity has been determined, the lateral dispersion coefficient can be calculated (Eqn. 4).

Equation 4 example:

If c = 0.6 and D_t = 0.8 ft and v = 0.1482 ft/s then:*

$$d_y = \left(1.5 \cdot 0.6 \cdot 0.8\ ft \cdot 0.1482\ ft/s\right)$$

$$d_y = 0.1067\ ft^2/s$$

The lateral dispersion coefficient is then used with target stream width and velocity, to estimate the distance where the wastewater has (laterally) dispersed across the stream width. The distance to (estimated) complete lateral mixing is denoted by X_m and the equation used to estimate that distance is:

Eqn. 6 $$X_m = \frac{m \cdot W_t^2 \cdot V_t}{d_y}$$

Where:

m = coefficient which defines the degree of uniformity for complete mixing (5% variation across the cross section is acceptable. In some situations based upon the chemical parameter, the Department may allow up to a 25% variation to be considered completely mixed) and the transverse location of the discharge entering the stream when mixing begins. Typically:

m = 0.2 when the discharge **IS NOT** near the center of the stream thalweg and discharged induced mixing (e.g. stream-to-effluent flow ratio is 3:1 or less or a high rate diffuser is used) **DOES NOT** occur.

m = 0.1 when the discharge **IS** near the center of the stream thalweg or discharge induced mixing **DOES** occur; when effluent equals or exceeds 33% of background stream flow or a high rate diffuser is used.

W_t = stream width at design flow
V_t = stream velocity at design flow
d_y = lateral dispersion coefficient

Equation 6 example:

If m = 0.2, W_t = 11 ft, V_t = 0.5 ft/s and d_y = 0.1067 ft^2 /s then:

$$X_m = \frac{0.2 \cdot (11\,ft)^2 \cdot 0.5\,ft/s}{0.1067\,ft^2/s}$$

$$X_m = \frac{12.1}{0.1067\,ft^2/s}$$

$$X_m = 113\,ft$$

For this example, the point at which the effluent is predicted to be mixed completely across the entire volume of the stream is 113 feet (rounded to the nearest foot).

LOADING CAPACITY CALCULATION

Due to differences in stream morphology and effluent volume, some effluent discharges will mix more rapidly than others. In an effort to simplify the process two methods of determining the point source WLAs can be used. When the point to complete mixing is predicted to be equal to or less than the selected mixing zone boundary by equation 6 above, the following mass balance equation should be used.

Eqn. 7 $$C_e = \frac{C_x(Q_e + Q_s) - C_s(Q_s)}{Q_e}$$

Where:

C_e = maximum allowable effluent concentration (mg/l)
C_x = water quality criteria (mg/l)†
Q_e = median seasonal facility discharge
Q_s = seasonal design flow of receiving stream (above point source)
C_s = background pollutant concentration of receiving stream

† Water quality criteria can be found in Chapter 4, Title 117. Chronic criteria for ammonia are based upon temperature and pH of the receiving water. For some stream segments, site-specific criteria for ammonia and other parameters have been designated. Site-specific criteria are based upon surveys that indicate fewer intolerant species present compared to species used in establishing statewide criteria.

Equation 7 example: (chronic ammonia)

Assume the 30-day ammonia criteria, for a Warmwater B aquatic life use class is 1.895 mg/l and if the 30Q5 or Q_s = 1.5 cfs, Q_e = 0.2 cfs and C_s = 0.1 mg/l then:

$$C_e = \frac{1.895mg/l(0.2cfs + 1.5cfs) - 0.1mg/l(1.5cfs)}{0.2cfs}$$

$$C_e = \frac{3.22 - 0.15}{0.2}$$

$$C_e = \frac{3.07}{0.2}$$

$$C_e = 15.36mg/l$$

The 30-day ammonia wasteload allocation for this discharge would be 15.36 mg/l. The value would be forwarded and recommended for inclusion into an NPDES permit. Permit writers in NDEQ's Municipal and Industrial Section will determine appropriate end-of-pipe permit limits based upon this value.

Typically, wide shallow streams mix more slowly and the estimated point to complete lateral mixing may be several miles downstream of the discharge point. In these cases the mass balance equation described above (Eqn 7.) would likely over allocate dilution that is actually being used at the mixing zone boundary. Therefore, to predict the concentration/load that a facility can discharge and still meet water quality criteria at the mixing zone boundary, NDEQ has developed an equation based on an equation found in EPA's TSD (EPA, 1991).

$$\textbf{Eqn. 8} \quad C_e = \frac{\left(C_x - C_s\right)\left[Q_s\left(\pi \cdot d_y \cdot X/V_t\right)^{0.5}\right]}{Q_e\left(W_t\right)}$$

Where:

C_e = maximum allowable effluent concentration (mg/l)
C_x = water quality criteria (mg/l)†
C_s = background pollutant concentration‡
Q_s = seasonal design flow of receiving stream
π = pi = 3.1416
d_y = lateral dispersion coefficient (ft/s)
X = maximum allowable distance from outfall to mixing zone boundary (ft)
V_t = average velocity of receiving stream at design flow (ft/s)
Q_e = median seasonal effluent flow (cfs)
W_t = average width of receiving stream at design flow (ft)

Equation 8 example: (chronic ammonia)

Assume the 30-day ammonia water quality criteria for a Coldwater Class A aquatic life use is 0.883 mg/l.

If C_x = 0.883, C_s = 0.1 mg/l, Q_s = 22 cfs, d_y = 0.0449 ft ^{2}/s, X = 2500 ft, V_t = 0.63 ft/s, Q_e = 0.39 cfs and W_t = 78 ft then:

$$C_e = \frac{\left(0.883mg/l - 0.1mg/l\right)\left[22cfs\left(\pi \cdot 0.0449 \cdot 2500\,ft/0.63\,ft/s\right)^{0.5}\right]}{0.39cfs\left(78\,ft\right)}$$

$$C_e = 13.40mg/l$$

The 30-day ammonia WLA for this discharge would be 13.40 mg/l. Remember permit writers would assign the end-of-pipe limits based on this figure.

In the calculation of near field or acute WLAs, situations arise where the calculated WLA is less than the applicable water quality standard. This most often occurs when lateral dispersion is slow and the effluent volume is substantial. In these situations, the default is to fall back to the Title 117 and allow for 5% of the chronic mixing zone for the acute mixing zone. In terms of WLA calculations, the mass balance equation (Equation 7) should be utilized with the seasonal stream design flow (Q_s) being 5% of the stream utilized in the chronic WLA. The volume of stream used is determined by equation 9.

$$\textbf{Eqn. 9}\ Q_s = \frac{C_e(Q_e) - C_x(Q_e)}{C_x - C_s}$$

Where:

Q_s = stream volume used at mixing zone boundary (cfs)
C_e = maximum allowable effluent concentration (mg/l)
Q_e = median seasonal effluent flow (cfs)
C_x = water quality standard for pollutant (mg/l)
C_s = background pollutant concentration (mg/l)

Equation 9 example:

If C_e = 13.40 mg/l, Q_e = 0.39 cfs, C_x = 0.883 mg/l, and C_s = 0.1 mg/l (from equation 8) then:

$$Q_s = \frac{13.4mg/l(0.39cfs) - 0.883mg/l(0.39cfs)}{0.883mg/l - 0.1mg/l}$$

$$Q_s = \frac{5.23 - 0.3444}{0.783}$$

$$Q_s = \frac{4.88}{0.783}$$

$$Q_s = 6.2cfs$$

At the end of the chronic mixing zone, 6.2 cfs is utilized in the assimilation of the effluent flow in equation 8.

Due to differences in effluent volume, stream morphology, natural background concentrations, etc. the percentage of stream volume used may vary from one parameter to the next.

REFERENCES:

Nebraska Department of Environmental Quality, _____ Title 117 – Nebraska Surface Water Quality Standards. Water Quality Division, Department of Environmental Quality, Lincoln, NE.

Nebraska Department of Environmental Quality, _____. Standard Operating Procedure for Determining Channel Meander/Channel Sinuosity Coefficients. Planning Unit, Water Quality Division, Department of Environmental Quality, Lincoln, NE.

Nebraska Department of Environmental Quality, 2000. Standard Operating Procedure for Determining Log-Pearson Type III Flow Distribution. Planning Unit, Water Quality Division, Department of Environmental Quality, Lincoln, NE.

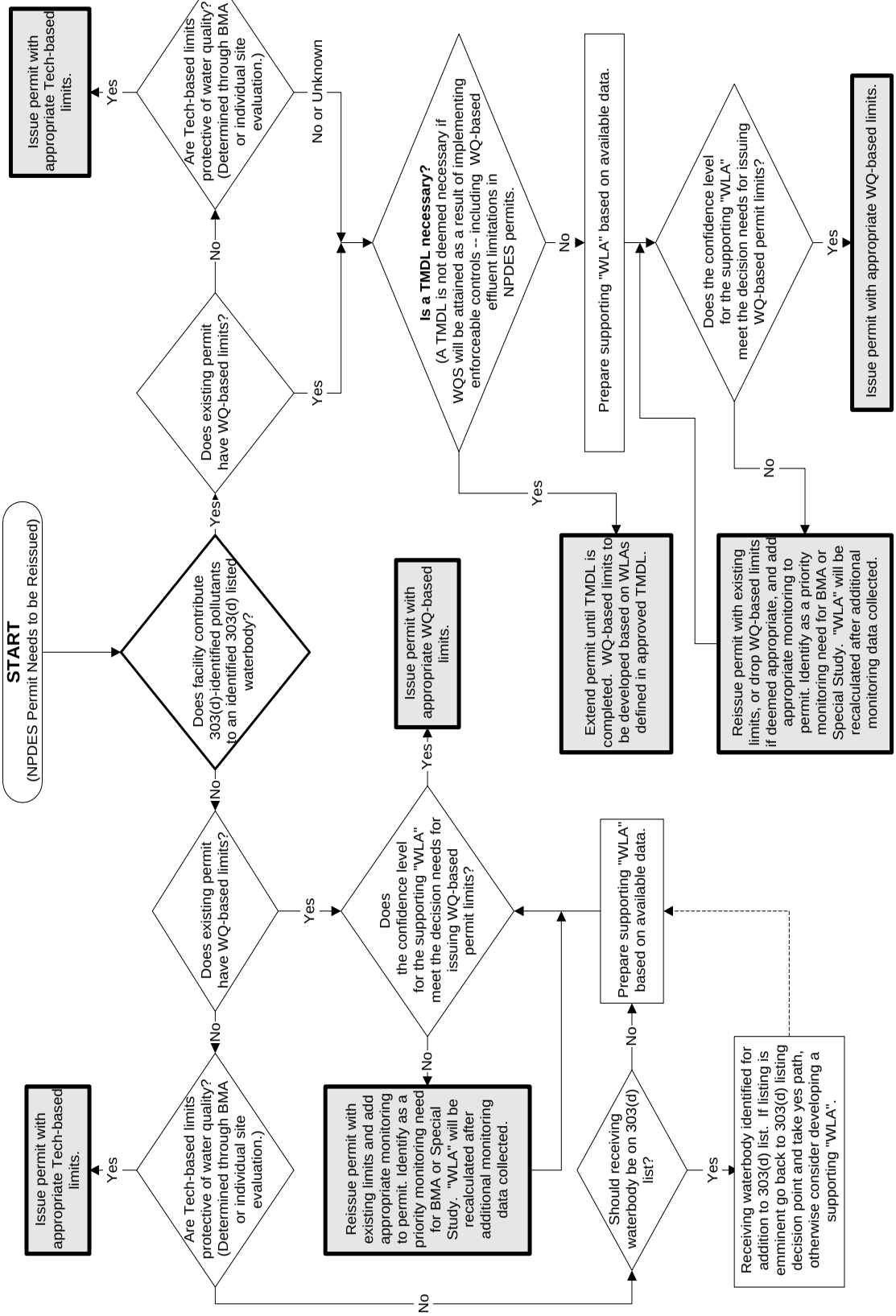
United States Environmental Protection Agency, 1981. Technical Guidance Manual for Performing Waste Load Allocations. United States Environmental Protection Agency. Washington, D.C. Chapter 1, Book 11 Streams and Rivers.

United States Environmental Protection Agency, 1991. Technical Support Document for Water Quality - based Toxics Control. United States Environmental Protection Agency, Washington D.C.

02/23/01

Appendix A. - TMDL Program Implementation Procedure 1.

Interfacing the NPDES Permitting Process with the Basin Management Approach (BMA) and the Development of TMDLs -- Flow Chart



LISTING AND DELISTING WATERBODIES ON THE SECTION 303(D) LIST OF IMPAIRED WATERS

CPP Document Number 6.1

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Lincoln, NE

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DETERMINATION OF LOADING CAPACITIES FOR STREAMS AND RIVERS

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DETERMINATION OF LOADING CAPACITY FOR LAKES

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DETERMINATION OF WASTELOAD ALLOCATIONS AND LOAD ALLOCATIONS AS PART OF A TMDL

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DEVELOPMENT OF TMDL IMPLEMENTATION PLANS

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REVIEW AND REVISIONS OF TMDLS

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REVISION OF THE STRATEGIC PLAN AND GUIDANCE FOR IMPLEMENTING THE NONPOINT SOURCE MANAGEMENT PROGRAM

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IDENTIFICATION AND REVISION OF NONPOINT SOURCE PRIORITIES

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DEVELOPMENT OF WATERSHED WATER QUALITY MANAGEMENT PLANS

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BASIN MANAGEMENT APPROACH FRAMEWORK DOCUMENT

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COMPILING GIS DATA LAYERS FOR SURFACE WATER POLLUTION POTENTIAL ASSESSMENT WITHIN BASINS

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IDENTIFYING ADDITIONAL INFORMATION NEEDS TO SUPPORT DEVELOPMENT OF BASIN MANAGEMNT PLANS

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DEVELOPMENT OF BASIN MANAGEMENT PLANS

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CONDUCTING GROUND WATER QUALITY ASSESSMENTS TO SUPPORT DESIGNATIONS OF GROUND WATER MANAGEMENT AREAS

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Water Quality Assessment Section
Water Quality Division
Nebraska Department of Environmental Quality
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DETERMINING WELLHEAD PROTECTION AREAS

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INITIAL INVESTIGATION, EVALUATION, AND DETERMINATION OF FURTHER ACTION NEEDED AT PETROLEUM RELEASE SITES

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DETAILED INVESTIGATION, EVALUATION, AND DETERMINATION OF CLEANUP NEEDED AT PETROLEUM RELEASE SITES

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LUST/Release Assessment Section
Water Quality Division
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DEVELOPMENT OF THE STATE REVOLVING FUND INTENDED USE PLAN UNDER THE PERVIEW OF THE FEDERAL CLEAN WATER ACT

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Municipal and Industrial Section
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Nebraska Department of Environmental Quality
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PREPARATION OF CONTAMINANT SOURCE INVENTORIES UNDER THE SOURCE WATER ASSESSMENT PROGRAM

CPP Document Number: 10.2

Prepared by:

Planning Unit
Water Quality Division
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Lincoln, Nebraska

March, 2001

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TABLE OF CONTENTS

Page

1 INVENTORY OF POTENTIAL CONTAMINANT SOURCES

1.1 CONTAMINANTS OF CONCERN

The list of contaminants of concern must include raw water contaminants regulated under the Safe Drinking Water Act that have a maximum contaminant level (MCL), and cryptosporidium. MCL means the maximum permissible level of a contaminant in water which is delivered to any user of a public water supply system (NHHS, 1998). States may also include contaminants that are not federally regulated under the SDWA, but which the state has determined may present a threat to public health. In accordance with the Contamination Potential Rating (CPR) point system for ground water (Table 1), sources inside 1000 feet will be considered significant potential sources.

Below is the list of contaminants that PWSSs in Nebraska test for water quality. MCLs are listed strictly for informational purposes. New contaminants of concern may be added when new federal or state regulations are promulgated.

1.1.1 Contaminants Tested for and Regulated

These are drinking water contaminants that have a maximum contaminant level (MCL) and are regulated under the Nebraska Safe Drinking Water Act (NHHS,179, NAC2,1998).

CONTAMINANT	
Coliform Bacteria	The MCL is based on the presence or absence of total coliforms in a sample (NHHS, 179, NAC2,002.02C1, 1998).

Inorganic Chemicals:	**MCL**
Antimony	0.006 ppm
Arsenic	0.05 ppm
Asbestos	7M fibers/l
Barium	2.0 ppm
Beryllium	0.004 ppm
Cadmium	0.005 ppm
Chromium	0.1 ppm
Copper	1.3 ppm (Advisory Level)
Cyanide	0.2 ppm
Fluoride	4.0 ppm
Lead	0.015 ppm (Advisory Level)
Mercury	0.002 ppm
Nickel	0.1 ppm
Nitrate	10. ppm
Nitrite	1. ppm
Total nitrate and nitrite	10.0 ppm
Selenium	0.05 ppm
Sodium	500.0 ppm
Thallium	0.002 ppm

Synthetic Organic Chemicals:

Pesticides & Other Synthetic Organic Chemicals:	**MCL**
Alachlor	2 ppb
Atrazine	3 ppb
Benzo(a)pyrene	0.2 ppb
Carbofuran	40 ppb
Chlordane	2 ppb
Dalapon	200 ppb
Di(2-ethylhexyl)adipate	400 ppb
Dibromochloropropane	0.2 ppb
Dinoseb	7 ppb
Di(2-ethylhexyl)phthalate	6 ppb
Diquat	20 ppb
2,4-D	70 ppb
Endothall	100 ppb
Endrin	2 ppb
Ethylene dibromide	0.05 ppb
Glyphosate	700 ppb
Heptachlor	0.4 ppb
Heptachlor epoxide	0.2 ppb
Hexachlorobenzene	1 ppb
Hexachlorocyclopentadiene	50 ppb
Lindane	0.2 ppb
Methoxychlor	40 ppb
Oxamyl (Vydate)	200 ppb
Pentachlorophenol	1 ppb
Picloram	500 ppb
Polychlorinated biphenyls	0.5 ppb
Simazine	4 ppb
Toxaphene	3 ppb
2,3,7,8-TCDD (Dioxin)	0.00003 ppb
2,4,5-TP (Silvex)	50 ppb

Volatile Organic Chemicals:	**MCL**
Benzene	5 ppb
Carbon Tetrachloride	50 ppb
o-Dichlorobenzene	600 ppb
Para-Dichlorobenzene	75 ppb
1,2-Dichloroethane	5 ppb
1,1-Dichloroethylene	7 ppb
Cis-1,2-Dichloroethylene	70 ppb
Trans-1,2-Dichloroethylene	100 ppb
Dichloromethane	5 ppb
1,2-Dichloropropane	5 ppb
Ethylbenzene	700 ppb
Monochlorobenzene	100 ppb
1,2,4-Trichlorobenzene	70 ppb
1,1,1-Trichloroethane	200 ppb
1,1,2-Trichloroethane	5 ppb
Trichloroethylene	5 ppb
Vinyl Chloride	2 ppb
Styrene	100 ppb
Tetrachloroethylene	5 ppb
Toluene	1,000 ppb
Xylenes (total)	10,000 ppb
Disinfection By-Products:	
Total Trihalomethanes	100 ppb
Radionuclides:	
Gross Alpha (minus Uranium & Radium 226)	15 pCi/l
Radium 226 plus Radium 228	5 pCi/l

Abbreviations	**Full name of abbreviation**
MCL	Maximum Contaminant Level
M fibers/l	Million fibers per liter
ppb	parts per billion, roughly equivalent to micrograms per liter
ppm	parts per million, roughly equivalent to milligrams per liter
pCi/l	picoCuries per liter

Table 1. Second Phase Vulnerability Analysis for Ground Water Community PWS wells - ranking by well or by well field, only if wells are in close proximity and share similar characteristics.

CHARACTERISTIC	POINT SYSTEM		
Depth to water	• < 10 feet • 10 - 50 feet • > 50 feet	*choose one*	• 15 • 10 • 0
Vadose (unsaturated) zone (zone above water table)	• all sand and/or gravel • 1 - 15 feet of clay present • > 15 feet of clay present	*choose one*	• 10 • 5 • 0
Age of well	• constructed before May, 1977 • constructed after May, 1977	*choose one*	• 0 • -10
Potential contaminant source within WHPA[1] - includes potential nonpoint[2] sources	• inside 1000 feet • within 1000 feet to 10 year TOT • outside 10 year TOT • none	*choose highest value*	• 10 • 5 • 2 • 0
Transportation corridors within WHPA	• main line railroad or pipeline • major highway or interstate intersection • state or federal highway or interstate • county roads or city/village streets • none	*choose highest value*	• 5 • 5 • 2 • 2 • 0
Average PWSS nitrate as nitrogen concentration over last 5 years	• below or equal to 5 ppm • between 5 - 7 ppm • between 7 -10 ppm • at 10 ppm or above	*choose one*	• -2 • 0 • 5 • 10
Detection of any contaminant regulated under drinking water quality standards in last 5 years (not including coliform)	• none • any at or below 50% MCL • any above 50% MCL, but < MCL • any at or above MCL or Administrative Order	*choose one*	• -10 • -5 • 5 • 20
Existing land use or zoning ordinances for water quality concerns or protecting PWSS	• none • county • local WHP program	*choose one*	• 5 • 0 • -10
Natural Resources District Ground Water Management Area in place	• none • Phase I • Phase II higher	*choose one*	• 5 • 0 • -5

Footnotes:

1 - Potential contaminant sources from “on-the-ground” inventory and from NDEQ database search.

2 - Nonpoint sources are usually associated with agricultural production where fertilizers and pesticides are applied. Pasture or wooded lands are not usually included as potential nonpoint sources of contamination.

1.1.2 Contaminants Tested for and not Regulated

States may also include contaminants that are not federally regulated under the SDWA, but the state has determined may present a threat to public health (NHHS, 1998). Nebraska Health and Human Services requires testing for the following non-regulated contaminants:

Inorganic Chemicals:

Sulfate

Volatile Organic Chemicals:

Chloroform
Bromodichloromethane
Chlorodibromomethane
Bromoform
Chlorobenzene
m-Dichlorobenzene
1,1-Dichloropropene
1,1-Dichloroethane
1,1,2,2-Tetrachloroethane
1,3-Dichloropropane
Chloromethane
Bromomethane
1,2,3-Trichloropropane
1,1,1,2-Tetrachloroethane
Chloroethane
2,2-Dichloropropane
o-Chlorotoluene
p-Chlorotoluene
Bromobenzene
1,3-Dichloropropene

Pesticides and Other Synthetic Organic Chemicals:

Aldrin
Butachlor
Carbaryl
Dicamba
Dieldrin
3-Hydroxycarbofuran
Methomyl
Metolachlor
Metribuzin
Propachlor

2 GROUND WATER SYSTEMS, TWO LEVEL APPROACH

2.1 LEVEL ONE - DATABASE SEARCH

NDEQ will do a database search of potential contaminant sources within the WHPA (for all types of PWSSs), including databases from the following State Agencies:

- Nebraska Department of Environmental Quality (NDEQ) (see section 2.2),
- Nebraska Department of Health and Human Services (NHHS),
- Nebraska State Fire Marshal (NSFM),
- Nebraska Oil and Gas Conservation Commission (NOGCC),
- Nebraska Department of Agriculture (NDA).

A Draft Source Water Assessment including information from the agencies listed above will be shared with the PWS operator before completion. From the draft assessment, the PWSS will be able to make changes or additions if needed. The PWSS will be given a final Source Water Assessment, then the PWSS can move onto Level Two, when ready.

2.2 NDEQ'S DATABASE

NDEQ has developed an Integrated Information System (IIS) which is a centralized, shared database containing descriptive and locational information for all facilities under the agency's jurisdiction. A unique identification number is provided for each facility, and program staff correlate agency-wide information for a given facility. Additionally, IIS facility data is being developed for use with the Geographic Information System (GIS) by obtaining locational coordinates with address matching and from hand-held Global Positioning System (GPS) units. The following are programs or facility information that make up the IIS facility list:

- Clean Air Act
- Emergency Response
- Grants and Planning (recycling centers)
- Integrated Waste Management (landfills)
- Leaking Storage Tanks (underground and above ground)
- Legal Services
- Livestock Waste Control Facilities
- Low Level Radioactive Waste
- National Pollutant Discharge Elimination System (NPDES) - permits for municipal and industrial waste discharge
- Stormwater Permits
- Combined Sewer Overflows - combined storm water and wastewater sewer system
- Remedial Action Plan Monitoring - voluntary ground water and soil remediation sites
- Resource Conservation Recovery Act (RCRA) - hazardous waste investigations
- Septic Tanks

- Comprehensive Emergency Response Cleanup and Liability Act, CERCLA (Superfund) - hazardous waste investigations
- Superfund Amendments and Reauthorization Act (SARA Title III)
- Emergency planning, emergency chemical release notification, community right-to-know reporting, toxic chemical release reporting
- Title 118 Ground Water Investigations and Cleanups
- Title 200 Reimbursement Fund Leaking Underground Storage Tank cleanup sites (petroleum)
- Underground Injection Control (UIC) - injection of fluids in or below ground water drinking water sources
- Wastewater Facilities (Municipal, Industrial, and others)

2.3 CLASS V UIC WELLS

The Underground Injection Control (UIC) program could contribute information on Class V injection wells in WHPAs and WDAs. This UIC program information is in the IIS. Proposed changes to federal UIC regulations could provide NDEQ with the regulatory influence to prohibit certain Class V wells.

2.4 LEVEL TWO - "ON-THE-GROUND" INVENTORY FOR ALL GROUND WATER PWSSS

An "on-the-ground" inventory for ground water PWSSs may be done by the community or others at any time. This applies to Community and Non-Transient, Non-Community systems. Transient, Non-Community systems may also do an "on-the-ground" inventory. However, this type of system is only required to monitor nitrate and microbiological contaminants, therefore, they need only to inventory for those sources. As mentioned in section 2.1, the database search will be done for all types of PWSSs. The "on-the-ground" inventory will be completed as described in section 3.

3 LEVEL TWO - "ON-THE-GROUND" INVENTORIES

The next step in the inventory process is done by the community, using the level one database search as a starting point. An "on-the-ground" inventory may be done by the PWSS or community served by it. This action is voluntary and can be done at any time. NDEQ encourages PWSSs to use trained volunteers to do the inventory. This type of inventory applies to all PWSSs, ground water and surface water.

As is explained in section 5, any time a level two "on-the-ground" inventory is completed the results must be sent in to NDEQ. This level two inventory is necessary before a more complete Contamination Potential Rating can be done.

3.1 THE CONTAMINANT SOURCE INVENTORY GUIDEBOOK FOR NEBRASKA

To aid in the "on-the-ground" inventory effort, NDEQ has developed a Contaminant Source Inventory Guidebook (Inman, 1997), which can be a useful tool in completing an

inventory. The Contaminant Source Inventory Guidebook includes categories of sources of contamination as well as an approach for identifying different types of land use or activities which may be potential sources of contamination. While this Guidebook was written for ground water systems, the same principles can be used for surface water systems as well.

Main topics in the Guidebook include a short description of Nebraska's Wellhead Protection (WHP) program, what a contaminant source inventory is, some of the advantages of doing an inventory, how to recruit and train volunteers to do an inventory, materials and maps needed to do an inventory, how to do an inventory (including completed sample forms), recognizing the volunteers, and how to keep people in the community informed about the inventory process.

Extensive appendices include phone numbers and addresses for state and federal agencies/organizations, phone numbers and addresses for county assessors, local cooperative extension, and USDA offices, and phone numbers for regional agencies or organizations, such as Natural Resources Districts, Nebraska Department of Economic Development, Resource Conservation and Development Offices (RC&Ds), University of Nebraska, Midwest Assistance Program, and Groundwater Foundation.

The appendices also include blank and sample inventory forms, as noted above, and miscellaneous information, such as sample press releases. Tables of potential contaminant sources and materials that could be found at sites are also listed.

A copy of the Contaminant Source Inventory Guidebook is available free of charge to anyone, just by requesting it. Currently, it is also available on-line at: **http: //gwpc.site.net/sourcewater.Nebraska/NEguidebook01.htm**. NDEQ anticipates having all the WHP Newsletters on-line soon. These will be found at: **http://deq.ne.gov/** under Agency Programs, Water Quality Division, Ground Water Section, Wellhead Protection. WHP Newsletter 3 is about the Contaminant Source Inventory Guidebook and inventory process.

3.2 WHP ASSISTANCE THROUGH A CWA 319 PROJECT

NDEQ is planning a FY99 Clean Water Act (CWA) Section 319 project to aid communities in WHP activities. NDEQ will contract with three Natural Resources Districts to hire a WHP Coordinator to assist local communities with "on-the-ground" Contaminant Source Inventories and Contaminant Source Management plans. These people will be in place for three years. NDEQ will provide support and training for these people. NDEQ hopes to expand this project to several other areas or regions after the first year. This project will enable one-on-one assistance to be given to PWSSs in the WHP program. Since the vast majority of Nebraska's systems are ground water based, NDEQ is targeting these systems. Surface water source PWSS may participate in this project as well.

3.3 RC&D/GROUNDWATER FOUNDATION AMERICORPS APPLICATION

Several Resource Conservation and Development (RC&D) offices, in cooperation with the Groundwater Foundation, have applied for an AmeriCorps grant. This grant would place seven individuals in seven different areas of the state to do WHP and recycling/household hazardous waste activities. One of the main duties of these people would be to help communities do "on-the-ground" Contaminant Source Inventories and Contaminant Source Management plans. NDEQ will provide support and training for these people.

During the summer of 1998, several RC&Ds housed summer interns who helped communities do "on-the-ground" inventories. The lessons learned and successes of this short-term project encouraged the RC&Ds to apply for the AmeriCorps grant.

3.4 TRAIN THE TRAINER OPPORTUNITIES

Both the Midwest Assistance Program and the Nebraska Environmental Training Center (part of Central Community College at Hastings) have expressed interest in conducting "train-the-trainer" sessions. These sessions would train water operators and other community individuals on how to conduct "on-the-ground" inventories and how to recruit and train volunteers for doing inventories.

3.5 GROUNDWATER GUARDIAN

There are currently 13 Groundwater Guardian communities (a Groundwater Foundation program) in Nebraska. An activity that has been recognized as a good "Result Oriented Activity" (ROA) is an "on-the-ground" inventory. NDEQ supports and encourages Groundwater Guardian communities in WHP activities.

3.6 NEBRASKA RURAL WATER ASSOCIATION

The Nebraska Rural Water Association (NeRWA) works with communities on WHP activities. One of their efforts is to help towns (less than 10,000 population) with Contaminant Source Inventories. Once information from the NeRWA and their continuing efforts in the area of map drawing and inventories are coordinated, it will be a great benefit to the SWAP.

3.7 SAMPLING WAIVERS

NHHS has an existing waiver program that provides statewide waivers to all PWSSs, for contaminants that are not used in Nebraska. Beyond this type of waiver, it is possible for a PWSS to get an additional waiver, specific to a contaminant or water test for a group of contaminants. A Public Water Supply System that completes an "on the ground" contaminant source inventory may be able to use that information to help them apply for a water testing waiver from NHHS. An Inventory may show that the use and storage of a particular chemical has never occurred in the Wellhead Protection Area. NHHS may approve a reduced testing schedule for that particular chemical, thereby saving the community money.

4 SURFACE WATER SYSTEMS, TWO LEVEL APPROACH

4.1 LEVEL ONE - DATABASE SEARCH

The approach for Nebraska's surface water systems is very similar to the ground water system approach described in Section 2 and 3. NDEQ will do a database search of potential contaminant sources within the established Assessment Area (24 hour Time-of-Travel zone), including the data from the following State Agencies:

- Nebraska Department of Environmental Quality (NDEQ),
- Nebraska Health and Human Services (NHHS),
- Nebraska State Fire Marshal (NSFM),
- Nebraska Department of Agriculture (NDA), and
- Nebraska Oil and Gas Conservation Commission (NOGCC).

All relevant information from these agencies will be used in a Source Water Assessment and given to the PWSS. Since some of the Assessment areas are relatively large, a priority will be made in the database search for direct discharges to surface water. In accordance with the Contamination Potential Rating point system for surface water (Table 2), sources inside the assessment area (24 hour TOT) will be considered significant potential sources. A Draft Source Water Assessment will be shared with the PWS operator before completion. From the draft assessment the PWSS will be able to make changes or additions if needed. The PWSS can then move onto Level Two, when ready. The area upstream of the 24 hour TOT zone will be delineated, but it will be up to the system to decide what is done in the area. NDEQ will not require any protection activities in this area. If known potential contamination sources lie outside the Assessment Area (24 hour TOT zone), they may be included in the first level inventory.

4.2 LEVEL TWO - "ON-THE-GROUND" INVENTORIES

Level two is exactly the same for surface water systems as it is for ground water systems. This is described above in section 3.

5 RESPONSIBILITY

The Nebraska Department of Environmental Quality will assume the responsibility for completing the database search (Level One) for all PWSSs (ground water and surface water systems), and include the results in the Assessment for PWSSs to make any changes or additions.

Level Two, or "on-the-ground" inventories will be the responsibility of the PWSS and will remain voluntary. NDEQ has several projects planned to aid PWSSs with their "on-the-ground" inventories. Once the "on-the-ground" inventory has been completed, PWSSs are required to send a copy of the results to NDEQ.

Table 2. Second Phase Vulnerability Analysis for Surface Water Systems.

CHARACTERISTIC	POINT SYSTEM		
Integrity of intake, from last NHHS inspection	• poor • adequate • excellent	*choose one*	• 10 • 2 • 0
Size of Watershed Delineation Area (WDA)	• > 35 square miles • < 35 square miles	*choose one*	• 10 • 0
Potential contaminant source within Assessment Area[2] -- includes potential nonpoint[3] sources and permitted discharges	• present • absent	*choose one*	• 15 • 0
Transportation corridors within Assessment Area (24 hour TOT)	• main line railroad or pipeline • major highway or interstate intersection • state or federal highway or interstate • county roads or city/village streets • none	*choose highest value*	• 5 • 5 • 2 • 2 • 0
Detection of any contaminant regulated under drinking water quality standards in last 5 years (not including coliform)	• none • any at or below 50% MCL • any above 50% MCL, but less than MCL • any at or above MCL or Administrative Order	*choose highest value*	• -10 • -5 • 5 • 20
Existing land use or zoning ordinances for water quality concerns	• none • county • local Watershed Protection program or project[4]	*choose highest value*	• 5 • 0 • -10

Footnotes:

1 - From NDEQ database search, within the Assessment Area (24 hour TOT).

2 - Potential contaminant sources from "on-the-ground" inventory

3 - Nonpoint sources are usually associated with agricultural production where fertilizers and pesticides are applied. Pasture or wooded land are not usually included as potential nonpoint sources of contamination.

4 - Local Watershed Protection program or project could be a CWA 319 project, Nebraska Environmental Trust project, or other local/state program to protect the watershed and/or educate the public.

VULNERABILITY DETERMINATIONS UNDER THE SOURCE WATER ASSESSMENT PROGRAM

CPP Document Number: 10.3

Prepared by:

Planning Unit
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

March, 2001

This document is approved for inclusion in the Nebraska Department of Environmental Quality – Water Quality Division's Continuing Planning Process:

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Patrick W. Rice, Assistant Director **Date**

TABLE OF CONTENTS

Page

1 VULNERABILITY ANALYSIS

1.1 VULNERABILITY DEFINITION

For purposes of Nebraska's SWAP, the terms susceptibility and vulnerability are interchangeable. Nebraska has chosen to use the word vulnerability because of its use in Nebraska Health and Human Services' (NHHS) Sanitary Survey Program and statewide familiarity with the term in the public drinking water supply industry. Both the SDWA Amendments and EPA's SWAP Guidance encourage the use of existing information and coordination with other programs. Using the existing Sanitary Survey for the first phase of the vulnerability analysis is a use of effective information and cooperation between programs. The following chart shows examples of the information examined and recorded when a Sanitary Survey is completed by NHHS (see Appendix C for a complete blank vulnerability form).

Sanitary Survey Inspection Categories	**Examples**
Records	Water-Quality, Quantity, Use, Lab Reports
Wells	Site- Access, Drainage, Encroachment
Pumps	Base- Seal, Motor Mount, Bolts
Well House Mechanical	Piping- Supports, Ties, Sleeves, Corrosion
Auxiliary Equipment	Chemical- Safety, Storage, Controls, Pump
Storage Tanks	Condition- Structural, Corrosion, Leaks
Truck Fill Location	Backflow Prevention- Vacuum Breaker
Distribution System	Material Storage and Spare Parts
Operating Practices	New Construction and Abandonment
Miscellaneous	Wellhead Encroachment Policy, Emergency Plan
Treatment Plant	Sites, Structures, Buildings and Bins, Waste Handling

A Public Water Supply System's vulnerability to contamination is based on several factors:

- the integrity of the well (ground water) or intake (surface water) construction
- the geologic environment, including depth to water, presence of retarding sediments in the subsurface (ground water)
- the nature of the surface water source and watershed - large lake, small stream, large river, etc.
- the locations of potential contaminant sources in the WHPA or WDA

Nebraska is proposing a two phase Vulnerability Assessment, much like the two level Contaminant Source Inventory. The database search that was done as the level one Contaminant Source Inventory will be provided to NHHS field representatives to aid them in completing a Sanitary Survey for a PWSS. The existing Sanitary Survey vulnerability determination will be used for the first phase, and a more detailed vulnerability analysis of the PWSS will be done using the information from the "on-the-ground" inventory of potential contaminant sources (CPP Document No. 10.2) and specific site information. This second vulnerability will be called a **Contamination Potential Rating (CPR)**.

The first phase vulnerability analysis will assist PWSSs in focusing their local voluntary protection activities on the wells and locations that are more vulnerable to contamination. As Contamination Potential Ratings are completed, PWSSs will also benefit from this advanced analysis when assessing resources and protection activities for the Assessment Area (24 hour Time of Travel) in the watershed or the Wellhead Protection Area. It is also possible that results of the second phase vulnerability will be coordinated in the future to the Drinking Water State Revolving Loan Fund (DWSRF) priority list.

2 GROUND WATER SYSTEMS

2.1 PHASE ONE - EXISTING SANITARY SURVEY PROGRAM

The Nebraska Health and Human Services (NHHS) visits all Public Water Supply Systems to conduct a Sanitary Survey. The phase one vulnerability analysis for the Source Water Assessment will not change from the existing NHHS Sanitary Survey rating. Community PWSSs are visited once every three years and Non-Community PWSS are visited once every five years. Current regulations require PWSSs to take "actions as necessary to protect the system and its components from encroachments which are likely hazards to the safety of the drinking water quality, or which could have a substantial impact on system pressure or economies delivered by the system" (NHHS, Title 179 NAC2.008.02F, 1998). The Sanitary Survey is a vulnerability assessment done within 1000 feet of a well. A well is given a rating of vulnerable or not vulnerable to contamination. Specific components of a PWSS are evaluated in a sanitary survey, including source water, treatment, storage, the distribution system, and maintenance. A copy of the form used by NHHS, listing the specific details that are recorded, is included as Appendix C.

The phase one vulnerability analysis 1000 feet review distance is not inclusive of the entire source of drinking water for the PWSS. However, it has been determined that for a "middle" sized PWSSs well, 1000 feet is inclusive of the 2 year Time of Travel zone within the WHPA. This 1000 foot radius may include as much as the 5 year Time of Travel (this 5 year Time of Travel is not routinely calculated for the WHP program). This zone is the most crucial area to protect and NHHS's regulations reflect this need.

NDEQ intends to use all existing sanitary survey data with cooperation from NHHS to make a "first round" vulnerability analysis. This first phase vulnerability analysis will be accessed in NHHS's files for the initial Source Water Assessment given to the PWSS. It should be noted that no changes will be made to this already existing sanitary survey program and vulnerability assessment. PWSSs may challenge the "vulnerable" or "not vulnerable" rating given to them by NHHS. Being rated "vulnerable" usually means the PWSS may not be eligible for additional monitoring waivers.

2.2 PHASE TWO - MORE DETAILED VULNERABILITY ANALYSIS

A more detailed vulnerability analysis will be made by NDEQ after the results of the voluntary "on-the-ground" contaminant source inventory by the PWSS (or individuals, agencies, or organizations helping with inventories) are given to NDEQ. A review of available PWS well information from the WHP file and Safe Drinking Water Information System (SDWIS - EPA's

database of PWS information and violations) will be undertaken and a table completed (see Table 2). A Vulnerability Score will be the result of filling out the table. The scores will fall into different ranges, high to low, that will compare vulnerability of PWSS across the state (see Table 1). It should be noted that vulnerability scores will be ranked differently for Community ground water systems, Non-Community ground water systems, and surface water systems. This means a score of 40 does not mean the same thing for the above noted categories (see Table 7). The second phase vulnerability determination is independent of the initial rating by NHHS's sanitary survey. This second phase vulnerability determination will help PWSS prioritize and plan local protection activities.

Table 5.1. Vulnerability Scores Ranking for Ground Water Community PWSSs

High Vulnerability	**Medium Vulnerability**	**Low Vulnerability**
> 65	45 - 65	< 45

It is likely that more information about the well(s) and local geology will be needed after an initial review of the WHP file is completed. NDEQ will work with the local PWS operator, the NHHS field representative and any other organizations which may have more site specific information available (Nebraska Rural Water Association, Natural Resources Districts, University Nebraska Lincoln-Conservation and Survey Division, local County Health Departments, etc.). NDEQ may contract with consultants, agencies, or organizations to complete this task. A PWSS may hire a consultant or engineer to complete this task, as an addition to a local WHP program. Vulnerability Analyses done by consultants and engineers on behalf of the PWS will be reviewed by NDEQ for completeness and adequacy prior to acceptance. By NDEQ performing or reviewing all of the Contamination Potential Ratings, statewide consistency will be maintained.

2.3 EXPLANATION OF TABLE CHARACTERISTICS

Depth to Water

Shallow depth to the ground water table elevation makes a well more vulnerable to contamination than a deeper ground water level.

Vadose (Unsaturated) Zone

The zone between the surface and the saturated sediments that define the ground water table transmit recharge and contaminants downward. The type of sediments that comprise this zone are very important in determining how fast or even if contaminants will move toward the ground water. Sand and gravel transmit contaminants much faster than clay.

Age of well

May, 1977 was the date of the original Nebraska Safe Drinking Water Act, requiring plans and specs to be submitted after this date. Consideration may be given to PWSSs that submitted plans and specifications to NHHS prior to the 1977 date, even though they were not required.

Table 5.2. Second Phase Vulnerability Analysis for Ground Water Community PWS wells - ranking by well or by well field, only if wells are in close proximity and share similar characteristics.

CHARACTERISTIC	POINT SYSTEM		
Depth to water	• < 10 feet • 10 - 50 feet • > 50 feet	*choose one*	• 15 • 10 • 0
Vadose (unsaturated) zone (zone above water table)	• all sand and/or gravel • 1 - 15 feet of clay present • > 15 feet of clay present	*choose one*	• 10 • 5 • 0
Age of well	• constructed before May, 1977 • constructed after May, 1977	*choose one*	• 0 • -10
Potential contaminant source within WHPA[1] - includes potential nonpoint[2] sources	• inside 1000 feet • within 1000 feet to 10 year TOT • outside 10 year TOT • none	*choose highest value*	• 10 • 5 • 2 • 0
Transportation corridors within WHPA	• main line railroad or pipeline • major highway or interstate intersection • state or federal highway or interstate • county roads or city/village streets • none	*choose highest value*	• 5 • 5 • 2 • 2 • 0
Average PWSS nitrate as nitrogen concentration over last 5 years	• below or equal to 5 ppm • between 5 - 7 ppm • between 7 -10 ppm • at 10 ppm or above	*choose one*	• -2 • 0 • 5 • 10
Detection of any contaminant regulated under drinking water quality standards in last 5 years (not including coliform)	• none • any at or below 50% MCL • any above 50% MCL, but < MCL • any at or above MCL or Administrative Order	*choose one*	• -10 • -5 • 5 • 20
Existing land use or zoning ordinances for water quality concerns or protecting PWSS	• none • county • local WHP program	*choose one*	• 5 • 0 • -10
Natural Resources District Ground Water Management Area in place	• none • Phase I • Phase II higher	*choose one*	• 5 • 0 • -5

Footnotes:

1 - Potential contaminant sources from "on-the-ground" inventory and from NDEQ database search.

2 - Nonpoint sources are usually associated with agricultural production where fertilizers and pesticides are applied. Pasture or wooded land are not usually included as potential nonpoint sources of contamination.

Potential or existing contaminant source within WHPA - including potential nonpoint sources
Potential contaminant sources within a WHPA indicate a possible threat to nearby or existing well(s). NDEQ feels that any potential source of contamination should be treated equally and that proximity to PWS wells is more important than the type of contaminant. Existing active ground water or soil remediation or monitoring will be included here. Nonpoint sources of contamination, such as irrigated and fertilized corn fields, may also increase the risk of nitrate as nitrogen or pesticide contamination to the PWSS. This characteristic also includes potential sources of bacterial contamination, such as septic systems.

Transportation corridors within WHPA
These potential sources were likely identified in the "on-the-ground" second level inventory. However, they offer the unpredictable threat of accidental spills that should be factored into the vulnerability analysis.

Average PWSS nitrate as nitrogen concentration over last 5 years
One of Nebraska's most widespread and serious threats to drinking water quality is nitrate as nitrogen (Maximum Contaminant Level = 10 ppm). In many places, nitrates have increased over the past five to ten years and many domestic and public water supply wells have been impacted. Higher nitrate concentrations in PWSS wells indicates vulnerability to further nitrate increases.

Detection of any other contaminant in last 5 years (not including bacteria detections)
The detection of contaminants other than nitrate and bacteria over the last 5 years indicates the PWSS may be vulnerable to contamination. Bacteria is not included here because sampling for it is from the system (at someone's home or business) and not at the well or Point of Entry. This sampling reflects more on the sampling point and procedures rather than the source of water. Potential sources of bacterial contamination will be addressed during the "on-the-ground" inventory.

Existing land use or zoning ordinances for water quality concerns
This characteristic is given points that will lower the PWSS's vulnerability rating if controls (county or local zoning, ordinances, etc.) are in place to help prevent impacts to the PWSS's water quality. An example of county zoning to protect water quality might relate to the size and number of confined animal feeding operations in a county.

Natural Resources District Ground Water Management Area in place
As in the characteristic explained above, points are given that will lower the vulnerability rating if a Ground Water Management Area (GWMA) is in place

2.4 NON-COMMUNITY PWSS

For Non-Community PWSS (both transient and non-transient), the same phased approach to vulnerability assessments will be taken as for Community PWSS, but on a less detailed scale. The first phase will be simply NHHS's "vulnerable" or "not vulnerable" rating, based on the results of the Sanitary Survey (done once every five years for Non-Community PWSSs).

For the second phase, an area-wide approach will be used. All non-community PWSSs in a county will be plotted on a county, NRD, or some regional map. Ground water nitrate concentrations for the county (or NRD) from the University of Nebraska - Water Center Clearinghouse project (soon to be accessible on the Nebraska Natural Resources Commission internet web site) will be plotted or assessed within a one mile radius of the PWS well(s). Regional nitrate concentrations, PWSS monitoring violations, and regional depth to water will be taken into account for this CPRs.

Table 5.3. Second Phase Vulnerability Analysis for Non-Community PWSS

CHARACTERISTIC	POINT SYSTEM	
Monitoring detections of regulated contaminant not meeting drinking water quality standards in last 5 years (including coliform)	• none • any	• 0 • 15
Regional nitrate concentrations	• average < 7 ppm in 1 mile radius • average > 7 ppm in 1 mile radius	• 0 • 5
Regional depth to water	• < 50 feet • > 50 feet	• 10 • 0

Table 5.4. Vulnerability Scores Ranking for Non-Community PWSS

High Vulnerability	Medium Vulnerability	Low Vulnerability
≥ 20	15	0 - 10

As more information about these types of vulnerability assessments become available, NDEQ will consider refining this process. If deemed necessary, NDEQ will submit a SWAP amendment to EPA.

2.5 VULNERABILITY BY WELL, WELLFIELD, OR BY SYSTEM

Currently, NHHS determines vulnerability for individual wells, unless several wells use a common Point of Entry (POE). This same rating by well or Point of Entry will be used for the first phase of vulnerability analysis in the SWAP.

For the second phase of the SWAP vulnerability analysis, NDEQ will look at wells in the same contiguous Wellhead Protection Area for a common vulnerability rating. Often PWSSs will have more than one wellfield, separated by more than a mile. Each separate Wellhead Protection Area will be rated using the appropriate table from this section. This second phase rating does not change the rating given by NHHS in the Sanitary Survey process, it is intended to be used for planning purposes.

5.3 Surface Water Systems

Surface water systems undergo the same Sanitary Survey with NHHS as the ground water PWSSs. The same two phased approach will be used for these systems, as explained above. The following table (Table 5) reflects modifications needed for the surface water systems.

Table 5. Second Phase Vulnerability Analysis for Surface Water Systems

CHARACTERISTIC	POINT SYSTEM		
Integrity of intake, from last NHHS inspection	• poor • adequate • excellent	*choose one*	• 10 • 2 • 0
Size of Watershed Delineation Area (WDA)	• > 35 square miles • < 35 square miles	*choose one*	• 10 • 0
Potential contaminant source within Assessment Area[2] -- includes potential nonpoint[3] sources and permitted discharges	• present • absent	*choose one*	• 15 • 0
Transportation corridors within Assessment Area (24 hour TOT)	• main line railroad or pipeline • major highway or interstate intersection • state or federal highway or interstate • county roads or city/village streets • none	*choose highest value*	• 5 • 5 • 2 • 2 • 0
Detection of any contaminant regulated under drinking water quality standards in last 5 years (not including coliform)	• none • any at or below 50% MCL • any above 50% MCL, but less than MCL • any at or above MCL or Administrative Order	*choose highest value*	• -10 • -5 • 5 • 20
Existing land use or zoning ordinances for water quality concerns	• none • county • local Watershed Protection program or project[4]	*choose highest value*	• 5 • 0 • -10

Footnotes:

1 - From NDEQ database search, within the Assessment Area (24 hour TOT).

2 - Potential contaminant sources from "on-the-ground" inventory

3 - Nonpoint sources are usually associated with agricultural production where fertilizers and pesticides are applied. Pasture or wooded land are not usually included as potential nonpoint sources of contamination.

4 - Local Watershed Protection program or project could be a CWA 319 project, Nebraska Environmental Trust project, or other local/state program to protect the watershed and/or educate the public.

Table 5.6. Vulnerability Scores Ranking for Surface Water Community PWSS

High Vulnerability	Medium Vulnerability	Low Vulnerability
> 40	20 - 40	< 20

3 EXPLANATION OF TABLE CHARACTERISTICS

Many of the Vulnerability Analysis characteristics are the same between ground water and surface water systems. Please see section 2.3 for these common explanations.

Table 5.7. Summary of Different Types of PWSSs Vulnerability Scores

Type of PWSS	High Vulnerability	Medium Vulnerability	Low Vulnerability
Community, Ground Water	>65	45-65	<45
Non-Community, Ground Water	>20	15	0-10
Surface Water	>40	20-40	<20

3.1 INTEGRITY OF INTAKE, FROM LAST NHHS INSPECTION

Nebraska Health and Human Services routinely inspects surface water intakes as part of their Sanitary Survey program and ongoing work with PWSSs. Integrity of an intake structure for a surface water system should include:

- Withdrawal of water from more than one level if quality varies with depth (most often in a lake, but if the potential exists for a chemical spill it may also apply to a river).
- Should be a valve at each inlet and also a valve in the pipeline in case inlet valves are damaged/malfunction.
- Adequate protection against damage by ice, anchors, etc.

Integrity and safety of the intake to accident are evaluated in this inspection and reflect on the vulnerability of the system to contamination.

3.2 SIZE OF WATERSHED DELINEATION AREA (WDA)

A PWSS in a larger WDA will be more vulnerable to contamination than a smaller one due to a greater number of potential sources.

3.3 EXISTING LAND USE OR ZONING ORDINANCES FOR WATER QUALITY CONCERNS

Counties may have controls (zoning, ordinances, etc.) that are protective of water quality. Local sponsors (such as NRDs, City of Omaha, etc.) have implemented watershed or lake projects that put Best Management Practices on the land and help educate land owners about surface water quality. Points are given for these types of projects that could lower a PWSS's vulnerability.

4 RESPONSIBILITY

The Nebraska Department of Environmental Quality will assume the responsibility of compiling the data from the Sanitary Survey Program with assistance from the Nebraska Health and Human Services, for the first phase of the vulnerability assessment/analysis. NDEQ will also undertake the CPRs for a PWSS, after the results of the voluntary "on-the-ground" inventory are given to NDEQ. In addition, the state or its contractors/cooperators will do a CRP (including a second round CSI within 3 hour TOT) for all Surface Water systems in Nebraska by May 2003. The goal for the Contamination Potential Ratings is to complete 90% of the PWSSs by the year 2010. A new Source Water Assessment, reflecting the Contamination Potential Rating, will be sent to the PWSS. An explanation of how the new vulnerability score was determined will be provided. The PWSS owner will be required to make this Assessment known and available to the public.

PUBLIC PARTICIPATION IN THE CONTINUING PLANNING PROCESS

CPP Document Number 11.1

Being Developed by:

Planning Unit
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

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Patrick W. Rice, Assistant Director **Date**

UPDATING AND MAINTAINING WATER QUALITY MANAGEMENT PLANS

CPP Document Number 11.2

Being Developed by:

Planning Unit
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

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PROCESSES FOR INTERGOVERNMENTAL COOPERATION

CPP Document Number 11.3

Being Developed by:

Planning Unit
Water Quality Division
Nebraska Department of Environmental Quality
Lincoln, Nebraska

This document is being developed for inclusion in the Nebraska Department of Environmental Quality -- Water Quality Division's Continuing Planning Process:

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Patrick W. Rice, Assistant Director **Date**

Attachment 1. Schedule for Development and Revision of CPP Components as of April 1, 2001.

Document	Status	Target Date for Completion	Being Completed By
1.0 INTRODUCTION	Completed		
2.0 IDENTIFICATION OF WATER QUALIUTY MONITORING NEEDS			
2.1 Surface Water Monitoring Strategy	Completed		
2.2 Ground Water Monitoring Strategy	Under Development	9/30/01	Ground Water and Planning Units
3.0 DEVELOPMENT AND IMPLEMENTATION OF SURFACE WATER QUALITY STANDARDS			
3.1 Review and Revision of Surface Water Quality Standards (Title 117)	Under Development	9/30/01	Planning Unit
3.2 Use Attainability Analysis Procedures and Water Body Classifications for Nebraska Surface Waters	Under Revision	9/30/01	Planning Unit
3.3 Antidegradtion Implementation Procedures for Title 117: Nebraska Surface Water Quality Standards	Under Revision	9/30/01	Planning Unit
3.4 Implementation Procedures for Narrative Water Quality Criteria in Title 117: Nebraska Surface Water Quality Standards	Completed		
3.5 Section 401 Certification Procedures	Completed		
3.6 Disinfection Policy	Completed*		
4.0 DEVELOPMENT AND IMPLEMENTATION OF GROUND WATER QUALITY STANDARDS			
4.1 Review and Revision of Ground Water Quality Standards (Title 118)	Under Development	9/30/01	Ground Water Unit
4.2 Determination of Clean-Up Levels at Contaminated Ground Water Sites	Under Development	9/30/01	Ground Water Unit
5.0 IMPLEMENTATION OF THE NPDES PERMITTING PROGRAM			
5.1 Determination of Priorities for NPDES Permit Issuance	Under Development	9/30/01	NPDES Permits Unit
5.2 Procedures for Determining if Water Quality-Based Effluent Limitations are Needed in a Permit	Under Development	9/30/01	Planning and NPDES Permit Units
5.3 Development of Technology-Based Effluent Limitations and Schedules of Compliance	Under Development	9/30/01	NPDES Permits Unit
5.4 Development of Water Quality-Based Effluent Limitations and Schedules of Compliance	Under Development	9/30/01	NPDES Permits Unit
5.5 Procedures for Controlling the Disposition of Residual Waste from Wastewater Treatment	Under Development	9/30/01	NPDES Permits Unit
5.6 Development of Water Quality-Based Wasteload Allocations when a TMDL is not Required	Completed		
6.0 IMPLEMENTATION OF THE TOTAL MAXIMUM DAILY LOAD (TMDL) PROGRAM			
6.1 Listing and Delisting Waterbodies on the Section 303(d) List of Impaired Waters	Under Development	9/30/01	Planning Unit
6.2 Determination of Loading Capacities for Streams and Rivers	Under Development	9/30/01	Planning Unit
6.3 Determination of Loading Capacities for Lakes	Under Development	9/30/01	Planning Unit
6.4 Determination of Wasteload Allocations and Load Allocations as Part of a TMDL	Under Development	9/30/01	Planning Unit
6.5 Development of TMDL Implementation Plans	Under Development	9/30/01	Planning Unit
6.6 Review and Revision of TMDLs	Under Development	9/30/01	Planning Unit
7.0 IMPLEMENTATION OF THE NONPOINT SOURCE (NPS) MANAGEMENT PROGRAM			
7.1 Revision of the Strategic Plan and Guidance for Implementing the Nonpoint Source Management Program	Under Development	9/30/01	Planning Unit
7.2 Identification and Revision of Nonpoint Source Priorities	Under Development	9/30/01	Planning Unit
7.3 Development of Watershed Water Quality Management Plans	Under Development	9/30/01	Planning Unit

Attachment 1. (Continued).

Document	Status	Target Date for Completion	Being Completed By
8.0 BASIN MANAGEMENT PLANNING			
8.1 Basin Management Approach Framework Document	Under Revision	9/30/01	Planning Unit
8.2 Compiling GIS Layers for Surface Water Pollution Potential Assessment within Basins	Under Development	9/30/01	Planning Unit
8.3 Identifying Additional Information Needs to Support Development of Basin Management Plans	Under Development	9/30/01	Planning Unit
8.4 Development of Basin management Plans	Under Development	9/30/01	Planning Unit
9.0 GROUND WATER QUALITY MANAGEMENT PLANNING			
9.1 Conducting Ground Water Quality Assessments to Support Designations of Ground Water Management Areas	Under Development	9/30/01	Ground Water Unit
9.2 Determining Wellhead Protection Areas	Under Development	9/30/01	Ground Water Unit
9.3 Initial Investigation, Evaluation, and Determination of Further Action needed at Petroleum Release Sites	Under Revision	9/30/01	LUST/Release Assessment Section
9.4 Detailed Investigation, Evaluation, and Determination of Cleanup needed at Petroleum Release Sites	Under Development	9/30/01	LUST/Release Assessment Section
10.0 MISCELLANEOUS WATER QUALITY MANAGEMENT PLANNING			
10.1 Development of the State Revolving Fund Intended Use Plan under the Purview of the Federal Clean Water Act	Under Development	9/30/01	Community Aid Unit
10.2 Preparation of Contaminant Source Inventories under the Source Water Assessment Program	Completed		
10.3 Vulnerability Determinations under the Source Water Assessment Program	Completed		
11.0 PLANNING AND INTERGOVERNMENTAL COOPERATION			
11.1 Public Participation in the Continuing Planning Process	Under Development	9/30/01	Planning Unit
11.2 Updating and Maintaining Water Quality Management Plans	Under Development	9/30/01	Planning Unit
11.3 Processes for Intergovernmental Cooperation	Under Development	9/30/01	Planning Unit

* May need to be revised based on the revisions to document 3.2, “Use Attainability Analysis Procedures and Waterbody Classification for Nebraska Surface Waters”.