U.S. Army Corps of Engineers
Omaha District

Strategic Plan and Guidance for Implementing the Omaha District's Water Quality Management Program

Supporting Documentation for the Omaha District's Water Quality Management Program

December 2003

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STRATEGIC PLAN AND GUIDANCE FOR IMPLEMENTING THE OMAHA DISTRICT'S WATER QUALITY MANAGEMENT PROGRAM

Prepared by:

Water Quality Unit
Water Control and Water Quality Section
Hydrologic Engineering Branch
Engineering Division
Omaha District
U.S. Army Corps of Engineers

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This document is approved for implementation:

Dave Jensen — 23 Dec 2003
Dave Jensen – Team Leader, Water Quality Unit — **Date**

Timothy E. Temeyer — 29 Dec 03
Tim Temeyer – Chief, Water Control and Water Quality Section — **Date**

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For Information Regarding This Document Please Contact:

Dave Jensen
U.S. Army Corps of Engineers, Omaha District
Attention: CENWO-ED-HA
106 South 15th Street
Omaha, Nebraska 68102-1619
(402) 221-4622
david.e.jensen@usace.army.mil

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VISION STATEMENT

For The

Omaha District's Water Quality Management Program

A program that efficiently and effectively implements the water quality management requirements identified in the Corps' Engineer Regulation – ER 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects", and provides the needed technical support on surface water quality issues to successfully implement planning and operational activities at Corps projects.

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1 GUIDING PRINCIPLES FOR THE OMAHA DISTRICT'S WATER QUALITY MANAGEMENT PROGRAM

The Omaha District's Water Quality Management Program is primarily directed at surface water quality management issues. The Omaha District recognizes the importance of ground water quality management at its water resource projects; however, ground water quality management issues are addressed through other program efforts.

The activities of the Omaha District's Water Quality Management Program are chiefly driven by the guidance and requirements set forth in the U.S. Army Corps of Engineer's (Corps) Engineering Regulation – ER 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects." The following guiding principles, taken from ER 1110-2-8154, serve as the basis for implementing surface water quality management activities in the Omaha District.

1.1 AUTHORITIES FOR WATER QUALITY MANAGEMENT BY THE CORPS

The Corps' water quality management authority is founded on the Federal Water Pollution Control Act (FWPCA) of 1948 and its amendments including the Clean Water Act (CWA) of 1977 and the Water Quality Act of 1987. The FWPCA Amendment of 1972 (PL 92-500) strongly affirms the Federal interest in water quality. Executive Order 12088, Federal Compliance With Pollution Control Standards, dated 13 October 1978, requires compliance by Federal facilities and activities with applicable pollution control standards in the same manner as any non-Federal entity. To ensure project compliance, the Federal Facilities Compliance Act of 1990 provides for the U.S. Environmental Protection Agency (EPA) and/or States to inspect Federally owned or operated facilities that are subject to the Clean Water Act of 1977.

Water control management authority is contained in specific project authorizations and other enabling legislation. The ultimate responsibility to control water quantity and quality at all Corps projects rests with the Corps.

1.2 NATIONAL AND CORPS WATER QUALITY MANAGEMENT POLICY

It is national policy that the Federal government, in the design, construction, management, operation, and maintenance of its facilities, shall provide leadership in the nationwide effort to protect and enhance the quality of our air, water, and land resources. Federal facilities shall comply with all Federal, state, interstate, and local requirements in the same manner and extent as other entities. The national antidegradation policy, defined in the Federal water quality management laws, requires: 1) that the existing water quality of waters that constitute an outstanding national resource be maintained and protected; 2) that the existing water quality of high quality waters that supports a diverse, productive, and ecologically sound habitat be maintained and protected unless there is compelling evidence that to do so will cause significant national economic and social harm; and 3) in all cases, the existing beneficial uses and the water quality necessary to protect them will be maintained. Existing beneficial uses are defined as those beneficial uses actually attained in a water body on or after November 28, 1975,

whether or not they are included in state or tribal water quality standards (40CFR131.3e). This national policy is founded on the overall objective established in the Clean Water Act to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The thrust of this policy is to protect all existing and future uses including assimilative capacity, aquatic life, water supply, recreation, industrial use, hydropower, etc. Where uses are degraded, it is the national goal to restore those degraded waters to more productive conditions.

It is the Corps' policy to take a leadership role in carrying out the goals and objectives of the national policy by managing the nation's water resources that are under its control so that they are protected, maintained, and restored. As stewards of project resources, the Corps will not allow degradation of the aquatic resource in accordance with the Federal antidegradation policy. In cases where degradation has occurred, it is the Corps' policy to restore the resource to a biologically productive, diverse, and ecologically robust condition. Corps management responsibilities extend throughout the area influenced by and influencing the water it manages. Because the management of Corps projects affects environments distant from project property boundaries and is influenced by actions of others also distant from its properties, the Corps must actively pursue a management philosophy committed to partnering with a wide range of resource organizations and interested individuals. It is the Corps policy to develop and implement a holistic, environmentally sound water quality management strategy for each project. This strategy must be developed in concert with other authorized project purposes. However, the environment will be addressed as equal in value and importance to other project purposes when developing or carrying out management strategies. The Corps will, at least, manage its projects in accordance with all applicable Federal and state environmental laws, criteria, and standards. It is the goal of the Corps to responsibly manage its projects to maximize their environmental potential. The four pillars of the Army environmental strategy (conservation, prevention, restoration, and compliance) will help guide the Corps policy for water quality management.

1.3 RESPONSIBILITIES AND COMMITMENT OF THE CORPS TO WATER QUALITY MANAGEMENT

Corps water control projects (dams, local protection, levee systems, and navigation projects) store, regulate, divert, constrict, or convey most of the surface waters in the United States. As water moves through Corps projects, the projects alter the physical, chemical, and biological character of much of that water. Consequently, Corps projects determine or significantly influence the ecological integrity of a large percentage of the riverine and estuarine environment in the United States. Corps water control decisions determine or significantly influence whether or not Corps projects have a positive or negative impact on the environmental value and human usefulness of much of the nation's water resources. As stewards of a significant percentage of the nation's aquatic environment, the Corps has a responsibility to preserve, protect, and where necessary restore that portion of the environment altered by Corps projects. The Corps is fully committed to environmentally sound project management and operation. It is the policy of the Corps that the environment be given equal standing, not simply consideration, in all aspects of project management and the operational decision-making process.

The Corps' water quality program is committed to holistic watershed ecosystem based resource management. This requires a comprehensive understanding of the interactions of the

uses and users of the aquatic environment and the impact of Corps structures and their operation on the aquatic environment. The continued development of ecological management skills within the Corps is essential for the development, protection, and restoration of the resources in its charge. Understanding the physical, chemical, and biological processes allows the Corps the opportunity to operate, maintain, and modify projects in ways that provide for sustainable human uses while protecting, restoring, and conserving the environmental value of the resource. The factors that determine the persistence, resilience, and robustness of ecosystems are often counter-intuitive processes and lack of understanding complicates attempts to manage them.

The water quality program provides one of the greatest opportunities for the Corps to demonstrate its commitment to environmental leadership, conservation, restoration, and stewardship. By planning, designing, constructing, and operating water projects in a manner that achieves project purposes while preserving, protecting, and restoring the ecological integrity of the aquatic resources, the Corps can demonstrate its leadership role in responsible environmental engineering. Environmental success will not be measured by production of single or limited numbers of species, or enhanced recreational opportunities, but by expertise in reestablishing flow regimes, rehabilitating wetlands and riparian areas, managing sediment delivery, controlling the chemical and physical aspects of the aquatic systems, and overall ability to restore a dynamic, self-sustaining aquatic ecosystem. This approach will make a significant contribution toward the achievement of the sustainable development goals of the nation.

1.4 REQUIREMENT FOR DISTRICT WATER QUALITY MANAGEMENT PROGRAMS

Division-wide (District) water quality management programs are required. Specific water quality management objectives must be developed by the Districts' for each project, and procedures must be outlined and implemented to meet those objectives. These objectives will be included in the project water control plans. These plans must be reviewed and updated as needed but not less than every 10 years. The plans must achieve environmentally sustainable overall use of the resource. The water quality management plans should be scoped to include all areas influencing and influenced by the project. It must be ensured that water quality management is an integral part of the water control management program.

1.5 PROJECT WATER QUALITY MANAGEMENT OBJECTIVES

The following general water quality management objectives are to be adopted and implemented for all Corps water resource projects:

a) Ensure that water quality, as affected by the project and its operation, is suitable for project purposes, existing water uses, and public health and safety and is in compliance with applicable Federal and state water quality standards.

b) Define baseline water quality conditions for each project. A pre-project water quality evaluation, and/or a description of the post-construction water quality characteristics must be developed at the earliest time in which data collection and evaluation are practical.

c) Establish and maintain a water quality monitoring and data evaluation program that ensures achievement of water quality management objectives and to evaluate project performance and water quality trends.

d) Identify existing and potential water quality problems, and develop and implement appropriate solutions. Identify opportunities for water quality improvements to projects or receiving waters and initiate management actions that accomplish those improvements.

e) Integrate water quality considerations into all water control management decisions.

f) Maintain coordination and communication among Division and District elements involved in environmental and water quality matters.

g) Maintain close coordination and, where possible, collaboration with all interested governmental and nongovernmental entities with regard to activities that may affect or be affected by the water quality or water control decisions associated with Corps projects.

h) Use an interdisciplinary team approach to develop objectives, establish priorities, and execute the water quality management program.

i) Develop an understanding and continuing awareness of the water quality factors and processes in the project, in the watershed, and in the area influenced by project operation.

j) Where degraded conditions exist, develop a plan for restoration that will restore the aquatic environment to a desirable, biologically diverse, productive, and robust condition. This plan should normally be coordinated with appropriate local, state, and other Federal agencies.

k) Ensure that the project and its operation offer the lowest stress possible to the aquatic environment.

l) Ensure that Corps projects are managed to accentuate the projects' potential to play a positive role in the conservation and preservation of natural and cultural resources.

m) Document the water quality management activities of the program and individual projects to record trends, identify problems and accomplishments, and provide guidance to program managers.

n) Recognize that some problems and opportunities are of short duration and demand rapid response. The District water managers should be empowered to react in a time frame commensurate with the event and with best available information and judgment. Long-term situations provide for more comprehensive study and refined response.

o) As appropriate, promote and develop cost-sharing partnerships in accordance with available authorities.

1.6 WATER QUALITY DATA COLLECTION PROGRAM

A continuing water quality data collection program is necessary for each Corps project. This data collection is essential in order to understand and manage the environmental resources of the Corps' water resource projects effectively.

1.6.1 GENERAL RULES FOR DATA COLLECTION ACTIVITIES

Data collection activities at Corps projects to support water quality management are to be guided by the following general rules:

a) Data collection efforts will be determined on a project-specific basis. Local conditions, specific project characteristics, and program objectives will be used to determine parameters to be measured, sampling and analytical methods, frequency of sampling, number and location of data collection stations, and data analysis techniques to be employed.

b) Sample collection and handling shall be accomplished using scientifically sound and commonly accepted procedures.

c) Biological monitoring programs are encouraged. Biological data are often the most important component of a water quality data collection effort, are especially useful in identifying pollution spikes or other forms of environmental stress, and often are more cost effective than more conventional chemical and physical data. In most cases an integration of physical, chemical, and biological data is needed to understand the performance and behavior of a project. A component of a monitoring program should be determining if threatened and endangered species and their habitats are adversely affected by water quality conditions, or could be enhanced through improved water quality management.

d) Partnering of data collection efforts with other governmental and nongovernmental entities is encouraged and is cost effective. Use of appropriately trained volunteers for observers and data collection is encouraged.

e) A quality assurance/quality control (QA/QC) program covering all aspects of data collection and analysis is required to ensure validity of the data. Analytical procedures accepted by the EPA should be utilized as appropriate.

f) Data collection programs must be evaluated and modified as necessary to satisfy established objectives, eliminate unnecessary sampling, and address changes in priorities.

1.6.2 WATER QUALITY DATA COLLECTION OBJECTIVES

Water quality data collection activities will be carried out to support one or more of the following objectives as appropriate for a given project or system of projects:

a) Establish baseline conditions and identify trends, opportunities, and problems.

b) Assess compliance with applicable Federal, state, and tribal water quality standards.

c) Provide an adequate database for understanding project conditions and facilitate coordination with Federal and state agencies with regard to watershed activities influencing water quality.

d) Investigate special problems, design and implement modifications, and improve water management procedures.

e) Provide data to support reservoir regulation elements for effective management and control of water quality and environmental problems.

f) Provide water quality data required for real-time project regulation.

g) Evaluate water/sediment interactions and their effects on overall water quality.

h) Engineer aquatic environments and ecosystems.

i) Develop and maintain the environmental awareness and sensitivity essential for sound stewardship for the resource.

j) Monitor swimming beaches and water supplies for priority pollutants.

Other objectives or special needs for water quality data may occur. District offices must take the initiative in determining data needs, identifying problems or opportunities, proposing solutions, justifying resources, implementing approved actions, and reporting results.

When designing water quality studies or developing or revising water control plans, the views of other Federal, state, and local agencies regarding data requirements must be fully considered. Data collection is costly and labor-intensive; therefore, every opportunity to share data and partner the data collection effort must be exercised. Coupling water quality data with hydrologic and other environmental data is essential.

1.7 APPLICATION OF WATER QUALITY DATA

Water quality data must be applied to understand and manage water resources effectively. Application of appropriate mathematical models promotes efficient and effective use of data. Models are powerful tools for guiding project operations, refining water quality sampling programs, planning project modifications, evaluating management scenarios, improving project benefits, and illuminating new or understanding complex phenomena. Models should be used to the maximum extent practicable.

Use of automated data management systems (collection, interpretation, an storage) contributes to the efficient use of the data. Districts must utilize automated information systems

appropriate to their needs. In order to make water quality data widely available, data should be transferred to the EPA Storage and Retrieval System (STORET).

1.8 REPORTING FOR EFFECTIVE WATER QUALITY MANAGEMENT

The diversity and magnitude of impacts Corps projects and water management activities have on natural resources are very significant. Corps projects and their mode of operation often determine the fate of ecosystems, usefulness of the water resource, and overall benefit derived from a project. The impacts of projects and their operation are often far reaching, affecting the environment and resource usefulness quite distant from the project. This makes effective monitoring and reporting essential to responsible management. Various reports are required to ensure that adequate information is available to Corps Headquarters (HQUSACE), Divisions, Districts, other agencies, and the public. Reports are not limited to reservoir projects but encompass all civil works projects that influence the physical, chemical, or biological condition of the aquatic environment. Reports are prepared for the following general objectives:

a) To provide information needed to manage the water quality program.

b) To ensure a review of Division and District water quality management programs.

c) To disseminate information to the public, other agencies, academia, the media, and within the Corps.

d) To direct research and development (R&D), program R&D resources to meet identified needs, and establish new or terminate existing R&D programs.

e) To evaluate the design, management, and operation of each project.

f) To document identified opportunities, problems, and solutions.

g) To serve as a basis for developing technical guidance.

h) To provide a base for formulation of Corps-wide programs.

i) To store institutional knowledge and provide historical documentation.

j) To provide feedback to improve project planning, design, and operation and maintenance.

Accomplishment of these reporting objectives requires several types of reports. Each type should be tailored to address the specific characteristics of the project and meet the information needs of the report user. The types of reports to be prepared can be grouped into five categories: 1) project-specific reports, 2) needs assessment reports, 3) special situation reports, 4) special study reports, and 5) annual water quality reports.

1.8.1 PROJECT-SPECIFIC REPORTS

Project-specific reports provide basic information on all pertinent factors affecting water quality and the aquatic environment. These reports should be prepared for each project and be updated as needed. These technical reports should contain:

- a general project description;
- watershed characteristics;
- physical project elements affecting water quality;
- water quality management objectives;
- data collection activities;
- evaluation of water quality conditions;
- effect of water control operations on water quality;
- description of the physical, chemical, and biological processes that take place in the project, affect the project, or are affected by the project.

The report should comprehensively describe project water quality and the project's impact on water quality. It should identify specific concerns, problems, or opportunities. Project-specific reports describe historical and current water quality conditions and are developed along the lines of an owner's manual for the project. These technical reports are extremely useful to HQUSACE, Divisions, and Districts. The reports may also be useful to other resource agencies so they can better understand and appreciate the project and the effect the influence of the project on the water quality environment.

1.8.2 NEEDS ASSESSMENT REPORTS

Needs assessment reports are similar to project-specific reports and can often be incorporated into them. They describe a project based on the needs of the project and the investment of resources required to meet those needs. For example, a needs assessment report should identify all the needs of a project related to its water quality and the management thereof. The report should identify problems (sedimentation, eutrophication, watershed management, erosion, fisheries, wetlands, etc.), causes, appropriate solutions and alternatives, and the costs and benefits of implementation. The reports are useful for scheduling and allocating dollar resources for their maximum impact. These reports are primarily for project managers and Division and District water control/water quality managers, project operations, environmental and project offices, and interested Federal, state, and local agencies. Needs assessment reports are encouraged for all civil works projects. Care should be taken to ensure that sensitive cost information, which may be contained in these reports, is not distributed to non-Corps offices.

1.8.3 SPECIAL SITUATION REPORTS

Special situation reports summarize unique events that occur which warrant upward reporting. Examples would include fish kills, hazardous waste spills, operational emergencies, health emergencies, unscheduled endangered species actions, etc. The report must include adequate detail to explain the event, actions taken, monitoring activities, and plans for additional action to address the event and to prevent future occurrences and an indication if there will be follow-up reports. These reports are brief, factual accounts of the situation and must be forwarded to Division and HQUSACE as the situation unfolds. Districts are required to report

on the nature and extent of special situations as they occur. Because of their time-sensitive nature, these reports must be forwarded by the fastest means available.

1.8.4 SPECIAL STUDY REPORTS

Special study reports are detailed reports that describe a special topic or specific issue and delve in depth into the significance, character, and solution of that issue. Special study reports are prepared for all the activities that affect project operation or water quality performance. Typically these reports address new operating plans, changes in or new management objectives, modeling results, or other activities that may impact project performance or benefits. These reports should be coordinated with Division and HQUSACE as appropriate and forwarded for information as soon as they are completed.

1.8.5 ANNUAL WATER QUALITY REPORTS

An annual water quality report is mandatory. Division commanders are to prepare an annual water quality report for the previous fiscal year. This report must reach HQUSACE by 1 February each year.

The required annual water quality report summarizes the water quality management program for the past fiscal year and highlights specific project information and activities of the Division and Districts. The report describes the goals and objectives of each Division's overall water quality management program, progress made toward meeting division-wide water quality management goals, and activities that are planned for out years. Other items include changes in technical capabilities in the Division and District offices, relationships between water quality and water control management activities, pertinent division regulations, laboratory facilities, data management systems, and training needs. The report must include a discussion of research and development needs, special studies completed or required, water quality coordination with other agencies, scheduling for detailed project evaluations, and problems encountered with contracted work. The Divisions should identify any hindrances to meeting their goals and objectives and should propose solutions to removing them. The report should highlight special assistance from the Committee on Water Quality, from the Water Operations Technology Support Program, from the Corps laboratories, or from HQUSACE. Other information, as requested by HQUSACE, may also be required. The report should provide a project-by-project summary of water quality conditions, problems encountered and how addressed at each project, opportunities identified and how addressed, and innovative techniques utilized to improve water quality. Special regulation activities, new or modified data collection programs, plans to address identified problems, possible Corps-wide applications of available data (R&D), and ongoing applied research should also be included. Any changes to basic information, such as project water quality objectives, regulation/operation modifications for water quality, or modifications to sampling programs and objectives, should be summarized. Tabular format is encouraged for summarizing this information.

2 OVERVIEW OF THE OMAHA DISTRICT'S WATER QUALITY MANAGEMENT PROGRAM

2.1 GOALS AND LONG-TERM OBJECTIVES

Goals are clear statements describing an intention or direction and are forward looking. The goals of the District's Water Quality Management Program set the stage for defining objectives that integrate the District's water quality management needs; respond to national, state, and local issues; and define information, monitoring, and evaluation needs. In addition, they provide planning guidance for program budgets.

Objectives offer a sharper focus to goals and provide benchmarks to measure progress. They also serve as reference points to establish and update action items. As such, objectives bridge the gap between goals and action items and lead to recommendations for future program implementation. The long-term objectives identified below provide a "roadmap" for implementing the District's Water Quality Management Program.

GOAL 1: Ensure that water quality, as affected by District projects and their operation, is suitable for project purposes, existing water uses, and public health and safety and is in compliance with applicable Federal and state water quality standards.

Long-Term Objectives for Implementing Goal 1:

1) Determine if any surface water quality concerns exist that are due to the operation of District projects.

2) Where degraded surface water quality conditions exist at District projects, develop a plan for restoration that will restore water quality and the aquatic environment to a desirable, biologically diverse, productive, and robust condition.

3) Evaluate District projects and their operations to ascertain that they offer the lowest possible stress to surface water quality and the aquatic environment.

GOAL 2: Establish and maintain a water quality monitoring and data evaluation program that facilitates the achievement of water quality management objectives, allows for the characterization of water quality conditions, and defines the influence of District projects on water quality.

Long-Term Objectives for Implementing Goal 2:

1) Characterize surface water quality conditions at District projects.

2) Quantify any surface water quality concerns identified at District projects.

3) Provide data to support reservoir regulation elements at Districts projects for effective management and enhancement of surface water quality and the aquatic environment.

4) Evaluate the effectiveness of structural or operational measures implemented at District projects to enhance surface water quality and/or the aquatic environment.

GOAL 3: Establish and maintain strong working partnerships and collaboration with appropriate entities within and outside the Corps regarding water quality management at District projects.

Long-Term Objectives for Implementing Goal 3:

1) Provide technical support on surface water quality issues to other Corps echelons.

2) Maintain coordination and communication among Corps elements involved in water quality management matters.

3) Maintain close coordination and, where possible, collaboration with all interested governmental and nongovernmental entities with an interest in water quality conditions at or affected by District projects.

4) Use a team approach to develop objectives, establish priorities, and execute the District's Water Quality Management Program.

5) As appropriate, promote and develop cost-sharing partnerships in accordance with available authorities.

GOAL 4: Document the water quality management activities of the District's Water Quality Management Program and projects to record trends, identify problems and accomplishments, and provide guidance to program and project managers.

Long-Term Objectives for Implementing Goal 4:

1) Apply the Corps Program Management Business Process (PMBP) to the implementation of the District's Water Quality Management Program.

2) Prepare an annual report of water quality conditions in the Omaha District.

3) Prepare an annual report on the implementation of the District's Water Quality Management Program.

2.2 FUNCTIONAL AREAS

The District's Water Quality Management Program is categorized into four functional areas: 1) water quality monitoring and assessment, 2) project water quality management planning, 3) technical support, and 4) program development and evaluation (Figure 2.1).

OMAHA DISTRICT WATER QUALITY MANAGEMENT PROGRAM

A program that provides the needed technical support to Corps echelons in the area of surface water quality, while efficiently and effectively implementing the requirements identified in the Corps' Engineer Regulation – ER 1110-2-8154, "Water Quality and Environmental Management for Corps Civil Works Projects".

PROJECT WATER QUALITY MANAGEMENT PLANNING

- Develop specific water quality management objectives for each water resource project in the District.
- Outline and implement procedures to meet project water quality management objectives.

WATER QUALITY MONITORING AND ASSESSMENT

- Water Quality Monitoring Strategy.
- Quality Assurance/Quality Control (QA/QC).
  - Quality Management Plan (QMP).
  - Standard Operating Procedures (SOPs).
  - Quality assurance of laboratory testing.
  - Sampling and Analysis Plans (SAPs)
  - Data quality review.
- Data Management.
  - DASLER.
  - STORET.
- Data Evaluation
  - Identify trends.
  - Identify problems and concerns.
  - Apply water quality models.
- Reporting.

TECHNICAL SUPPORT

- Facilitate planning and operations at Corps projects in the District by providing information and recommendations on surface water quality issues.

PROGRAM DEVELOPMENT AND EVALUATION

- Strategic Plan and Guidance.
- Program Management Plans.
- Annual Program Reports.

Figure 2.1. Diagram depicting the functional areas of the Omaha District's Water Quality Management Program.

2.3 CORPS WATER RESOURCE PROJECTS WITHIN THE OMAHA DISTRICT

Figure 2.2 shows the location of Corps water resource project areas within the Omaha District. Table 2.1 provides background information on the projects identified in Figure 2.2. These are the Corps' water resource projects that will be addressed by the District's Water Quality Management Program regarding water quality data collection and water quality management planning. Technical support on surface water quality issues is available under the District's Water Quality Management Program beyond these project areas if it will facilitate operational and planning activities undertaken by the Corps.

2.4 PRIORITY WATER QUALITY ISSUES IDENTIFIED BY THE OMAHA DISTRICT

The Omaha District has identified eight priority issues for water quality management. These priority issues, and their relative ranking, are listed in Table 2.2.

2.5 CORPS PROJECTS IN THE OMAHA DISTRICT THAT ARE LISTED ON SECTION 303(D) LISTS

Under Section 303(d) of the Federal Clean Water Act (CWA), States and Tribes, with the delegated authority from the U.S. Environmental Protection, are required to prepare a biennial list of impaired waters [i.e., 303(d) list]. Impaired waters refer to those waterbodies where it has been determined that technology-based effluent limitations required by Section 301 of the CWA are not stringent enough to attain and maintain applicable water quality standards. States and tribes, as appropriate, are required to establish and implement Total Maximum Daily Loads (TMDLs) for waterbodies on their 303(d) lists. Corps projects in the Omaha District that are listed on a State or Tribal Section 303(d) list as of 2002 are given in Table 2.3.

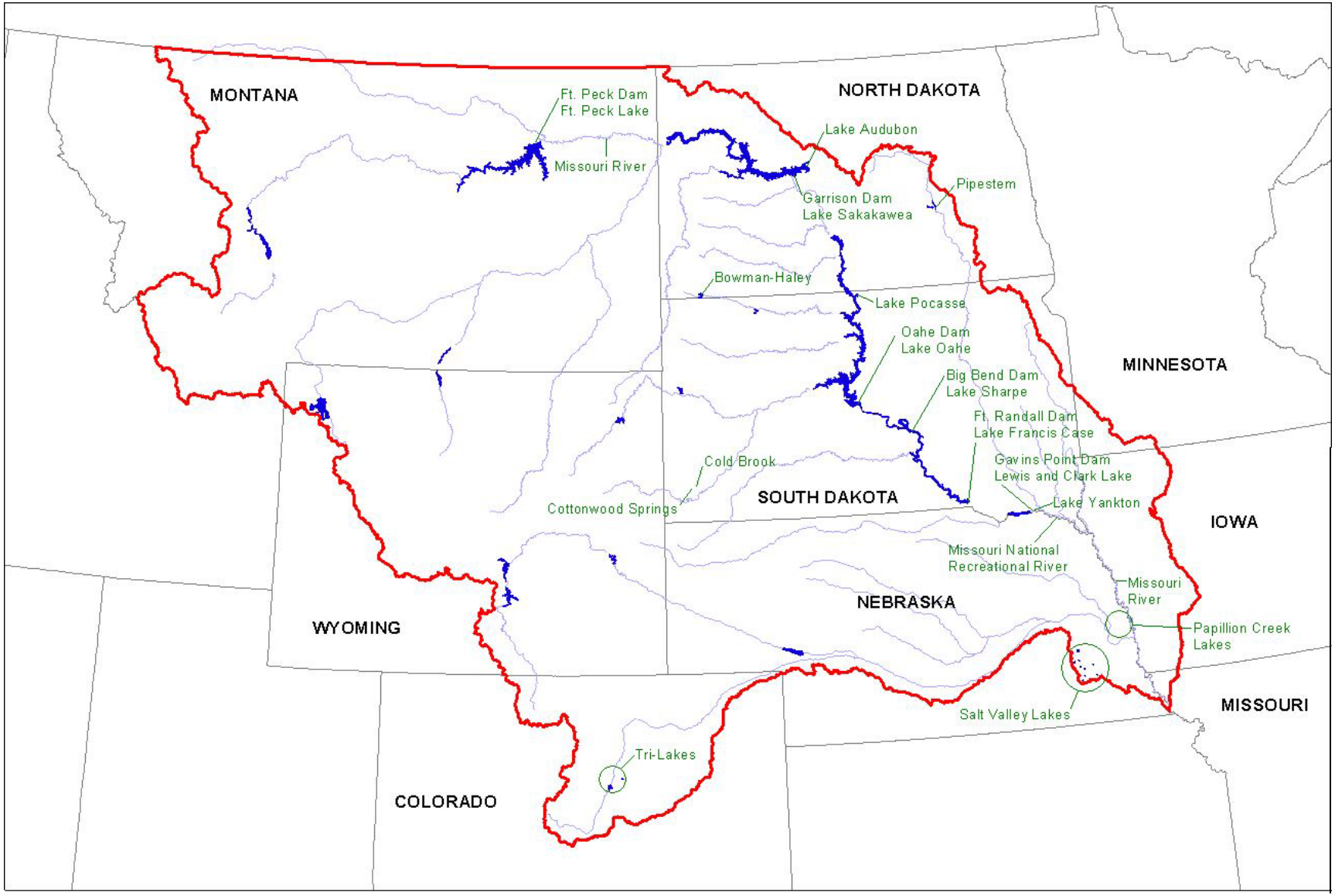

Figure 2.2. Location of Corps water resource project areas within the Omaha District. (See Table 2.1 for project area information.)

Table 2.1. Background information for Corps water resource project areas within the Omaha District.

Project Name	Location	Date of Dam Closure	Lake Size or River Length*	Water Quality and Aquatic Habitat Issues
MAINSTEM RESERVOIRS				
Gavins Point Dam, Lewis and Clark Lake	Yankton, SD	1955	31,000 A (f)	Protect beneficial uses of lake. Downstream affects on Missouri River.
Ft. Randall Dam, Lake Francis Case	Pickstown, SD	1952	102,000 A (f)	Protect beneficial uses of lake. Downstream affects on Missouri River.
Big Bend Dam, Lake Sharpe	Chamberlain, SD	1963	61,000 A (f)	Protect beneficial uses of lake. On state 303(d) list. Downstream affects on Missouri River.
Oahe Dam, Lake Oahe	Pierre, SD	1958	374,000 A (f)	Protect beneficial uses of lake. Downstream affects on Missouri River.
Garrison Dam, Lake Sakakawea	Garrison, ND	1953	380,000 A (f)	Protect beneficial uses of lake. Downstream affects on Missouri River.
Ft. Peck Dam Ft. Peck Lake	Fort Peck, MT	1937	246,000 A (f)	Protect beneficial uses of lake. On state 303(d) list. Downstream affects on Missouri River.
TRIBUTARY RESERVOIRS				
Tri-Lakes (Colorado):				
Bear Creek Lake	Denver, CO	1977	107 A (mp)	Protect beneficial uses of lake. Site-specific water quality regulations.
Chatfield Lake	Denver, CO	1973	1,423 A (mp)	Protect beneficial uses of lake. Site-specific water quality regulations.
Cherry Creek Lake	Denver, CO	1948	844 A (mp)	Protect beneficial uses of lake. Site-specific water quality regulations.
Salt Valley Lakes (Nebraska):				
Olive Creek Lake	Lincoln, NE	1963	162 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Bluestem Lake	Lincoln, NE	1962	309 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Wagon Train Lake	Lincoln, NE	1962	277 A (cp)	Protect beneficial uses of lake. TMDL implementation.
Stagecoach Lake	Lincoln, NE	1963	195 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Yankee Hill Lake	Lincoln, NE	1965	211 A (cp)	Protect beneficial uses of lake. TMDL implementation.
Conestoga Lake	Lincoln, NE	1963	217 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Twin Lakes (East and West Twin Lakes)	Lincoln, NE	1965	236 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Pawnee Lake	Lincoln, NE	1964	739 A (cp)	Protect beneficial uses of lake. TMDL implementation.
Holmes Lake	Lincoln, NE	1962	123 A (cp)	Protect beneficial uses of lake. TMDL in development.
Branched Oak Lake	Lincoln, NE	1967	1,847 A (cp)	Protect beneficial uses of lake. On state 303(d) list.
Papillion Creek Lakes (Nebraska):				
Glenn Cunningham Lake	Omaha, NE	1974	377 A (mp)	Protect beneficial uses of lake. On state 303(d) list.
Standing Bear Lake	Omaha, NE	1972	125 A (mp)	Protect beneficial uses of lake. TMDL in development.
Ed Zorinsky Lake	Omaha, NE	1984	259 A (mp)	Protect beneficial uses of lake. TMDL implementation.
Wehrspann Lake	Omaha, NE	1982	239 A (mp)	Protect beneficial uses of lake. On state 303(d) list. Evaluate 1135 project.
North Dakota Lakes:				
Bowman-Haley Lake	Bowman, ND	1966	1,732 A (mp)	Protect beneficial uses of lake.
Pipestem Lake	Jamestown, ND	1973	840 A (mp)	Protect beneficial uses of lake. Enhancement of Arrowwood NWR.
South Dakota Lakes:				
Cold Brook Lake	Hot Springs, SD	1952	36 A (mp)	Protect beneficial uses of lake.
Cottonwood Springs Lake	Hot Springs, SD	1969	41 A (mp)	Protect beneficial uses of lake.

Table 2.1. (Continued).

Project Name	Location	Date of Dam Closure	Lake Size or River Length*	Water Quality and Aquatic Habitat Issues
OTHER LAKES				
Lake Audubon	Pollock, SD	1952	18,780 A (mp)	Protect beneficial uses of lake.
Lake Pocasse	Garrison, ND	1961	1,520 A (mp)	Protect beneficial uses of lake. On state 303(d) list.
Lake Yankton (Cottonwood Lake)	Yankton, SD	1955	250 A	Protect beneficial uses of lake.
MISSOURI RIVER				
National Recreational River Reach	Ft Randall Dam to Lewis and Clark Lake	---	39 M	Pallid sturgeon priority management area.
National Recreational River Reach	Gavins Pt. Dam to Ponca, NE	---	59 M	Pallid sturgeon priority management area. On state 303(d) list.
Bank Stabilization and Navigation	Ponca, NE to Rulo, NE	---	255 M	Pallid sturgeon priority management area.

* A = acres, M = miles, f = full, mp = top of multipurpose pool, cp = top of conservation pool.

Table 2.2. Priority Water Quality Issues within the Omaha District.

General Water Quality Priorities:	**Relative Priority Ranking***
• Provide water quality information to support Corps reservoir regulation elements for effective water quality and aquatic habitat management.	**4**
• Provide water quality information and technical support to the States in the development of their Section 303(d) lists and development and implementation of TMDLs at District projects.	**5**
• Identify existing and potential water quality problems at District projects, and develop and implement appropriate solutions.	**6**
• Evaluate water quality conditions and trends at District projects.	**7**
Specific Water Quality Priorities:	
• Determine how District operation of the Missouri River mainstem dams affects water quality in the impounded reservoir and downstream river. Utilize the CE-QUAL-W2 hydrodynamic and water quality model to facilitate this effort.	**1**
• Evaluate how eutrophication is progressing in the Missouri River mainstem reservoirs, especially regarding the expansion of anoxic conditions in the hypolimnion during summer stratification.	**2**
• Determine how flow regime, especially the release of water from Missouri River mainstem projects, affects water quality in the Missouri River.	**3**
• Determine how current water quality conditions in the Missouri River (e.g., water temperature, turbidity, etc.) may be affecting pallid sturgeon populations in the Missouri River system.	**8**

* 1 = Highest priority issue; 8 = lowest priority issue.

Table 2.3. Omaha District Projects Listed on Section 303(d) Lists as of 2002.

Waterbody	Listing Agency	Impaired Use	Parameters of Concern	TMDL Status
Colorado:				
Cherry Creek Lake	CO Dept. of Public Health and Environment	Aquatic Life Recreation	Chlorophyll *a*	Being Revised*
Montana:				
Fort Peck Lake	MT Dept. of Environmental Quality	Drinking Water Supply Primary Contact Recreation	Lead Mercury Metals Noxious Aquatic Plants	To Be Developed
Missouri River (Fort Peck Dam to the Milk River)	MT Dept. of Environmental Quality	Aquatic Life Cold Water Fishery – Trout Drinking Water Supply Warm Water Fishery	Flow Alteration Other Habitat Alterations Riparian Degradation Thermal Modifications	To Be Developed
Missouri River (Milk River to the Poplar River)	MT Dept. of Environmental Quality	Aquatic Life Warm Water Fishery	Flow Alteration Other Habitat Alterations Riparian Degradation Thermal Modifications	To Be Developed
Missouri River (Poplar River to North Dakota)	MT Dept. of Environmental Quality	Aquatic Life Warm Water Fishery	Flow Alteration Thermal Modifications	To Be Developed
Nebraska:				
Bluestem Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients	To Be Developed
Branched Oak Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients	To Be Developed
Conestoga Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	To Be Developed
East Twin Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients	To Be Developed
Ed Zorinsky Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	Completed
Glen Cunningham Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	To Be Developed
Holmes Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	Completed
Missouri River (Niobrara River to NE-KA Border)	NE Dept. of Environmental Quality	Primary Contact Recreation	Fecal Coliform Bacteria	To Be Developed
Olive Creek Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Low Dissolved Oxygen Nutrients Sedimentation	To Be Developed
Pawnee Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients	Completed
Stagecoach Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	To Be Developed
Standing Bear Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	Completed
Wagon Train Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Low Dissolved Oxygen Nutrients	Completed
Wehrspann Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients	To Be Developed
West Twin Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Low Dissolved Oxygen Nutrients	To Be Developed
Yankee Hill Lake	NE Dept. of Environmental Quality	Aesthetics Aquatic Life	Nutrients Sedimentation	Completed
North Dakota:				
Lake Sakakawea	ND Dept. of Health	Fish and Other Aquatic Biota Fish Consumption	Low Dissolved Oxygen Water Temperature Methyl-Mercury	To Be Developed
South Dakota: Lake Sharpe (Sedimentation) and the Missouri River – Elk Point (Ammonia) were on the SD Dept. of Environment and Natural Resources 303(d) list prior to 2002, but have been delisted.				

* A phased Total Maximum Annual Load (TMAL) has been developed and is being revised.

3 PROGRAM IMPLEMENTATION STRATEGY

3.1 WATER QUALITY MONITORING AND ASSESSMENT

The effective collection of surface water quality data will provide the critical information needed to effectively develop, implement, and evaluate surface water quality management plans and activities. Properly designing a water quality data collection program will ensure that it effectively delivers the critical information needed by water quality analysts, water managers, or clients. A poorly planned data collection 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 data collection program will be supported by a sampling and analysis plan that, among other things, clearly defines and identifies data needs and usage, monitoring objectives, data quality requirements, and data collection and analysis approaches to be utilized.

When designing water quality studies or developing or revising water management plans, the District will fully consider the views of other Federal, state, and local agencies regarding data requirements. Data collection is costly and labor-intensive; therefore, every opportunity to share data and partner in the data collection effort will be exercised. Coupling water quality data with hydrologic and other environmental data is essential.

3.1.1 MONITORING STRATEGY FOR THE OMAHA DISTRICT'S WATER QUALITY MANAGEMENT PROGRAM

3.1.1.1 Purposes and Monitoring Objectives for Data Collection

To facilitate implementation of its Water Quality Management Program, the Omaha District has identified five purposes for surface water quality data collection. These five purposes are:

1) Determine surface water quality conditions at District projects.
2) Determine if any surface water quality concerns exist that are due to the operation of District projects.
3) Quantify any surface water quality concerns attributed to District projects.
4) Provide data to support reservoir regulation elements at District projects for effective management and enhancement of surface water quality and the aquatic environment.
5) Evaluate the effectiveness of structural or operational measures implemented at District projects to enhance surface water quality and/or the aquatic environment.

Monitoring objectives have been established under each of these five purposes to help direct and focus surface water quality data collection activities in the Omaha District. The identified data collection purposes and objectives are geared towards addressing the goals and long-term objectives of the District's Water Quality Management Program, and the water quality management objectives, data collection rules and objectives, data application guidance, and reporting requirements identified in ER 1110-2-8154.

3.1.1.1.1 Purpose 1: Determine surface water quality conditions at Corps projects.

Monitoring Objective 1: For all new Corps water resource projects, establish baseline water quality conditions as soon as possible and appropriate.

Establishing baseline water quality conditions at a project greatly facilitates assessment of project water quality conditions – especially trend assessment. Establishing baseline conditions as early as possible in a project's life, will allow for a more complete and accurate assessment of water quality conditions. Knowing the "as-built" conditions of a constructed reservoir or sediment basin, regarding its available volume, is important in determining sedimentation rates and potential water quality impacts or enhancements.

Monitoring Objective 2: Characterize the spatial and temporal distribution of water quality conditions at Corps projects.

The water quality occurring at Corps water resource projects is subject to spatial and temporal variability. Water quality conditions in surface water bodies (e.g., lakes, streams, etc.) are a reflection of their watersheds and, can also vary widely over time in response to climatic and seasonal influences. A thorough understanding of the spatial and temporal variability of water quality conditions is needed if the Omaha District is to meaningfully assess and manage surface water quality at Corps projects.

Monitoring Objective 3: Determine if water quality conditions attributed to the operation of Corps projects are improving, degrading, or staying the same over time.

In preparing the water quality reports identified in ER 1110-2-8154 (i.e., project-specific and annual reports), the determination and assessment of water quality trends will allow the Omaha District to achieve many of the reporting requirements. If properly conducted, trend assessment can yield valuable information regarding whether water quality conditions at Corps projects has improved, degraded, or remained unchanged over the assessed period.

3.1.1.1.2 Purpose 2: Determine if any surface water quality concerns exist that are due to the operation of Corps projects.

Monitoring Objective 4: Determine if water quality conditions at Corps projects or attributable to the operation of Corps projects (i.e., downstream conditions resulting from reservoir discharges) meets applicable Federal, state, and tribal water quality standards.

Water quality standards adopted pursuant to the Federal Clean Water Act include the identification of beneficial uses that are to be protected. Beneficial uses typically identified in water quality standards include recreation (primary and secondary), aquatic life (warm and cold water), and water supply (public drinking water, industrial, agricultural). Water quality criteria are established to protect the appropriate beneficial uses. The protection and maintenance of existing water quality is also required under the anti-degradation provisions of water quality

standards. Determining whether or not water quality standards are being met can involve monitoring of parameters for which criteria have been established or the monitoring of the use itself.

In order to meet this objective, water quality data of sufficient quality and quantity must be collected to determine the status of a water body in relation to its designated beneficial use(s). Where water quality criteria have been established, measurements of water quality are taken and compared to the applicable criteria to determine if the criteria are exceeded. The frequency, magnitude, and duration of the criteria exceedences are considered when determining if the designated beneficial uses of the water body are impaired. Biological monitoring can be used to identify impairment; however, follow-up monitoring is needed to identify the pollutants causing the impairment. To promote consistency in assessments, the Omaha District's intent is to employ the 305(b) and 303(d) assessment methodologies utilized by the appropriate states within the District to assess Corps projects within those states.

Monitoring Objective 5: Assess water quality conditions at Corps projects in relation to potential sources, transport, fate, and effects of contaminants.

As mentioned under Monitoring Objective 2, water quality at Corps water resource projects is subject to spatial and temporal variability. While it is important to understand how surface water quality varies spatially and temporally, it is also important to gain insights into what influences this variability. Understanding how the occurrence of point and nonpoint sources of pollution affect water quality at Corps projects is important if water quality conditions are to be meaningfully assessed.

Monitoring Objective 6: Evaluate water/sediment interactions and their effects on overall water quality at Corps projects.

Sediments in lakes, rivers, and wetlands can contain potential water quality pollutants. Natural and human-produced materials can be eroded or discharged into the water bodies and settle to be bottom and become incorporated into the sediments. Many dissolved substances have an affinity to adsorb to sediment particles leading to the accumulation of these substances in the bottom sediments. These accumulated substances and materials can have toxic and other deleterious affects on water quality, with the sediment serving as both a sink and reservoir for these contaminates. Contaminated sediment can affect water quality through the direct release of contaminates into the water column and through the bioaccumulation of the contaminants in aquatic organisms.

The oxidation-reduction processes occurring at the water/sediment interface have a predominant affect on the release and uptake of many water quality contaminants. Under anaerobic conditions many potential contaminants (e.g., phosphorus, metals) can be released from the sediments into the overlying water. The reverse process can occur under aerobic conditions, with dissolved substances in the water being taken up by the bottom sediments. Depending on the substances and water bodies involved, the release and uptake of dissolved substances can have a significant affect on the water quality of the water body.

A wide range of physical, chemical, and biological factors can influence the bioavailability of sediment contaminants. The bioavailability of contaminants in sediment is a function of the type of chemical and the chemical speciation, as well as the behavior and physiology of the organism. The two basic routes of exposure for organisms are transport of dissolved contaminants in pore water across biological membranes, and ingestion of contaminated food or sediment particles with subsequent transport across the gut. For upper-trophic-level species, ingestion of contaminated prey is the predominant route of exposure, especially to hydrophobic chemicals. Uptake through ingestion of or direct exposure to water or sediment can also be important depending on the trophic level of the organism and the physical-chemical characteristics of the contaminant.

Monitoring Objective 7: Identify the presence and concentrations of contaminants in indicator and human-consumed fish species at Corps projects.

Fish 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 water body that may not be detected through either water or sediment samples. Because of this, fish tissue monitoring is an excellent early indicator of potential toxic problems in surface waters. Different tissue types in fish (e.g., muscle, bone, organ, skin, adipose, etc.) tend to accumulate toxicants at different rates. Therefore, when used as an indicator, fish tissue analysis typically uses whole fish samples – a combination of all tissue types.

The analysis of fish fillets for toxicants is typically used to determine the suitability of fish for human consumption. The public has expressed concerns on whether fish caught from Corps project waters are safe to consume. It is important that answers to public health concerns be based on substantiated knowledge of toxicants in fish fillets and the public health risks associated with measured toxicant concentrations. This type of information can be used by states when considering the issuance of fish consumption advisories.

Monitoring Objective 8: Investigate, as necessary, unique events (e.g., fish kills, hazardous waste spills, operational emergencies, health emergencies, public complaints, etc.) at Corps projects that may have degraded water quality or indicate that the aquatic environment has been impacted.

The purpose of this monitoring is to determine if water quality degradation has occurred. If a situation has occurred where water quality conditions were degraded, information will be collected to document the situation. If it is determined that a pollution event has occurred, additional monitoring may be conducted in an attempt to determine the cause of the event.

Monitoring Objective 9: Identify pollutants and their sources that are affecting water quality and the aquatic environment at Corps projects.

Determining the source of pollution is often more difficult than determining its presence because there are often many potential sources that 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 that may be difficult to ascertain.

3.1.1.1.3 Purpose 3: Quantify any surface water quality concerns identified at Corps projects.

Monitoring Objective 10: For identified surface water quality concerns at Corps projects, determine the loading capacity for contributing pollutants.

The loading capacity of a water body is the amount of a pollutant that the water body can assimilate and still meet water quality standards and support its beneficial uses. Loading capacities for a water body are dependent on several factors such as hydrologic conditions (e.g., water volume, retention time, etc.), background and natural presence of pollutants, pollutant degradation processes, outflows from the water body, etc. Determination of the loading capacity is a critical step, as this will define the maximum amount of a pollutant a water body can tolerate without the occurrence of water quality problems. The loading capacity serves as the benchmark to determine if pollutant-loading reductions are necessary and to what degree. Loading capacities may be determined empirically (e.g., lake volume available for sedimentation, streamflow available for dilution under critical flow conditions) or through the use of models (e.g., tolerable phosphorus input to a lake based on a in-lake phosphorus dynamics).

Monitoring Objective 11: For identified contributing pollutants at Corps projects, estimate the current watershed loadings for those pollutants.

Establishing the current watershed loading of a pollutant to a water body is needed to evaluate the magnitude of the corrective actions that may be necessary. The estimated existing load of a pollutant to a water body is compared to its loading capacity to determine the reduction of that pollutant that is necessary for protecting water quality. Existing pollutant loadings to a water body can vary greatly with climatic factors, such as the duration, frequency, and timing of precipitation events. Existing loads can be estimated 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). Existing loads can be estimated through the use of models and, in some cases, empirically.

Monitoring Objective 12: Identify critical areas within project watersheds that are contributing nonpoint source pollutants that are a concern.

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: 1) the land resource perspective, and 2) 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 nonpoint source 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 best management practices (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 nonpoint source pollution control effort (Mass et. al., 1985b). Critical area identification can be greatly facilitated though the use of watershed water quality models.

Monitoring Objective 13: Calibrate and validate water quality and watershed models used to assess water quality concerns at Corps projects.

Water quality models are often used to predict a water body's response to a set of circumstances. For example, the CE-QUAL-R1, CE-QUAL-W2, BATHTUB, and EUTROMOD models may be used to assess the fate, transport, and loading of pollutants in reservoirs. The water quality model is used because empirically measuring the fate, transport, and loading of pollutants usually is not possible. 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.

3.1.1.1.4 Purpose 4: Provide data to support reservoir regulation elements at Corps projects for effective management and enhancement of surface water quality and the aquatic environment.

Monitoring Objective 14: Provide water quality data required for real-time regulation of Corps projects.

Water control activities can have a significant affect on water quality and the aquatic environment at Corps projects. In many cases, the timing of the water control activity may be a critical factor affecting water quality, and may be used to reduce water quality impacts and potentially improve aquatic environmental conditions. Where these situations are identified, there may be a need to provide real-time water quality data to project managers for their consideration when implementing water control activities.

Monitoring Objective 15: Collect the information needed to design, engineer, and implement measures or modifications at Corps projects to enhance surface water quality and the aquatic environment.

Operational and structural changes to Corps projects that enhance surface water quality and the aquatic environment may be feasible. During design and engineering of possible project changes it is necessary that certain studies and evaluations be accomplished to provide

information on which to base proposed changes and ensure an end result that will meet its objectives. A thorough understanding of the physical, chemical, and biological water quality processes at projects will allow the Corps the opportunity to investigate ways to operate, maintain, and modify projects to better protect and enhance water quality and the aquatic environment while still achieving project purposes. Possible project changes could include water control plan modifications, modifications to outlet works, shoreline management activities, etc.

3.1.1.1.5 Purpose 5: Evaluate the effectiveness of structural or operational measures implemented at Corps projects to enhance surface water quality and/or the aquatic environment.

Monitoring Objective 16: Evaluate the effectiveness of implemented measures at Corps projects to improve water quality and the aquatic environment.

Implemented measures to improve water quality or the aquatic environment should be monitored to evaluate their effectiveness. This will allow for ineffective measures to be identified and the pursuance of alternative measures. It will also allow for the identification of successful measures that can be documented for a project and referenced for possible use at other projects.

3.1.1.2 Approaches To Surface Water Quality Data Collection

From a pollution management perspective, surface water quality data collection approaches have been 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 sediment 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.
- Compliance sampling inspections by states or the U.S. Environmental Protection Agency (EPA) to provide a cross check of discharger self-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 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 coverage and a specific focus.

3.1.1.3 Data Collection Approaches Utilized By The Omaha District

The Omaha District is primarily involved in ambient monitoring; however, source monitoring (i.e., effluent characterization studies) will be utilized if an appropriate situation should arise. The Omaha District will typically use the following data collection approaches in conducting its water quality data collection activities:

- Long-term fixed station monitoring,
- Intensive surveys,
- Special studies,
- Watershed assessments, and
- Investigative monitoring.

Long-term fixed station monitoring is intended to provide information that will allow the Omaha District to determine the status and trends of surface water quality at Corps projects. This type of sampling consists of systematically collecting samples at the same location over a long period of time (e.g., collecting monthly water samples at the same site for several years).

Intensive surveys are intended to provide more detailed information regarding the water quality conditions at Corps projects. They typically will include more sites and parameters sampled over a shorter timeframe than long-term fixed station monitoring. Intensive surveys will provide the detailed water quality information needed to thoroughly understand water quality conditions at a project.

Special studies are conducted to address specific water quality information needs at Corps projects. Among other things, special water quality studies may be undertaken to collect the information needed to "scope-out" a specific water quality problem; calibrate and validate water quality models; design and engineer modifications at projects; or evaluate the effectiveness of specific implemented water quality enhancement measures.

The purpose of watershed assessments is to collect the information needed to identify and quantify sources and loadings of pollution being transported to targeted receiving waters from their watersheds. The Omaha District may conduct watershed assessments at a "scoping-level" to better understand possible pollution concerns impacting Corps projects. Information at this level will allow the Omaha District to interface with state and local entities regarding the identification of pollution concerns at Corps projects. Additionally, detailed watershed assessments may be conducted to definitively identify and quantify pollution sources, loadings, necessary loading reductions, contributing critical areas, and possible pollution control measures for implementation. The compilation and assessment of this information is typically facilitated through the utilization of watershed water quality models. The Omaha District's involvement in detailed watershed assessments would normally be in a supporting role to state and local agencies that have the lead in developing a watershed management plan or total maximum daily load (TMDL) for a water body that involves a Corps project.

Investigative monitoring is typically initiated in response to an immediate need for water quality information. This may be in response to an operational situation at a Corps project, the occurrence of a significant pollution event, public complaint, or a report of a fish kill. Any Omaha District response to a pollution event or fish kill would need to be coordinated with the appropriate state and local agencies. The type of sampling that is done for investigative purposes is highly specific to the situation under investigation.

Table 3.1 lists the data collection approaches used by the Omaha District to address each of the 16 identified surface water quality monitoring objectives.

3.1.1.4 Partnering Of Data Collection Efforts With Non-Corps Entities

The Omaha District realizes that many of its monitoring goals and objectives are similar to those of other governmental and nongovernmental entities. This is especially true for States

Table 3.1. Monitoring objectives and data collection approaches identified to address the Omaha District's surface water quality information needs.

	Data Collection Approach				
	Long-Term Fixed Station Monitoring	**Intensive Surveys**	**Special Studies**	**Watershed Assessments**	**Investigative Monitoring**
1) For all new Corps water resource projects, quantify baseline water quality conditions as soon as possible and appropriate.	●	●			
2) Characterize the spatial and temporal distribution of water quality conditions present at Corps projects.	●	●			
3) Determine if water quality conditions attributed to the operation of Corps projects are improving, degrading, or staying the same over time.	●	●			
4) Determine if water quality conditions at Corps projects or attributable to the operation of Corps projects (i.e., downstream conditions resulting from reservoir discharges) meets applicable Federal, state, and local water quality standards.	●	●			●
5) Assess water quality conditions at Corps projects in relation to potential sources, transport, fate, and effects of contaminants.		●	●		
6) Evaluate water/sediment interactions and their effects on overall water quality.		●	●		
7) Identify the presence and concentrations of contaminants in indicator and human-consumed fish species at Corps projects.			●		
8) Investigate, as necessary, unique events (e.g., fish kills, hazardous waste spills, operational emergencies, health emergencies, public complaints, etc.) at Corps projects that may have degraded water quality or indicate that the aquatic environment has been impacted.					●
9) Identify pollutants and their sources that are affecting water quality and the aquatic environment at Corps projects.	●	●	●	●	●
10) For identified surface water quality concerns at Corps projects, determine the loading capacity for contributing pollutants.			●	●	
11) For identified contributing pollutants at Corps projects, estimate the current watershed loadings for those pollutants.				●	
12) Identify critical areas within project watersheds that are contributing nonpoint source pollutants that are a concern.				●	
13) Calibrate and validate water quality and watershed models used to assess water quality concerns at Corps projects.			●	●	
14) Provide water quality data required for real-time regulation of Corps projects.	●				
15) Collect the information needed to design, engineer, and implement measures or modifications at Corps projects to enhance surface water quality and the aquatic environment.	●	●	●		
16) Evaluate the effectiveness of implemented measures at Corps projects to improve water quality and the aquatic environment.	●	●	●		

and Tribes that are implementing surface water quality monitoring activities pursuant to the Federal Clean Water Act (CWA). State and Tribal monitoring to meet the water quality reporting requirements for Sections 305(b), 303(d), and 319 of the CWA will have much in common with most of the Omaha District's surface water quality monitoring goals and objectives. The Omaha District believes that its monitoring efforts should be coordinated with appropriate State and Tribal monitoring, and cooperative efforts should be pursued wherever possible.

One action the Omaha District believes should be pursued is development and implementation of a coordinated monitoring effort among entities with common water quality data needs at Corps projects. A mutually agreed to monitoring plan could be jointly implemented with the acquired water quality data being shared among the participating partners – each partner would implement and fund their component of the plan. This would eliminate potential duplication of efforts and allow everyone's funding for water quality monitoring to go farther. Such a monitoring partnership arrangement could be formalized through Interagency Agreements or Memorandums of Understanding.

The Omaha District has several programs and authorities under which it can provide technical and funding support to States and Tribes to address water resources related issues and potentially assist in water quality monitoring efforts. One such program is the Planning Assistance to States Program authorized under Section 22 of the Water Resources Development Act of 1974, as amended. The Section 22 Program permits the Corps to use its technical planning expertise to supplement and support State and Tribal efforts to undertake water resource planning. This is a cost-sharing program with the non-Federal partner providing 50 percent of the cost of the work effort. The Omaha District also has authorities to provide cost-reimbursable support to States and Tribes. If it can be shown that the Omaha District can provide a specialized or unique service to a State or Tribe, use of the Intergovernmental Cooperation Act may be a possibility. If a State or Tribe acquires funding (i.e., grants) from another Federal agency, and that agency agrees to the Corps providing assistance, the Omaha District may be able to enter into a cost-reimbursable agreement with the State or Tribe under The Chief's Economy Act (with the grant funds used as reimbursement to the Omaha District).

3.1.1.5 Process For Identifying Monitoring Needs, Establishing Priorities, And Implementing Water Quality Data Collection In The Omaha District

The process for identifying annual monitoring needs, establishing monitoring priorities, and implementing monitoring activities is depicted in Figure 3.1.

3.1.1.5.1 Determination Of Water Quality Data Collection Needs In The Omaha District

3.1.1.5.1.1 Project Water Quality Management Planning

ER 1110-2-8154 requires that the Districts develop project-specific water quality management plans. In approaching the development of project water quality management plans, the Omaha District will base the plans largely on the project-specific report for the project. It is of paramount importance that the project-specific report for a project be updated prior to the development of a water quality management plan for the project. This is needed to insure that

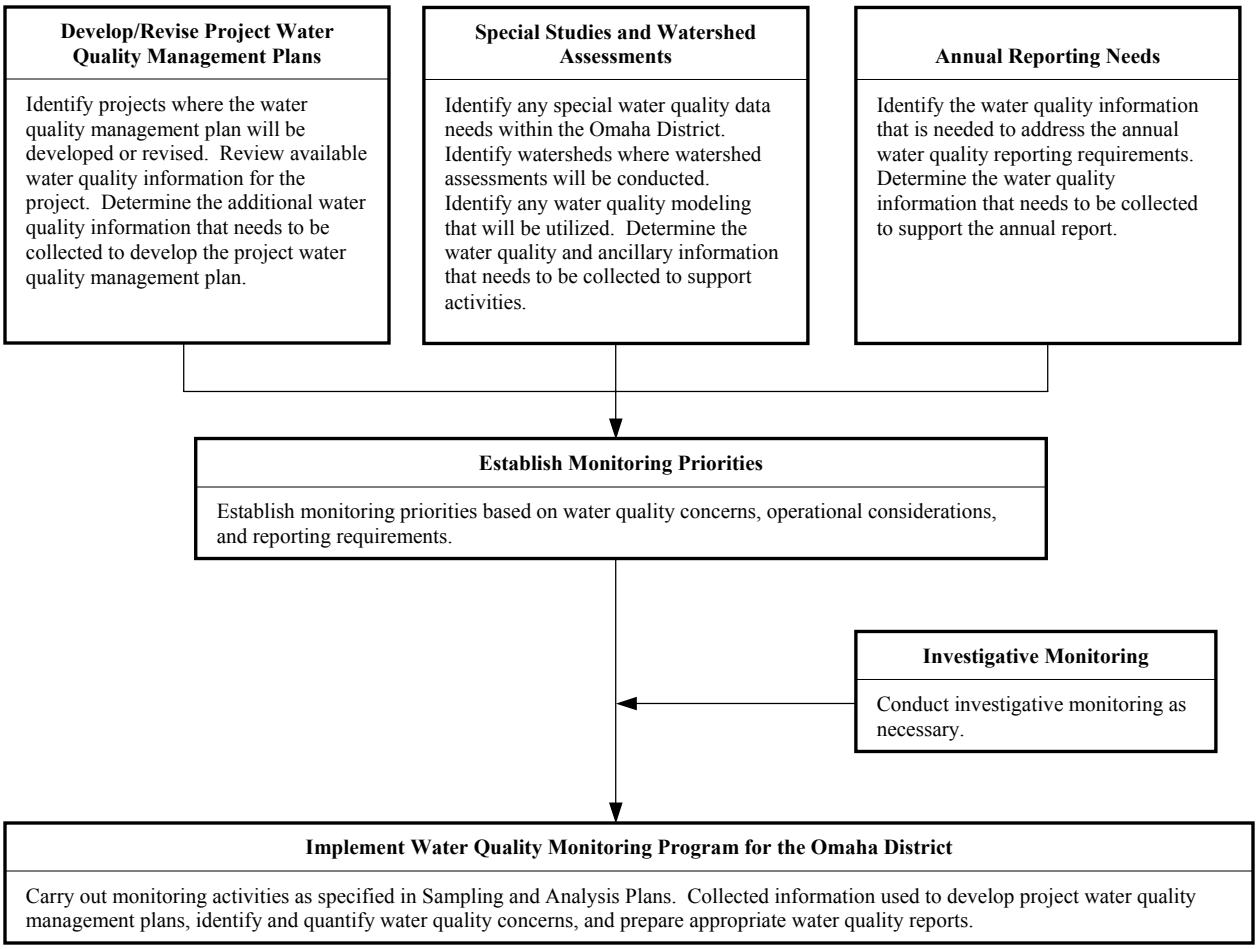

Figure 3.1. Process for identifying monitoring needs, establishing monitoring priorities, and implementing monitoring activities.

the report addresses all of the surface water quality issues and concerns associated with the project. Where data is lacking or water quality issues need to be further evaluated, monitoring should be implemented to address these data needs prior to the preparation of a water-quality management plan for the project.

3.1.1.5.1.2 Special Studies and Watershed Assessments

The need for water quality data outside of that required to prepare project water quality management plans may occur on an irregular basis. Information may be needed to address threatened and endangered species questions, human health concerns, operational procedures, or facilitate the identification of water quality problems. Special studies or watershed assessments would be the data collection approach most often utilized to address these types of data needs. The need for conducting special studies or watershed assessments should be reviewed on an annual basis and, where water quality data needs exists, monitoring should be considered.

3.1.1.5.1.3 Reporting Requirements

ER 1110-2-8154 requires that the Districts prepare an annual water quality report and, from time-to-time, project-specific reports. The annual report is to summarize the District's water quality management program for the past fiscal year, and to provide a project-by-project summary of water quality conditions. The water quality data needed to adequately prepare annual and project-specific reports should be identified and monitoring implemented to collect the needed information.

3.1.1.5.2 Establish Water Quality Monitoring Priorities

After the water quality monitoring needs are compiled, the resources required to conduct the monitoring 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. Based on the environmental implications, public needs, and operational concerns, the appropriate Corps staff will determine where monitoring activities are most needed.

3.1.2 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

A rigorous QA/QC program is essential to insure that data generated by the Water Quality Management Program is of a known quality that meets the data quality requirements of the data users for whom the data is generated. The Omaha District will develop, maintain, and implement QA/QC procedures and protocols that cover all aspects of data collection, analysis, management, assessment, and reporting to ensure the validity of all generated data and any conclusions and recommendations drawn from such data.

The Water Quality Management Program operates under the Omaha District, Hydrologic Engineering Branch's Quality Management Plan (QMP) (USACE, 2002). The quality system used to support data collection efforts implemented under the Water Quality Management Program follows the cyclic Plan-Do-Check-Act process, and utilizes a systematic planning process (SPP), data quality objectives (DQOs), sampling and analysis plans (SAPs), standard operating procedures (SOPs), data quality assessment (DQA), and quality control plans (QCPs) to ensure the quality of generated data and findings (Figure 3.2).

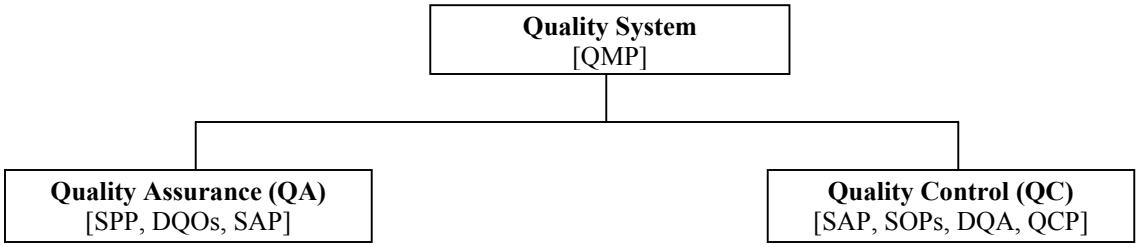

Figure 3.2. Components of the quality system employed by the Water Quality Management Program.

3.1.2.1 Systematic Planning Process and Data Quality Objectives

To ensure that a water quality data collection effort or project is properly designed, it is important 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 uncertainty that can be tolerated by the user and still meet the user's need. DQOs clarify the objectives for data collection, define the most appropriate type of data to collect, determine the most appropriate conditions from which to collect 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 identified action. Establishment of DQOs involves the interaction of 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 and 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 uncertainty for the project, and how many samples to collect. The outputs of the SPP should be clearly articulated in a Sampling and Analysis Plan (SAP) that details the data collection effort to be implemented. Utilization of the SPP process to develop DQOs will be done in accordance with Water Quality SOP Number WQ-27102, "Establishing Data Quality Objectives".

3.1.2.2 Sampling and Analysis Plans

A Sampling and Analysis Plan (SAP) must be completed and approved prior to the initiation of any data collection effort implemented under the District's Water Quality Management Program. SAPs are typically developed by a project coordinator and, as appropriate, approved by field sampling coordinators, team leaders, laboratory personnel, and Section Chief. A SAP is the end product of the SPP process directed at data collection and consists of two main components: a field sampling plan and a quality assurance project plan. The field sampling component addresses the data collection field activities, including all aspects of sampling and field data gathering. The quality assurance component addresses the DQOs; measurement quality objectives (MQOs) for precision, bias, representitiveness, completeness, comparability, and sensitivity; analytical methodologies; specific QA/QC activities; laboratory requirements; and data assessment activities designed to achieve the data quality goals of the data collection effort or project. A SAP serves as a data collection "roadmap" by describing all aspects of a data collection effort, including sampling, field measurements, analysis, data quality review, data management and storage, data assessment, and reporting requirements. SAPs are to be developed in accordance with Water Quality SOP Number WQ-27101, "Sampling and Analysis Plan (SAP) Development for Surface Water Quality Monitoring and Related Efforts".

3.1.2.3 Standard Operating Procedures

Standard Operating Procedures (SOPs) are developed for technical and administrative activities to ensure consistency in the quality of products and activities produced under the

District's Water Quality Management Program. In support of the Program, SOPs are developed to document procedures and processes for collecting field measurements and samples, analyzing samples, data quality review, data storage and management, data assessment, data reporting, and supporting administrative activities. To ensure the validity of generated data, it is required that data collection activities be conducted in accordance with approved SOPs. If formal SOPs aren't available, data collection procedures and methodologies must be thoroughly described in the SAP supporting the data collection activity. SOPs are to be developed in accordance with Quality System Assessment SOP Number QSA-1, "SOP Development – Water Quality and Water Control". Appendix 7.1 provides a list of SOPs that directly support the Water Quality Management Program.

3.1.2.4 Data Quality Assessment

Data quality assessment (DQA) is the scientific and statistical evaluation of data to determine if data obtained from data collection operations are of the right type, quality, and quantity to support their intended use. The data "life cycle" comprises three steps: planning, implementation, and assessment. During the planning phase, the SPP process is used to define quantitative and qualitative criteria for determining when, where, and how many samples (measurements) to collect and a desired level of confidence. This information, along with the sampling methods, analytical procedures, and appropriate QA/QC procedures, are documented in the SAP. Data are then collected following the SAP specifications. DQA completes the data "life cycle" by providing the assessment needed to determine if the planning objectives were achieved. During the assessment phase, the data are verified and validated to ensure that the sampling and analysis protocols specified in the SAP were followed, and that the measurement systems performed were in accordance with the criteria specified in the SAP. DQA then proceeds using the verified data set to determine if the quality of the data is satisfactory.

3.1.2.5 Quality Control Plans

Quality control plans (QCPs) are utilized to assure the quality of all reports prepared pursuant to the District's Water Quality Management Program. QCPs including, where appropriate, a process for conducting an independent technical review are developed and implemented in accordance with the following SOPs: Water Quality SOP Number WQ-26001, "Preparation of Annual Water Quality Reports"; Water Quality SOP Number WQ-26002, "Preparation of Project-Specific Reports", Water Quality SOP Number WQ-26003, "Preparation of Needs Assessment Reports"; Water Quality SOP Number WQ-26004, "Preparation of Special Situation Reports"; and Water Quality SOP Number WQ-26005, "Preparation of Special Study Reports."

3.1.3 DATA MANAGEMENT

Water quality data collected by the Omaha District prior to 1999 is maintained on EPA's STORET legacy data management system. Data collected for 1999 and later will be maintained in EPA's STORET modernized data management system when it becomes feasible for the Omaha District. At this time, the Omaha District is maintaining its collected water quality data for 1999 and after on an internal database utilizing the DASLER (Data Management and

Analysis System for Lakes, Estuaries, and Rivers) software. EPA's STORET database may be accessed via the Internet at 'www.epa.gov/storet/'. The Omaha District's agency code in the STORET system is COEOMAHA. Management of data will be in accordance with the following SOPs: Water Quality SOP Number WQ-24201, "Using the DASLER Data Management System"; and Water Quality SOP Number WQ-24202, "Using the STORET Data Management System."

3.1.4 DATA ASSESSMENT

It is important that appropriate procedures and statistical methods be employed when assessing data. The use of appropriate procedures and statistical methods will ensure the validity of evaluation findings, results, and recommendations based on collected data. Surface water quality evaluations conducted under the Water Quality Management Program will include, but not be limited to, trend assessment, description of existing conditions, attainment of water quality standards, identification and quantification of problems and concerns, and application of water quality models. Where appropriate, the following SOPs are to be utilized: Water Quality SOP Number WQ-25001, "Assessing Beneficial Use Support and the Attainment of Water Quality Standards"; and Water Quality SOP Number WQ-25002, "Assessing Water Quality Trends."

3.1.5 REPORTING

Reports prepared under the Water Quality Management Program will be in accordance with the following SOPs: Water Quality SOP Number WQ-26001, "Preparation of Annual Water Quality Report Pursuant to ER-1110-2-8154"; Water Quality SOP Number WQ-26002, "Preparation of Project-Specific Reports", Water Quality SOP Number WQ-26003, "Preparation of Needs Assessment Reports"; Water Quality SOP Number WQ-26004, "Preparation of Special Situation Reports"; Water Quality SOP Number WQ-26005, "Preparation of Special Study Reports"; Water Quality SOP Number WQ-26006, "Preparation of Annual Report of Water Quality Conditions in the District"; and Water Quality SOP Number WQ-28003, "Preparation of the Annual Water Quality Management Program Report".

3.2 PROJECT WATER QUALITY MANAGEMENT PLANNING

ER1110-2-8154 requires that specific water quality management objectives be developed by the Districts for each project, and that procedures be outlined and implemented to meet those objectives. This requirement will be addressed through the development of project water quality management plans. These plans are to be reviewed and updated as needed but not less than every 10 years. The water quality management plans should be scoped to include all areas influencing and influenced by the project. It must be ensured that water quality management is an integral part of the water control management program. Project water quality management objectives are to be included in the project water control plans.

The development of project water quality management plans will be in accordance with Water Quality SOP Number WQ-28001, "Development of Water Quality Management Plans for Omaha District Civil Works Projects."

3.3 TECHNICAL SUPPORT

The Water Quality Management Program will strive to provide technical support in the area of surface water quality to Corps planning and operational activities on an as needed basis. Technical support will be contingent upon staff and resource availability.

3.4 PROGRAM DEVELOPMENT AND EVALUATION

3.4.1 APPLICATION OF THE PROJECT (PROGRAM) MANAGEMENT BUSINESS PROCESS (PMBP) TO THE WATER QUALITY MANAGEMENT PROGRAM

The U.S. Army Corps of Engineers has adopted the Project (Program) Management Business Process (PMBP), as defined in Engineer Regulation ER 5-1-11 – "U.S. Army Corps of Engineers Business Process", to guide its work efforts. This process establishes the philosophy, policy, and guidelines to accomplish all work performed by the Corps. The PMBP is the fundamental Corps business process used to deliver quality projects. It reflects the Corps corporate commitment to provide "customer service" that is inclusive, seamless, flexible, effective, and efficient. It embodies communication, leadership, systematic and coordinated management, teamwork, partnering, effective balancing of competing demands, and primary accountability for the life of a project. The PMBP applies to planning, development, and management of programs as well as projects, and is used at all echelons of the Corps.

The following definitions come from ER 5-1-11:

Program: A group of projects or recurring services that may be categorized by funding source, requirements defined in the program management plan, or other common criteria for which resources are allocated and collectively managed.

Program Management: Component of the PMBP undertaken by all USACE echelons to manage programs. It consists of the development, justification, management, defense, and execution of programs within available resources, in accordance with applicable laws, polices, and regulations, and includes accountability and performance measurements. Under program management, programs, projects and other commitments are aggregated for oversight and direction. Program management takes project management to a greater level of interdependence and broadens the corporate perspectives and responsibilities.

Project: Any work intended to produce a specific expected outcome. A project has a defined scope, quality objectives, schedule, and cost. Internal services are discrete projects when they are non-recurring or of special significance.

Project Management: The application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed defined expectations.

Project Management Plan (PMP) (PgMP for Programs): A living document used to define expected outcomes and guide project (or program) execution and control. Primary uses of the PMP/PgMP are to facilitate communication among participants, assign responsibilities, define

assumptions, and document decisions. Establishes baseline plans for scope, cost, schedule, safety, and quality objectives against which performance can be measured, and to adjust these plans as actual performance dictates. A PMP is a roadmap for quality project delivery. A PgMP is used to allocate funds and resources and establish program goals, objectives, acquisition strategy, and priorities on an annual basis.

In the context of the Water Quality Management Program (WQMP), program refers to all the activities preformed under the WQMP; while projects are specifically defined as those water quality monitoring activities for which Sampling and Analysis Plans (SAP) are developed. The SAP is in essence the Project Management Plan for the monitoring activity. The Program Management Plan for the WQMP serves as an "Annual Operating Plan" for activities to be implemented for a given annual period.

3.4.2 ANNUAL PLANNING AND IMPLEMENTATION CYCLE FOR THE OMAHA DISTRICT'S WATER QUALITY MANAGEMENT PROGRAM

3.4.2.1 Planning and Reporting Schedule

October:
- Begin preparing "Annual Report of Water Quality Conditions in the Omaha District."
- Begin preparing "Omaha District Annual WQMP Report" (pursuant to ER 1110-2-8154).

January:
- Complete "Annual Report of Water Quality Conditions in the Omaha District."
- Complete "Omaha District Annual WQMP Report" (pursuant to ER 1110-2-8154).
- Forward appropriate information to the Corps Northwest Division for use in preparing Division Annual Water Quality Report.

February:
- Begin preparing WQMP Program Management Plan.
- Begin preparing Sampling and Analysis Plans for water quality monitoring to be conducted.

March:
- Complete WQMP Program Management Plan.
- Complete Sampling and Analysis Plans.

April:
- Begin implementing new Program Management Plan and Sampling and Analysis Plans.
- Prepare final status report on implementation of the prior year's WQMP Program Management Plan.

April - March:
- Implement WQMP Program Management Plan.
- Conduct water quality monitoring as identified in approved Sampling and Analysis Plans.

Ongoing:
- Prepare Project-Specific and Special Project Reports as appropriate.
- Provide technical assistance, as appropriate, to other Corps echelons.
- Prepare necessary Standard Operating Procedures.
- Manage the Omaha District's water quality database.

3.4.2.2 Description of Annual Planning and Reporting Documents

3.4.2.2.1 WQMP Program Management Plan

The Program Management Plan (PgMP) serves as the WQMP's annual operating plan. It is developed in February and March of each year and covers the period of April 1st through March 30th. It covers the April through March period to allow for water quality data collected through the previous summer to be reviewed and assessed, and used to help identify water quality monitoring needs, special study needs, and establish monitoring priorities.

The PgMP establishes water quality management priorities for the coming year and identifies any special water quality management and monitoring needs projected for the coming five years. The PgMP establishes action items to be implemented that address the strategic goals and objectives of the WQMP. Under each action item tasks, milestones, and staff responsibilities are defined. Funds and resources available to implement the WQMP are allocated for the coming year and a baseline budget summary is prepared. A strategy for acquiring any needed goods or services for the coming year and future years is developed. Special study needs are identified and, as appropriate, Operation Maintenance Work Requests (OMWRs) are prepared for submission. The PgMP is prepared in accordance with water quality SOP Number WQ-28002, "Development of the Annual Program Management Plan for the Water Quality Management Program."

3.4.2.2.2 Annual Report of Water Quality Conditions in the Omaha District

The Omaha District issues an annual report of water quality conditions in the District each January. This report reviews and assesses water quality data collected at Corps projects in the Omaha District through September of the previous year. The preparation of the annual water quality report allows the Omaha District to regularly review and assess water quality conditions present at Corps projects in the District. The findings of the water quality report are used to identify monitoring needs and priorities for the coming monitoring season (i.e., April - March) and beyond. The information is also used to prepare an annual report of water quality conditions for public distribution, and the information is forwarded to the Northwest Division for their use in preparing the Division Annual Water Quality Report to be submitted to Corps Headquarters. This report is prepared in accordance with water quality SOP Number WQ-26006, "Preparation of the Annual Report of Water Quality Conditions in the Omaha District."

3.4.2.2.3 Omaha District Annual Water Quality Management Program Report

The District's annual WQMP report is an internal document prepared by the District that summarizes activities for the previous year and identifies specific needs for the coming and

future years. The report contains an "itemized" accounting of the implementation of action items identified in the annual WQMP PgMP and resource expenditures for the previous federal fiscal year. Any significant accomplishments for the previous year are also identified and described. Needs identification include training needs, research and development needs, and special study needs. As appropriate, the need for additional funding to conduct special studies is identified and, as appropriate, Operation Maintenance Work Requests (OMWRs) are prepared. The report is forwarded to the Northwest Division for their use in preparing the Division Annual Water Quality Report to be submitted to Corps Headquarters and is prepared in accordance with water quality SOP Number WQ-28003, "Preparation of the Annual Water Quality Management Program Report."

3.4.2.2.4 Sampling and Analysis Plans

Preparation of Sampling and Analysis Plans was previously discussed in Section 3.1.2.2. All monitoring conducted pursuant to the WQMP must have a SAP completed before sampling is initiated.

4 REFERENCES

Maas, R.P., M.D. Smolen, S.A. Dressing, C.A. Jamieson, and J. Spooner. 1985a. Practical guidelines for selecting critical areas for controlling nonpoint source pesticide contamination of aquatic systems. *In:* Perspectives on Nonpoint Source Pollution, Proceedings of a National Conference, Kansas City, Missouri, May 19-22, 1985. EPA 440/5-85-001, U.S. Environmental Protection Agency, Office of Water Regulations and Standards, Washington, DC. August.

Maas, R.P., M.D. Smolen, and S.A. Dressing. 1985b. Selecting critical areas for nonpoint-source pollution control. J. Soil and Water Cons. 40(1): 68-71.

U.S. Army Corps of Engineers. 1995. Engineer Regulation (ER) 1110-2-8154, Engineering and design – Water quality and environmental management for Corps civil works projects. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C.

_____. 2001. Engineer Regulation (ER) 5-1-11, Management – U.S. Army Corps of Engineers Business Process. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C.

_____. 2002. Quality management plan. Hydrologic Engineering Branch, Omaha District, U.S. Army Corps of Engineers, Omaha NE.

5 APPENDICES

5.1 SOPS TO SUPPORT THE WATER QUALITY MANAGEMENT PROGRAM

QUALITY SYSTEM ASSESSMENT/REVISION (QSA)

QSA-1: SOP Development – Water Quality and Water Control

SOPs TO SUPPORT WATER QUALITY ACTIVITIES – Series WQ-20000

<u>21000 – Sampling and Field Measurement and Observation Procedures</u>

Series 21100 – Sample Collection, Preservation, and Handling

WQ-21101: Collection of Surface Water Samples
WQ-21102: Collection of Sediment Samples (TBD)
WQ-21103: Collection of Soil/Sediment Samples for Elutriate Analysis (TBD)
WQ-21104: Containers, Preservation, and Holding Times for Selected Parameters
WQ-21105: Shipment of Samples

Series 21200 – Field Measurements and Observations

WQ-21201: Using a "Hydrolab 4 & 4a" to Directly Measure Water Quality
WQ-21202: Determining Secchi Depth (TBD)
WQ-21203: Describing Weather and Site Conditions (TBD)
WQ-21204: Determining Location using Global Positioning System (GPS) Equipment
WQ-21205: Determining Stream Discharge from Stream Transect Surveys (TBD)
WQ-21206: Determining Stream Discharge from Gaging Station Information (TBD)

Series 21300 – Equipment Maintenance

WQ-21301: Maintaining the "Hydrolab 4 & 4a" (DRAFT)
WQ-21302: Servicing Water Quality Unit Boats, Motors, and Trailers (TBD)

<u>22000 – Procedures for Determining Physical, Chemical, and Biological Water and Sediment Quality Conditions</u>

Series 22100 – Physicochemical Parameters

WQ-22101: Alkalinity (TBD)
WQ-22102: Biochemical Oxygen Demand (TBD)
WQ-22103: Chemical Oxygen Demand (TBD)
WQ-22104: Color (TBD)
WQ-22105: Conductivity (TBD)
WQ-22106: Dissolved Oxygen (TBD)
WQ-22107: Dissolved Solids (TBD)
WQ-22108: Gas Saturation (TBD)
WQ-22109: Hardness (TBD)
WQ-22110: pH (TBD)

WQ-22111: Suspended Solids (TBD)
WQ-22112: Turbidity (TBD)
WQ-22113: Water Temperature (TBD)

Series 22200 – Inorganic Chemical Parameters

WQ-22201: Chloride (TBD)
WQ-22202: Cyanide (TBD)
WQ-22203: Hydrogen Sulfide (TBD)
WQ-22204: Metals (TBD)
WQ-22205: Nitrogen, Nitrate/Nitrite (TBD)
WQ-22206: Nitrogen, Total Ammonia (TBD)
WQ-22207: Nitrogen, Total Kjeldahl (TBD)
WQ-22208: Phosphorus, Dissolved Ortho (TBD)
WQ-22209: Phosphorus, Total (TBD)
WQ-22210: Sulfate (TBD)

Series 22300 – Organic Chemical Parameters

WQ-22301: Carbon, Total Dissolved (TBD)
WQ-22302: Carbon, Total Organic (TBD)
WQ-22303: PCBs (TBD)
WQ-22304: Pesticides (TBD)
WQ-22305: Volatile Organics (TBD)

Series 22400 – Biological Parameters

WQ-22401: Bacteria (TBD)
WQ-22402: Chlorophyll (TBD)
WQ-22403: Macroinvertebrates (TBD)

23000 – Sample Analysis [Reserved]

[Note: Reference ECB Laboratory SOPs for all parameters we have need to analyze. SOPs to be developed for any sample analysis conducted by the Water Quality Unit.]

24000 – Data Control and Management

Series 24100 – Data Control

WQ-24101: Establishing Station Numbers for Monitoring Sites (TBD)
WQ-24102: Defining Trip Numbers and Activity Codes for Data Collection Activities (TBD)
WQ-24103: Identification and Documentation of Water Samples for Laboratory Analysis (TBD)

Series 24200 – Data Management

WQ-24201: Using the DASLER Data Management System (TBD)
WQ-24202: Using the STORET Data Management System (TBD)

25000 – Data Assessment

WQ-25001: Assessing Beneficial Use Support and the Attainment of Water Quality Standards (TBD)
WQ-25002: Assessing Water Quality Trends (TBD)

26000 – Data Reporting

WQ-26001: Preparation of Annual Water Quality Report Pursuant to ER 1110-2-8154 (TBD)
WQ-26002: Preparation of Project-Specific Reports (TBD)
WQ-26003: Preparation of Needs Assessment Reports (TBD)
WQ-26004: Preparation of Special Situation Reports (TBD)
WQ-26005: Preparation of Special Study Reports (TBD)
WQ-26006: Preparation of Annual Report of Water Quality Conditions in the Omaha District (TBD)

27000 – Quality Assurance and Quality Control

Series 27100 – Systematic Planning Process

WQ-27101: Sampling and Analysis Plan (SAP) Development for Surface Water Quality Monitoring and Related Activities
WQ-27102: Establishing Data Quality Objectives (TBD)

Series 27200 – Quality Control and Assurance of Generated Data

WQ-27201: Sampling Quality Control (TBD)
WQ-27202: Data Quality Review

28000 – Miscellaneous

WQ-28001: Development of Water Quality Management Plans for Omaha District Civil Works Projects (TBD)
WQ-28002: Development of the Annual Program Management Plan for the Water Quality Management Program (TBD)
WQ-28003: Preparation of the Annual Water Quality Management Program Report (TBD)

Note: TBD = To Be Developed.