Draft, May 11, 2001

DRAFT MASTER PLAN OF STUDY
RED RIVER VALLEY WATER SUPPLY PROJECT

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DRAFT MASTER PLAN OF STUDY
RED RIVER VALLEY WATER SUPPLY STUDY

INTRODUCTION

Development of a reliable water supply for the Red River Valley in North Dakota has been a subject of interest and concern to local residents, government officials, and others. Although streams in eastern North Dakota are prone to flooding and excessive runoff, there are also periods of low flow, such as during the 1930s and 1980s droughts.

This is the Master Plan of Study for the Red River Valley water supply project in North Dakota. The purpose of this document is to describe study tasks in sufficient detail so that individual plans of study can be developed for study components in accordance with the NEPA process. This document paints the "big picture" for all of the public scoping, data collection, analysis, and synthesis needed to prepare two documents: a draft feasibility-level engineering report and an associated draft Environmental Impact Statement (DEIS).

The Corps of Engineers is currently conducting two related studies in the Red River basin. The Devils Lake Outlet EIS and the Red River Reconnaissance study. The Red River Water Supply Study will coordinate with the Corps of Engineers' studies to eliminate redundant work and to assure consistency between the studies.

Authority

On December 15, 2000, the 106th Congress passed the Dakota Water Resources Act of 2000 (DWRA). Sections 5 and 8 of DWRA authorizes the Red River Valley Water Supply Project. The Act directs the Secretary of Interior to conduct a comprehensive study of the water quality and quantity needs of the Red River Valley in North Dakota and possible options for meeting those needs. The needs include municipal, rural, industrial (MR&I), water quality, aquatic environment, recreation, and water conservation measures. The study will analyze the potential to reduce water needs by including water conservation measures in all of the alternatives evaluated by the study. The Secretary is also directed to work with the State of North Dakota to jointly prepare a Environmental Impact Statement for the project.

Memorandum Of Understanding - Study Organization

In anticipation of the Red River Valley Water Supply Project, the Bureau of Reclamation (Reclamation), the North Dakota State Water Commission (State Water Commission), and the

Garrison Diversion Conservancy District (C-District) entered into a Memorandum of Understanding (MOU) in July 2000. This MOU created a partnership among the three parties to direct the completion of necessary studies and to oversee the preparation of reports to Congress. The MOU established a process for cooperation among State, Federal, and local interests in the completion of draft Report on Red River Valley Water Needs and Options (draft Needs and Options Report) and associated DEIS.

Study Management Team

This study will be administered by a Study Management Team (Management Team) comprised of one appointed official from each of the organizations that signed the MOU - Reclamation, C-District, and State Water Commission.

The Management Team formed a Technical Team and a Study Review Team (Review Team.) The Technical Team is responsible for developing plans of study, technical evaluations, and drafting portions of the draft Needs and Options Report. The Review Team will review draft products with the Technical Team to provide input into the study process and products. The Technical Team assisted in preparation of this Master Plan of Study which will be critiqued by the Review Team.

NEPA

With passage of the National Environmental Policy Act (NEPA), Congress established an environmental review process for federal agencies. The Dakotas Area Office, Bureau of Reclamation follows this environmental review process when preparing NEPA documents for Municipal, Rural, and Industrial (MR&I) water supply projects. NEPA mandates evaluation of a full range of reasonable alternatives and full disclosure of issues and environmental effects. The primary objectives of NEPA are to identify and evaluate all significant impacts of a proposed action on the human and natural environment and to inform the public of, and provide them with, the opportunity to comment on an agency's decision making process concerning the proposed action. Adherence to these objectives ensures that Reclamation will consider environmental concerns in its decision-making process.

Consideration of environmental issues and values begins early in the planning process before final engineering plans are completed. Potential environmental issues, such as biota transfer or impacts to wetlands or cultural resources, are identified. The EIS should be prepared concurrently with a feasibility study. Identification of alternatives must be coordinated between the teams preparing the feasibility study and the EIS. At a minimum, the EIS must address the alternatives evaluated in the feasibility study.

Purpose and Objective

The purpose of the Red River Valley water supply study is to conduct a comprehensive study of water quality and quantity needs of the Red River Valley and possible options for meeting those needs. The Red River Valley water supply study will consist of two main documents: the "draft Report on Red River Valley Water Needs and Options (draft Needs and Options Report)" and associated DEIS.

Scope of the Study (Location/Boundaries)

The draft Needs and Options Report will be conducted at the feasibility-level of detail. This means the study draws upon available sources of existing information and data but develops new sources of information and data as needed to complete the study. The study will also be conducted at a sufficient level of detail to define and evaluate all technical and environmental study parameters and to produce adequate cost estimates to ensure that accurate project funding levels (ceilings) can be documented for local, state, and federal governments.

The study area will depend on the scope of each specific study task. Listed below are the proposed geographic study areas associated with specific study tasks.

Study Area (general)	±	Red River Basin is the primary study area.
Service Area (water needs)	±	Thirteen eastern counties in North Dakota plus East Grand Forks, Moorhead, and Breckenridge, Minnesota. In addition, Red River Valley water users that request service may be included in the study service area.
Cumulative Impacts	±	From the beginning of the Missouri River in Montana to St. Louis, Missouri and all states in between are included. Entire length of Red River plus areas identified during public scoping process may be included.
Potential Water Sources	±	Hudson Bay Basin (North Dakota and Minnesota) and Missouri River will be considered.

Environmental Impact Statement	±	Study area will be defined by Reclamation based on public scoping process.

Background - Previous Studies

The Garrison Diversion Unit was authorized in 1965, and construction began in 1967. The project was designed to divert Missouri River water to central and eastern North Dakota for irrigation, fish and wildlife enhancement, MR&I water supply, and recreation development. Most of the principal supply works were constructed, except for a 20 mile reach between the end of the McClusky Canal and the beginning of the New Rockford Canal.

The project was reformulated in 1986 to place less emphasis on irrigation and more on meeting the MR&I water needs in North Dakota. The 1986 Reformulation Act authorized a Sheyenne River water supply and release feature, including a water treatment plant capable of delivering 100 cubic feet per second of water to eastern North Dakota.

In 1994, as an outcome of the North Dakota Water Management Collaborative Process, Reclamation initiated an appraisal-level (preliminary) assessment of MR&I water needs in the Red River Valley. That study was completed in two phases. The first phase was further subdivided into parts A and B. Phase IA compared the existing and projected future MR&I water needs in the Red River Valley with the surface water flows and groundwater resources available to meet those needs. That report, completed in April 1998, concluded that significant shortages could occur during future droughts if the problem was not resolved.

The Phase IB report provided an evaluation of seasonal instream flow needs for water quality and maintenance of aquatic life in the Sheyenne River and Red River. That report was finalized in August 1999. The report established the relationship between flows and available fish habitat which was used in the evaluation of preliminary alternatives in the Phase II report.

The Phase II report completed in January 2000 presented a range of preliminary alternatives to meet the shortages identified in the Phase IA report. These alternatives included both in-basin and out-of-basin water supplies, along with water conservation and a variety of management and operational techniques. Some commenting agencies raised concerns about some aspects of the Phase II report. These concerns were documented in the Phase II addendum and will be addressed in the draft Needs and Options Report and in the DEIS.

The U. S. Geological Survey also completed two reports which provided data which will be used in the hydrologic portions of the Reclamation reports. These are *Gaged and Estimated Monthly*

Streamflow during 1931-84 for selected sites in the Red River of the North Basin in North Dakota and Minnesota, USGS Water-Resources Investigations Report 90-4167, and *Methods for Estimating Monthly Mean Concentrations of Selected Water-Quality Constituents for Stream Sites in the Red River of the North Basin, North Dakota and Minnesota, USGS Water-Resources Investigations Report 91-4086*. The USGS is updating each report to include 1985-1999 data.

The project was again reformulated with passage of the DWRA in December 2000. DWRA increases construction cost ceilings for MR&I water supplies by about $600 million. The Act also requires an EIS and feasibility-level study as the decision making process for selecting a preferred alternative for meeting water needs in the Red River Valley.

Alternatives Developed under Phase II

Eight preliminary alternatives, including No Action, are described in the Phase II Needs Assessment. A more detailed description of these alternatives is provided in the "Preliminary Alternatives To Meet Projected Demands" section of the Master Plan of Study. These alternatives were investigated at an appraisal level during Phase II and, along with others identified during public scoping, will be studied in greater detail in the current investigations.

Overview of Study

The Red River Valley water supply study will consist of two reports to Congress; the draft Report on Red River Valley Water Needs and Options, and the associated DEIS. A series of study component tasks outlined in the Master Plan of Study will be undertaken to complete the above two reports. The following is a short overview of those study tasks.

Scoping and Public Involvement

A cooperative approach for adequate and timely public involvement will be developed for both the draft Needs and Options Report and for preparation of the DEIS. Scoping will disclose summary information on the studies and seek public input on water needs, issues, and alternatives to be evaluated in the draft Needs and Options Report. The public will be involved in review of the DEIS.

Study Components

The study tasks will be divided into four major study component areas: Needs, Hydrology, Engineering, and Environment / Biota Transfer. Water conservation measures are integrated into all of the study

component activities and generated alternatives. The following is a short description of activities and how these inter-relate with other study component activities.

Needs Assessment (Demands) - Interest by potential users in receiving water from the Red River Valley water supply project will be determined as part of the needs assessment. Communities, existing rural water systems, future rural water systems (undeveloped service areas), and industries will be contacted and their interest in participating in the Red River studies project will be determined. Their present and future water needs will be determined based on population projections, per capita water use projections, information on existing water source quantity and quality (as it relates to the Safe Drinking Water Act regulations and treatment costs) and other established methods. Also included in the needs assessment, as required by Section 8 of DWRA, are water quality, aquatic environment, water conservation measures, and recreation.

Hydrology - The hydrologic studies will classify the hydrologic system with sufficient detail to evaluate alternatives and estimate impacts to the system. Evaluation of alternatives will be based upon whether sufficient water will be available under each alternative to meet the present and projected water demands of the Red River Valley. Specific hydrologic issues will be identified and evaluated, including surface and ground water interaction, conjunctive use related to recreation, fish and wildlife, and the potential for aquifer storage and recharge.

Engineering - The engineering study activities will cover four primary activities: 1) tasks associated with establishing the water needs (including water conservation measures); 2) tasks involving the design of water treatment facilities (potable and biota containment), storage, and conveyance features; 3) cost estimates for construction, operation, and maintenance; and 4) system operations, maintenance and optimization. The sizing of alternative facilities will be established by information developed in the needs assessment and available water resources as determined in the hydrology study component. Water conservation measures will be included in all alternatives evaluated by the study.

Environment and Biota Transfer - The environmental study component tasks will cover a wide range of topics including existing environment (baseline), river management objectives, habitat impact evaluations, cumulative impacts to Sheyenne/Red River (including Devils Lake and Lake Winnipeg), and cumulative impacts to Missouri River. The study will also cover historic properties, threatened/endangered species, Indian Trust Assets, socioeconomic, paleontological resources, and environmental justice, as required under National Environmental Policy Act (NEPA).

One or more alternatives for meeting the water needs of the Red River Valley will involve the transfer of Missouri River water into the Red River Valley. The transfer of biota from one basin to another is a major concern. The study component will evaluate the ecosystem in the Red River, identify biota in adjoining basins that are not in the Red River and assess the potential effect these biota would have on the Red River ecosystem. In addition, the study will evaluate the risks associated with biota transfer and determine if damages are preventable and avoidable by selection of alternatives, design modifications, or biota containment measures. The study component activities will include a literature search of existing data and studies, new data collection as needed, identification of concerns and issues, and development and evaluation of containment measures to minimize risk.

Preliminary Alternatives to Meet Projected Demands

The Phase II report developed a number of alternatives to meet the MR&I water needs of the Red River Valley. These and other alternatives generated from the scoping and public involvement process will be evaluated at the appraisal level. Criteria will be established to determine which alternatives will be evaluated in detail in the draft Needs and Options Report and in the DEIS.

Draft Report on Red River Valley Water Needs and Options

After the above mentioned study component activities are completed, the report will incorporate relevant study tasks to provide an evaluation of the alternatives and best apparent option(s) for meeting the water quantity and quality needs of the Red River Valley. The report will include available information and new data to develop an evaluation that will help establish the future direction of the project.

Draft Environmental Impact Statement

The development of the DEIS will closely parallel the development of the draft Needs and Options Report. The DEIS will incorporate the study component tasks as mentioned above. Completion of the DEIS will follow federal law, regulations, Executive orders, and Reclamation's environmental policies (see http://www.usbr.gov/nepa). Reclamation will be the lead federal agency for completion of the EIS. The State Water Commission and C-District will be cooperating agencies.

PUBLIC INVOLVEMENT AND SCOPING

Public Involvement

The intent of public involvement is to include the public in the preparing the reports and in implementation of the NEPA process. This includes providing public notice of NEPA related hearings, public meetings, and the availability of environmental documents so as to inform those persons and agencies who may be interested or affected. This involvement follows three basic steps:

1. Federal Register notice:
   - Publication of the Notice of Intent in the Federal Register.
   - Issue press releases.
2. Solicit comments from interested parties:
   - Send documents to interested and affected persons, agencies, and organizations, and local media..
   - Develop public involvement strategy.
   - Hold Public Meetings.
   - Conduct scoping.
3. Distribute draft reports:
   - Hold public meetings.
   - Solicit comments on the draft reports.

The intent of these three steps is that the public have fair, equal, and meaningful access to agency decision making. If these steps are completed and carefully followed, the agency's decision will likely be acceptable to many people. Also, following these basic steps can reduce the possibility of future challenges to the NEPA document.

Notice of Intent (NOI) to prepare an EIS

The Notice of Intent (NOI) is required by the Council on Environmental Quality regulations and notifies the public that an DEIS will be prepared and considered. The notice shall briefly:

- Describe the proposed action and possible alternatives.
- Explain Reclamation's scoping process, including whether, when, and where any scoping meetings will be held.
- State the name and address of a person within the agency who can answer questions about the proposed action and the DEIS.

As the lead federal agency Reclamation, in cooperation with the C-District and State Water Commission, will prepare and submit the NOI for publication in the Federal Register. Public meetings for the purpose of scoping have to be published in the Federal Register. Thus, the NOI will include to the greatest extent possible the dates and locations of public meetings that will be held. This will

minimize the need for future publications required for each meeting. Currently, Reclamation intends to include the following 2001 public meetings North Dakota in the NOI:

!	Grand Forks	date to be determined
!	Fargo	date to be determined
!	Bismarck	date to be determined
!	Pembina	date to be determined
!	Wahpeton	date to be determined
!	Valley City	date to be determined

Public Meetings

Multiple public meetings will be held throughout the course of these studies. There will be formal public meetings with the Review and Technical Teams. In addition there will be informal and formal meetings to gather technical information, clarify needs and those involving the NEPA process. NEPA requires a number of formal and informal meetings between Federal, State, and local agencies along with affected Indian tribes, stakeholders, and other interested persons.

Scoping

Scoping is a process to initiate preparation of an EIS. It is not concerned with the ultimate decision on the proposal. The CEQ regulations direct federal agencies which have made a decision to prepare an EIS to engage in a public scoping process. The purpose of this process is to determine the scope of the EIS so that preparation of the document can be effectively managed. Scoping is intended to ensure that problems are identified early and properly studied, that issues of little significance do not consume time and effort, that the draft EIS is thorough and balanced, and that delays occasioned by an inadequate draft EIS are avoided. The scoping process will:

- Invite the participants of affected Federal, State and local agencies, any affected Indian tribe, the proponent of the action, and other interested persons.
- Identify the concerns of interested or affected public, agencies, groups or organizations.
- Identify state and local agency requirements which must be addressed.
- Clearly define the environmental issues and reasonable alternatives to be examined in the EIS including the elimination of non-significant issues and those covered by prior environmental review.
- Determine the scope and the significant issues to be analyzed in depth in the DEIS.
- Identify related issues which originate from separate legislation, regulation, or Executive Order.
- Facilitate the preparation of environmental documents.

- Allocate assignments for preparation of the DEIS among the lead and cooperating agencies.
- Indicate any public environmental assessments and other DEISs which are being or will be prepared.
- Identify other environmental review and consultation requirements so the lead and cooperating agencies may prepare other required analyses and studies concurrently with, and integrated with, the DEIS.
- Ensure that all relevant issues are treated adequately.

Identification of the Audience - The audiences interested in the project are numerous and diverse. They range from local leaders to elected state and federal government officials in both the United States and Canada. The following is a list of known audiences that may be expanded through the process:

Media:
- Local and major state papers in the identified states

Interest Groups:
- North Dakota Water Users
- East Grand Forks Water and Light
- National and Regional Audubon Society
- North Dakota Wildlife Federation
- Red River Basin Board
- Red River Watershed Management Board
- Eastern Dakota Water Users
- North Dakota Chapter of the Wildlife Society
- National Wildlife Federation
- Teddy Roosevelt group of the Sierra Club
- River Keepers
- Midwest Chapter of the American Fisheries Society

Native American Interests:
- Mni Sose
- Standing Rock Sioux
- Spirit Lake Nation
- Three Affiliated Tribes
- Trenton Indian Service Area
- Turtle Mountain Band of Chippewa
- Potentially affected tribes in Minnesota, Manitoba, and along the Missouri River

Local Elected Officials and Government Entities
- Mayors
- City Council members

County Commissioners

State and Provincial Elected and Government Officials

North Dakota
South Dakota
Minnesota
Missouri
Nebraska
Iowa
Kansas
Manitoba
Canadian Consulate General

State and Federal Agencies

US Army Corps of Engineers
Missouri Department of Natural Resources
North Dakota State Health Department
US Geological Survey
Minnesota Department of Natural Resources
Minnesota Pollution Control Board
US Fish and Wildlife Service
North Dakota State Game and Fish
Environmental Protection Agency (EPA)
Minnesota and North Dakota State Historical Preservation Office (SHPO)

Methods for Distribution of Information - Communicating effectively and delivering clear and accurate information on the Red River Studies and EIS is critical to success. This information must be correct and be presented in a way that the public can understand. This information should strive to incorporate the following principles:

- No decision has been made on the outcome nor will one be made until the end of the NEPA process.
- Strive for an open and public process with full disclosure.
- All public information will be available to the public .
- Target issues, not audiences.
- Public input and agency consultation is essential.

Web Site: This web site will contain up-to-date materials that allow the reader to peruse basic study information, track study progress, and review products that are produced. The web pages should have but are not limited to summaries of meeting minutes (no greater than 4 paragraphs in length), the MOU, a frequently asked question page, schedule of events, draft

public documents when they become available, the federal Notice of Intent, and press releases.

Newsletter: A periodic newsletter will be distributed and will be posted on the website . This newsletter can target specific study related issues and will be made available to the entire mailing list It will include summarized minutes, brief statements on current activities and a time line/schedule of upcoming activities. This newsletter should be short and informative.

Presentations: Members of the SMT or their representative may be available upon request to visit with principal stakeholders and interested parties. Meetings will include conferences and county, city, or state meetings. The study should have a presence, either by itself or through each of the agencies, at public functions and conferences that have groups of people who might be interested in the study.

Public Meetings: The intent of public meetings is to gather input on various issues and provide information on the goals, processes, and products. Federal guidelines for public meetings will be followed. Representative(s) from each member of the SMT will be present at each meeting.

News Releases: News releases will be prepared to announce scheduled meetings and other significant events occurring throughout the study process.

STUDY COMPONENTS

The study tasks are divided into four major study component areas: Needs, Hydrology, Engineering, and Environment / Biota Transfer. Separate component areas for water quality and water conservation measures were not developed, but are integrated into all of the study components. Specific plans of study will be written for each study component. The specific plans of study will require that each resulting study report clearly discusses the underlying assumptions and methodologies used in the study. The study reports will also discuss the ramifications of the methodologies and assumptions chosen.

Needs Assessment

DWRA requires the draft Needs and Options Report to include MR&I water, water quality, aquatic environment, recreation, and water conservation measures. Existing data includes surveys, cost projections, analysis, and issues associated with meeting the water needs of the service area. These and additional information will be used to complete the needs assessment at a feasibility-level from which alternatives can be developed to provide a water supply of adequate quantity and quality. The

service area includes the 13 eastern counties in North Dakota plus three cities in Minnesota - Moorhead, Breckenridge, and East Grand Forks. If other water systems outside the service area also request service, the Study Management Team may decide to include them in the service area.

Methodology to Quantify Present & Future Needs

A review of methods used to quantify water needs will be conducted to determine methods appropriate to quantify the water needs in the Red River Valley for the next 50 years. The major parameters pertaining to hydrology, economics, and the environment will be defined based on accepted standards. A range of needs will be outlined for different scenarios.

Municipal and Rural

The purpose of the draft Needs and Options Report is to develop alternatives for providing a sufficient quantity and quality of water to the Red River Valley at reasonable cost. Previous studies provided a database of current and future water needs. Water conservation was considered during these studies, and it was determined that a 15 percent demand reduction could potentially be achieved through conservation. Conservation elements were not included in the previous study alternatives, however, because it was recognized that the projected water needs in these studies were based solely on average annual demands with no provisions for increased annual demands during drought. Therefore, it was decided to offset the anticipated annual water demand increases during drought by the anticipated benefits of reduced water demands through conservation. Additional evaluation of both the demand projection methodologies and the benefits of conservation are warranted at the feasibility-level. A review will be conducted of major factors affecting the amount of water used and methods to control use.

Quality - Current and Future - The present water quality of municipal and rural water systems (raw and treated) will be evaluated based on present and future drinking water standards as defined under the Safe Drinking Water Act regulations. Deficiencies in treated water quality will be documented for both present and future conditions and structural or operational recommendations will be developed to address water quality issues. Water quality requirements for aquatic environment and recreation will also be evaluated.

Quantity - Current and Future - The water needs data developed in the previous studies will be updated. This information will include population, water demand, connection types and numbers, and interest surveys. A database will be developed that outlines future water use based on per capita usage and population projections. The database will also include information on water system water source, size, age, and location. The average annual demands for the Phase I and Phase II reports were based

on actual water demands in 1993 and 1994. Both of these years were relatively wet as compared to an average year. As a result, peak annual demands could be more than 15 percent higher (as compared to potential water conservation reductions) than the demands presented in the Phase I and Phase II documents. Peak monthly demands and minimum monthly stream flows were compared in the Phase I and Phase II reports. The accepted criteria for sizing water systems is to use peak daily demands. This methodology should be used at the feasibility-level. This phase of the study should also use minimum daily stream flows rather than monthly.

Per Capita Water Use - Reports from the State Water Commission, United States Rural Development, and North Dakota Rural Water Association will be used to update a list of current water use rates. Community and rural water systems will be surveyed to develop a database of current common water use rates from similar systems (size , water use, and water type, and financing of systems). A literature search will be conducted to determine how water use rates will change in the future. The potential change in water use rates in dry years as compared to normal years may also be investigated.

Population Projections - The populations of existing water systems will be updated based on 2000 census data. A review of current methodologies used for making population projections for water projects will be completed. This includes a review of the methodology used in the previous Red River Valley Phase 1A report. A list of variables affecting how projections are estimated in the region will be completed. Criteria will be developed to establish an acceptable range of populations for the various sizes and types of water systems. The 2000 census data will be used for population projections that were not available for previous studies.

Cost and Uses - Current and Future - The current summary of water service costs will be updated using the water system interest surveys. The Environmental Protection Agency guidelines on capacity assessment for water systems, as incorporated by the North Dakota State Health Department, will be used to assess the water systems. Water users need to consider if they want to remain independent or consider combining into a regional water system.

Repayment - Cost of DWRA Water - Repayment of the federal costs of supplying water to the Red River Valley will be based on two factors: reimbursable costs on the existing Garrison Diversion features used in alternatives, and any new features constructed to provide a water supply to the Red River Valley. A summary of the reimbursable costs will be developed based on documented Garrison Diversion feature costs associated with specific water supply alternatives.

Willingness / Ability to Pay - The overall cost of providing water to certain areas can be determined but does not necessarily reflect what cost is affordable to the user. “Ability to pay” is affected by economic

factors which will be analyzed such as income, existing debt, local borrowing costs, and utility costs of the region. The "willingness" of a water user to pay for water service may be evaluated by reviewing the water rates of other similar areas. Cost data from surrounding water systems will be gathered to develop a range of water rates for various sized systems. These data along with surveys of potential water users will be used to establish a range of water service costs which will define the "willingness" or "ability to pay" for the service area.

Industrial

The availability of a reliable source of water can affect whether it is economically viable for an industry to move to an area. Industries dependence on water varies by the type of industry. Some industries need a minimal amount of drinking water, while others may require a large volume of water for production. How the cost of water influences the cost model of specific industries needs to be understood as part of the projection of future industrial water needs. In addition to cost, other factors also affect industrial water needs such as quality requirements, access to water source, system efficiency, and the quantity. The study will review and summarize the water needs for a wide variety of industries that could develop in the Red River Valley.

Economic Development - Interest surveys will be conducted to develop a baseline of potential industrial water users in the region. The historic trend in the number and type of businesses in the study area will also be evaluated. The value that different types of industries place on the availability of water when considering location in the Red River Valley will be evaluated. The Greater North Dakota Association is conducting an economic development survey in 2001 which will address opportunities to attract new industries in the valley. Data generated from that survey, as well as other sources, will be used to define the potential industrial water needs in the valley.

Summarize Water Costs for North Dakota Industries - A baseline of current water costs will be developed from information provided by local and state agencies, communities, and industries. The water costs, along with other determining factors, will be used to assess the likelihood that certain industries may locate in the Red River Valley.

Sensitivity Analysis of Water Needs to Various Industries - An analysis will be conducted to understand how various industries increase or decrease water demands based on type and size of production and other needs.

Need versus Cost Analysis - Industries will make decisions about establishing their facilities in the Red River Valley depending, in part, on the cost of water. Existing industries will also make decisions about

expansion or reduction of facilities based upon water costs. An analysis will be conducted to determine ranges or limits of water costs that support new or expansion of existing industrial facilities in the valley.

Aquatic Environment

Aquatic environment was identified in DWRA as one of the needs to be addressed in the draft Needs and Options Report. A literature search, field work and modeling will be conducted to determine the streamflow needs for a variety of aquatic life. The hydrology model flow results of the rivers will then be compared to the flow needs of aquatic life and the impacts (positive and negative) will be evaluated. Based on the results of this evaluation, the water supply needs for aquatic life will be determined for the Sheyenne and Red Rivers.

Water Quality

Water quality is an important aspect of each of the water supply needs evaluated in the study. A high quality water source simplifies the treatment of domestic water. Water quality is also important for fish and wildlife, agriculture, and for recreation. The water quality standards as defined in the Clean Water Act and the Safe Drinking Water Act regulations will be used as the benchmark for water quality analysis as it relates to river and drinking water, respectively. The water quality needs for the aquatic environment might be more stringent than the Clean Water Act regulations. A literature search will be conducted on water quality requirements as it relates to local aquatic life to determine if more stringent water course water quality is required in the study.

Recreation

The water supply needs for various types of recreational activities in the Red River Valley will be investigated. A literature search of recreational water needs will be conducted to understand the water needs for various recreational activities. The study will evaluate how the water supply project could affect water-based recreation in the Red River Valley.

Hydrology Study Component

The Red River studies require a specific hydrology analysis, which will be investigated in a joint effort between Reclamation, C-District, U.S. Army Corps of Engineers (Corps), St. Paul District, State Water Commission, and the U.S. Geological Survey (USGS). Close coordination between these agencies will reduce any research or project work overlap. These studies will focus on both surface water and ground water, including an investigation of the possibilities for conjunctive use between the two sources.

Review and Evaluate Existing Data

The hydrology study work will require data to perform the technical analyses. Initially, existing data will be reviewed and evaluated to identify:

- Surface water supply including water yield, flow rates, volumes, and water quality.
- Ground water volumes, locations, availability, and water quality.
- Other information as needed.

The following information will be investigated in a collaborative effort and will be necessary for completion of the hydrologic analyses of the Red River and Missouri River basins:

Surface Water Data - Necessary data will include water quality, historic and natural flow rates, and reservoir volumes. The USGS is presently updating the surface water quantity open-file report 90-4167 and surface water quality open-file report 91-4086 for the Sheyenne and Red River basins. The USGS will estimate flows under natural conditions (unregulated streamflow) for the period of record 1931 through 1999, which has the largest continuous database available for the region. Natural flows are flows that would have occurred in the basin without human influence that include removing the hydrologic effects of dams, MR&I use, irrigation, etc. The natural flow data may be checked for consistency by reviewing the hydrometric station's history, comparing the data to upstream/downstream stations, and comparing the data to stations in adjacent, hydrologically similar basins.

Surface water quality data sources will be investigated, including the USGS, Corps, North Dakota State Health Department, Reclamation, Minnesota Pollution Control Agency, US Fish and Wildlife Service, ND Fish and Game, Canadian International Agencies (border water quality), and the Environmental Protection Agency. Water quality constituents used for modeling will be identified based on their relationship to stream flow. Water quality sampling requirements will be determined, and additional samples will be collected and analyzed as necessary. Water quality data will be collected for use in analysis of import alternatives for Lake Audubon and Garrison Diversion Unit facilities.

Other data sources will be investigated for water quality and quantity information, such as State Water Commission, Reclamation's Denver Technical Service Center, and the Souris-Red-Rainy Basin Comprehensive Study (1974). After review of all available information, data gaps will be identified. To fill data gaps, some data may be synthesized, however some gaps in the original record will still exist.

Ground Water Data - Data sources will be investigated for ground water quality and quantity information. Necessary data will include ground water volumes, location, availability, and water quality. Agencies, such as the State Water Commission, Reclamation's Denver Technical Service Center,

Minnesota Department of Natural Resources, and North Dakota State Health Department will be the primary sources explored. These data and others will be used to analyze the feasibility of alternatives for meeting Red River Valley's water needs.

Climatological Data - Regional climatological information will be investigated for prediction of future climatic cycles , which will affect water needs and hydrologic modeling scenarios. Data sources include USGS, University of North Dakota, Minnesota Department of Natural Resources (DNR), Environment Canada, and North Dakota State University and others.

Water Rights - The water rights of North Dakota, Minnesota, and Canada need to be understood for modeling purposes. The primary contacts on water rights include Minnesota DNR, ND State Water Commission, and Environment Canada. An examination of Lake Ashtabula's water allocation and operating plan are also essential for modeling. Modeling of the Red River Basin in previous studies assumed the use of full water right allocations. Records of actual water right use in the past may be incorporated into modeling in future Red River studies.

Red River Basin Reservoirs - Data including area-capacity tables, evaporation, outlet structure design, spillway capacity, storage allocation, and operating criteria will be necessary to model the following reservoirs: Lake Ashtabula, Lake Traverse, Lake Orwell, and Red Lake. This data will be furnished by the Corps.

MR&I Water Needs - The future MR&I water needs of the study service area will be determined by the Needs Assessment study component. These future needs will determine the future baseline conditions for computer simulation. This baseline condition will be used to compare against alternative solution modeling.

Model Evaluation - Models used in previous phases of the Red River Valley studies will be evaluated along with other models currently available. Goals and criteria will be established for the Hydrologic model based on the purpose of modeling in this study and desired results.

GIS Mapping Data - A list of Geographic Information System (GIS) data that will be needed to assist in completion of the Red River Valley Study will be developed. This list will include data availability and cost. Certain GIS methodologies may be needed for analysis and public presentation; computer requirements, availability, and costs associated with these methodologies will be evaluated.

Hydrology Water Supply Analysis

The hydrologic studies will classify the hydrologic system with sufficient detail to evaluate alternatives and estimate impacts to the system. Evaluation of alternatives will be based upon whether sufficient water will be available under each alternative to meet the present and projected water demands of the Red River Valley. Existing and projected water demands will be used to calculate the reasonable probability and severity of shortages.

The following specific issues will be evaluated, among others, for impacts to the hydrologic system:

Potential for Aquifer Storage and Recharge - The ability for ground water recharge and storage will be investigated for feasibility and cost. Specifically, the West Fargo North Aquifer and Elk Valley Aquifer have been determined to have the potential for aquifer water storage and recovery.

Devils Lake Impacts - The Corps is currently completing a study for a Devils Lake outlet into the Sheyenne River. Analysis will be required to assess how the Devils Lake outlet operations might affect Red River Valley Alternatives and operational plans.

Sheyenne River Issues - The issues of stream bank stability , losses of conveyed water, and channel capacity will be highly important for future MR&I water delivery down the Sheyenne River. The Corps is collecting data on these topics already, and pertinent data will be incorporated into this study. Also, the maintenance of a minimum flow requirement in the Sheyenne will be addressed when examining conjunctive uses related to recreation, fish, and wildlife enhancement.

Conjunctive Use Related to Recreation, Fish, and Wildlife - Topics such as recreation and wildlife enhancement may alter minimum flows necessary in the Sheyenne and Red Rivers, and therefore determine how the river system should be modeled. For example, minimum flow requirements may be found necessary for conjunctive uses in the basin. Also, operating plans of reservoirs may be altered to account for wildlife enhancement and would therefore influence hydrologic modeling of the basin.

Surface and Ground Water Interaction in the Red River Basin - Relationships between surface and ground water will be examined. Topics will include river “gaining” and “losing” reaches, where water is exchanged naturally between surface and ground water sources. The Sheyenne Delta Aquifer is considered a “gaining” reach of the river supplying water into the Sheyenne River upstream of Kindred. Other areas of the Red River Basin will be examined, but emphasis will be placed on the Sheyenne River.

The following work elements will be performed to analyze the hydrologic system:

Water Quantity Modeling - Hydrologic modeling will be used to estimate whether the flows in rivers of the Red River basin can meet the present and predicted future water demands at each usage point in the basin. Various models will be evaluated, and a model that meets specific study criteria will be selected. Using this model, the reasonable probability , frequencies and severities of shortages will be determined for the present level of usage and for usage under each future scenario. Time steps shorter than monthly will be considered for critical periods. The effects of groundwater withdrawals on instream flow will also be modeled.

The Corps has recently performed modeling for the Missouri River basin as part of updating their Master Manual for operation of the mainstem reservoirs on the Missouri River. Once the alternatives are formulated for the Red River study, Missouri River depletions attributed to Red River Valley withdrawals will be estimated and analyzed. The Corps model will be used to analyze the cumulative effects of these withdrawals on the Missouri River system.

Water Quality Modeling - Water quality modeling will be used to estimate the effects on water quality for present conditions and for each alternative. A water quality model will be chosen that meets all study criteria, including the ability to relate water quality to streamflow. The output of the water quality hydrologic model will provide the streamflow data for the water quality model. The water quantity and quality of return flows will be evaluated and their impacts assessed.

Evaluation of Existing Water Supply Facilities - Existing water supply facilities will be evaluated on their ability to supply existing and future needs in the Red River Basin. Such facilities include Lake Ashtabula, Lake Traverse, Lake Orwell, and Red Lake in the Red River Basin; Lake Sakakawea, Audubon Lake, and the Garrison Diversion principal supply works in the Missouri River Basin; and Lake of the Woods in the Hudson Bay Drainage. Rural water supply facilities in Eastern North Dakota will also be investigated for supplying current and future needs in the Red River Basin.

Identification and Analysis of Specific Management Scenarios and Their Impacts - The study alternatives analyzed will lead to the determination of specific management scenarios based on their ability to satisfy Red River Basin MR&I water needs. These scenarios will be synthesized through Hydrologic modeling and evaluated for potential impacts.

Engineering Study Component

The engineering study component section in the Master Plan of Study summarizes the engineering related tasks to be completed as part of the draft Report on Red River Valley Water Needs and Options and the associated draft Environment Impact Statement. These tasks contribute to defining the water needs of the valley; the design of water conveyance, storage, treatment features; the estimation of construction and operation/maintenance costs; and the development system operations plans. All of the features developed and designed under the engineering study component will be used in combination with one or more other features to develop alternatives which meet the water supply needs of the Red River Valley.

Design Criteria for Engineering Features

Design criteria will be developed prior to the start of any study design work. The criteria developed will assure design consistency between similar features. Given the complexity and size of the Needs and Option Report, a number of entities will be working simultaneously on similar features, and a clearly established design criteria will minimize discontinuities in the design phase of the study.

Pumping Plants - This criteria will develop a basis for design of all pump stations included in any of the alternatives. Key criteria will include equipment requirements, type and configuration, electrical service, instrumentation and control, SCADA, emergency power, and design parameters (head, flow rate, number of pumping units, horsepower, etc.).

Pipelines - This criteria will be developed for designing all pipeline segments of the alternatives. Key criteria to be covered include alignments, materials, joints, depth of cover, excavation, backfill, turnouts, etc.

Water Treatment - Criteria will be developed to describe anticipated water treatment requirements. The degree of water treatment required will depend on the alternative being considered. Water being treated for human consumption could be treated to a different degree than water treated for other purposes. This criteria will address treatment technology selection, staging/sizing, operations and future requirements. Treatment criteria will address current and future requirements of the Safe Drinking Water Act (SDWA) along with the needs of the users.

Canals - This criteria will develop a basis for design of all open channel conveyance features included in any of the alternatives.

Storage - This criteria establishes the basis for providing system storage. This storage does not include user storage, but establishes storage requirements for efficient operation of any alternative. Key criteria

will include volume, siting, operations, construction and appurtenances. Storage could include ring dikes, above-ground reservoirs, and below-ground reservoirs.

System Instrumentation and Control - This criteria establishes the basis for installing instrumentation and control for facilities operation and SCADA for facilities integration. This criteria will also identify communications requirements, data exchange, and the master control station.

New Dams or Modifications to Existing Dams - This criteria establishes the basis for alternatives that include the design of new dams or the modification of an existing dam. These dams will be used to store water to meet the needs. Key criteria will include volume, siting, operations, construction, safety and fish passage.

Engineering Features

Water treatment, conveyance, and storage features will need to be designed as part of the alternative development process. Under each type of features (such as pipelines), a list of specific tasks associated with that type of feature will be developed to cover all of the alternatives generated by the study. For example, most of the alternatives include one or more pipeline conveyance/distribution feature(s), but the pipeline configuration is different depending on the alternative. Therefore, the pipeline task would identify each different pipeline feature to be investigated for the study. Each pipeline design task would identify the required capacity, size, route, buried condition, material type, appurtenances, etc.

Pipeline Conveyance and Distribution - Pipeline conveyance systems will be designed for those alternatives which involve the transport of large volumes of water. Distribution system configurations will also be developed to serve potential water users in the valley. Alternative routes of conveyance and distribution system pipelines will be evaluated to develop the most feasible and cost effective configurations. Estimated unit pipeline costs, preliminary sizing of the distribution system options, and pipeline routing options will be used to layout and evaluate the systems. Depending on the mix and or availability of pretreated raw water or fully treated water at specific locations, a recommended preliminary distribution configuration will be developed for use in the detailed alternative analysis.

Pumping Plants - Pumping plants will be designed based on capacity and pressure head requirements. Pump sizing (capacity and head) will take into consideration pipe size/class costs such that the most economical combination of pump sizes and pipe size/class material costs are designed. The availability of power (three-phase) should also be considered in selecting the locations for pumping plants.

Water Treatment Facilities - There are potentially two types of water treatment design tasks under the engineering study component; new water treatment plants and modification of existing water treatment plants. Both water treatment design tasks will assure that a safe drinking water supply is available in the Red River Valley.

> Design of New Water Treatment Facilities - Some alternatives generated by the study may involve the design of new water treatment plant(s) capable of producing safe drinking water within the valley. The type, size, and location of water treatment plant(s) will be dependent on the location and quality of the available raw water sources.
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> Modification of Existing Water Treatment Facilities - The existing water systems in the valley will be evaluated to assure they can produce a safe supply of drinking water in accordance with present and proposed Safe Drinking Water Act regulations. If it is economically feasible, existing water treatment facilities my be rehabilitated to meet some of the water demands in the valley. The rehabilitation work will depend on the condition of the current facility and the quality of the available raw water source(s).

Biota Containment Systems - Some of the project alternatives involve importation of Missouri River water into the Red River basin. Therefore, project features need to be developed which are designed to contain organisms that may cause environmental damages if transferred into the basin. The ability of the proposed containment system to properly contain problem biota needs to be assessed. "Containment" is defined as "the condition in which an organism, including all its forms capable of reproducing, is prevented from freely moving beyond a specific location." For those alternatives involving importation, containment systems will be developed that consider project siting, magnitude of consequences (and therefore the extent of containment needed), and design and assessment of barriers (including need for redundancy). The analysis of containment systems will be focused on the likelihood of success of containing species identified as problems in the Environmental section, flexibility of the system to respond to changed circumstances that may appear during project operation, and assessment of costs of containment systems. This analysis will be part of the draft EIS.

River Bank Stabilization - Hydrologic modeling will be conducted on the Sheyenne and Red Rivers to determine if a change in historic river flows, as created by some alternatives, will have a detrimental effect on river bank stability. If there is a determination that the changed flow conditions have contributed to bank instability, some stabilization measures on the rivers may need to be designed.

Aquifer Recharge and Well Fields - Aquifer recharge was considered in one of the Phase II report alternatives. That work may need to be revised at the feasibility-level depending on how that alternative

fairs in the evaluation process. Aquifer recharge may also be considered in other alternatives as the study proceeds to the feasibility-level.

The development of additional ground water capacity in the Red River Valley was a feature in some of the Phase II report alternatives. The development of new or expanded well fields, as outlined in the Phase II report, will need to be reviewed and upgraded to the feasibility-level, if applicable.

New Dams or Modifications to Existing Dams - The design of a new dam and the modification of an existing dam were features developed in the Phase II report to meet the water needs of the valley. The dam appraisal-level design work conducted in the Phase II report will be reviewed and updated as necessary for this phase (feasibility-level) of the study.

Water Conservation Measures - Water conservation could be an engineering feature as it relates to the potential repair or replacement of existing water distribution systems to reduce water demand. If a determination is made that a MR&I system has excessive water losses associated with the condition of that system, the most economical option to meet some of the water demand might be the repair or replacement of all or part of the water distribution system.

The DWRA identified other needs in addition to MR&I. There also might be some engineering tasks associated with investigating water conservation measures which could reduce the water demand for these other needs.

Garrison Diversion Unit Principal Supply Works Upgrade Costs (Canal, Structures, SCADA) - Completion and improvement to the existing Garrison Diversion facilities linking Lake Audubon to the New Rockford Canal are required for several alternatives. A minimum of two levels of flow capacity will be evaluated, one for pipeline options and one for delivery of water via the Sheyenne River to the Red River. Sizing, layout and configuration of the connecting links between the McClusky Canal and the New Rockford Canal will be developed under the pipeline tasks. For the river delivery system, additional facilities (pump station, pipeline and energy dissipation structures) are required to connect the New Rockford Canal to the Sheyenne River.

Abandonment of Unused Garrison Diversion Unit Facilities - Under the “No-Action” and in-basin alternatives for meeting the water needs of the Red River Valley, a significant portion of the Garrison Diversion Unit principal supply works will be considered for decommissioning and abandonment. A determination will have to be made as to what principal supply works features will be abandoned and the method(s) used. The cost of abandonment will vary greatly depending on whether the features are basically “moth-balled” or a complete reclamation of the canal and structure sites is undertaken.

Effects of Safe Drinking Water Standards on Existing and New Water Sources - The Phase IA and II reports quantified the availability of existing water sources in the Red River Valley. The Safe Drinking Water Act (SDWA) regulations are proposing stricter water quality contamination levels which could affect the viability of water sources identified in the Phase IA and II reports. The water supply sources identified in the Phase IA and II reports will be reviewed using the latest SDWA regulations to verify these water sources are still available in the study area.

Condition of Present Water Treatment/Distribution Systems - Part of the public scoping process will include an evaluation of existing rural and community water systems to assess whether they currently meet the water quality requirements in the Safe Drinking Water Act. The water systems will also be assessed as to whether the systems will meet future treatment regulations. The water system evaluations will provide information about potential additional water needs.

Review Garrison Diversion Unit Existing Facility O&M Costs

The cost of operating and maintaining existing Garrison Diversion Unit facilities was estimated in the Phase II report for various alternatives. These cost estimates need to be reviewed and a determination made as to whether they were conducted at a sufficient level of detail (appraisal vs. feasibility) to be used in this phase of the study.

Water Conservation Measures

Water conservation measures can reduce the water supply needs of an area in two ways, supply management or demand management. Supply management affects water needs by controlling water delivery prior to use by the customer. This includes water metering, minimizing system water pressure, water auditing and leak detection, and an active repair/replacement program for the water distribution system. Demand management affects water needs by minimizing customer water usage. This includes public education programs, enforcement of water codes, low-water-use landscaping, retrofitting of in-home water fixtures, and conservation-oriented water rate structures.

Water loss can occur in any part of a water system. To assess water loss, a list of variables affecting water loss will be compiled, a review of the acceptable methods for minimizing water loss will be completed, acceptable limits will be determined for the various water needs, and a baseline of current water losses will be compiled.

The water quantity and quality impacts to downstream water users as a result of water conservation measures in upstream communities will be evaluated in the study. An example would be the impacts to Grand Forks due to changes in the Fargo return flows.

Supply Management Measures -

Water Metering - Water metering all customers provides valuable water use data to the system managers and the consumer. This also includes a meter testing and replacement program to assure accurate water use measurement.

Minimizing Water System Pressure - Controlling and reducing, where possible, the maximum pressure in water delivery systems is a proven water use reduction measure. This should include all new service areas as well as the retrofitting of existing services.

Water Auditing and Leak Detection - Water systems should conduct water audits and have an active leak detection program. This should include the repairing (pipe replacement if un-repairable) of all water system leaks. The condition of existing MR&I distribution systems may be evaluated to determine if unaccounted for water losses (leaks) are sufficiently high to justify structural solutions (pipe replacement) as a viable option to reducing water losses.

Water Reuse - A water reuse program looks at opportunities to reuse treated wastewater for non-potable water system needs such as public landscape watering.

Water Exchange - Water systems could experience water shortages due to nature or system component failure. Water exchange could allow a system to import or export water with another system. The purpose of the exchange could be to address needs during droughts, system failures, high demand periods, or to allow a water system to recharge its water source. Variables affecting water exchange will be identified. Acceptable levels will be identified relating to quality, quantity, and cost of developing exchanges. Baseline information of existing exchanges will be developed from surveys within the region. Possible detrimental effects of the interaction of different water sources (water chemistry) will also be evaluated where water exchanges are proposed.

Emergency Plans - The main purpose of an emergency plan is to prevent users from harm or damage to the system. The plan will evaluate temporary solutions to meeting water needs until the emergency is over and water service is restored. A list of emergencies for the various types of water uses will be developed with factors that create, enhance, or prolong an emergency. Variables affecting the implementation of emergency plans will be discussed. A range will be developed of acceptable upper and lower levels of duration and cost for using a plan. A survey of water systems will be used to determine a baseline of existing plans outlining goals, successes, and failures.

Demand Management Measures

Public Education - The institution of public education, outreach and demonstration programs about the benefits of water conservation can create a public awareness of the value of water conservation.

Water Codes and Ordinances - The policies (codes and ordinances) a water system applies to its users affects how, how much, who, and when water is used in times of wet, dry and average conditions. A summary of current policies will be obtained from surveys or reports available from water systems within the Red River Valley. This summary will be based on similar water systems and will determine a baseline of policies being used with goals, successes and failures of policies. A literature search will also be conducted to investigate water use policies which have been employed in other regions of the country. A list of variables affecting implementation of water use policies will be compiled. A list will be made of policies that could be applicable for addressing water use to meet the needs of various water users.

Low-Water-Use Landscaping - The encouragement or requirement of low-water-use landscaping, efficient irrigation (lawn/garden), and irrigation designs for new developments. Also, a public education program on the benefits of low-water-use landscaping for existing homes and business should be conducted.

Retrofitting of In-home Plumbing Fixtures - Retrofitting kits and/or programs to lower interior water use in existing homes, or rebates for the installation of new water conserving fixtures. Typically these fixtures include faucets, toilets, dishwashers, clothes washers, showerheads, sprinkler systems, fire protection components, livestock watering components, and many others. This portion of the study will include a summary of acceptable industry standards, a list of variables affecting the replacement of components, a review of acceptable methods for installing components, and a summary of expected cost versus benefit analysis of this type of water conservation measure.

Conservation-Oriented Rate Structures - The implementation of conservation-oriented rate structures should be considered to provide incentives for efficient water use. The water service rate structure could be graduated into multiple rates such that excessive water use would be charged at a higher rate than normal use.

Engineering Cost Estimates

Engineering cost estimates will be conducted at the feasibility-level for the best alternatives identified in the evaluation process.

Construction - Construction costs estimates for the best alternatives will be developed at the feasibility-level. Construction costs will be presented as "total project costs" that include contract cost, contingencies, and non-contract costs (engineering, administration, legal, etc.).

Operation and Maintenance (O&M) - Develop and summarize annual O&M costs required to operate any system identified in an alternative. These costs would be broken out for distribution pipeline facilities, treatment plants, and supply water pipelines. O&M costs would include labor, power, chemicals, equipment, parts/repairs, and replacement.

Water Rate Structure - Construction and O&M costs will be used to develop a composite water rate structure for the Phase II alternatives. During the public scoping process, rural and community water systems will be approached and a determination made as to their interest in participating in the water project. Interested rural and community water systems will want to know how much they could expect to pay for water under the project.

System Operations

General system operation plans need to be developed for each of the alternatives to assist in their evaluation. These plans will include a discussion of what portions of the water system will be operated by what entities, special seasonal (winter) operating conditions, summary discussion of normal operating procedures, and review of master control system.

Inter-basin Alternatives - The inter-basin alternatives will have special system operation requirements related to the biota transfer concerns. These special requirements will need to identify specific operational safeguards related to the biota transfer.

In-Basin Alternatives - Refer to general system operational plans described above.

Emergency Action Plans - The system operation plans should also identify what emergency action plans will be developed for each alternative. Emergency action plans will be required for potentially reasonably foreseeable unplanned events which could jeopardize the ability of the system to treat/deliver the water or contaminate a water course.

Environmental and Biota Transfer Study Component

The environmental and biota transfer plan of study components are part of the larger Master Plan of Study for the draft Report on Red River Valley Water Needs and Options and the associated draft Environment Impact Statement.

Review and Evaluate Existing Data

The environmental study group will gather and review all pertinent data in order to establish a baseline; this will include all entities (government and non-government) who are currently researching or maintaining databases for the study area. Coordination among the study participants and outside entities will avoid duplication of effort and will identify potential data gaps.

Literature Search - A comprehensive literature search for pertinent environmental data to the study area will be conducted including:

- Biological data
- Water quality data (as it relates to aquatic life)
- Cultural and paleontological resources
- Site specific geomorphology data
- Inter-basin water transfer data

Additional data will be gathered from the U.S. Army Corps of Engineers, U.S. Geological Survey, U.S. Fish and Wildlife Service, Minnesota Department of Natural Resources, North Dakota Game and Fish Department, North Dakota State Historic Preservation Office, Minnesota State Historic Preservation Office, Minnesota Pollution Control Agency, and North Dakota State Health Department concerning existing environmental, biota transfer, flow and water quality data. An annotated bibliography will be prepared and maintained throughout the study.

Environmental Components

Flow Assessment for the Sheyenne and Red Rivers - The flow assessment for the Sheyenne and Red Rivers will be updated using the most current data available. Impacts to each river will be estimated for each alternative. Areas of impact are to include aquatic habitat, aquatic life, riparian habitat, wildlife needs, bank stability and water quality (as it relates to aquatic life). Minimum flow recommendations for each river will be developed to provide for aquatic life and riparian corridor maintenance.

Other Impacts - Direct and indirect impacts that could result from each alternative will be estimated. Other possible impacts include, but are not limited to, grasslands, wetlands, woodlands, paleontological resources (fossils), and prime farmland.

Water Quality - Following determination of water quality data availability, specific water quality standards will be selected for further analysis and modeling purposes. The selected parameters will be evaluated in terms of the state of North Dakota's water quality standards which are in accordance with the 1972 Federal Water Pollution Act, as amended, which were established for the protection of public health and enjoyment of the state's water resources, and to ensure the propagation and well-being of fish, wildlife, and all biota associated or dependent upon the state's water resources.

Recreation - Potential recreation enhancement opportunities will be explored. Recreation enhancement opportunities and potential adverse impacts on recreation will be evaluated for each alternative.

Cost/Benefit Analysis of Natural Resources - Both economic and non-economic costs and benefits of each alternative will be evaluated from natural resource and ecological standpoints. Revenue generated as a result of natural resources in the study area will be estimated, and alternative induced economic and ecological impacts to natural resources will be evaluated.

Fish and Wildlife Enhancement Opportunities - Any potential fish and wildlife enhancement opportunities that exist will be explored. Enhancement opportunities will be evaluated for each alternative. Enhancement opportunities may include wetland mitigation, wetland creation, habitat enhancement, etc.

Cumulative Impacts - Potential cumulative impacts, resulting from an outlet from Devils Lake, will be evaluated. Cumulative impacts resulting from other potential discharges or withdrawals in the study area will be determined as well. In addition, impacts to source and recipient water bodies (e.g.- Lake Winnipeg and Missouri River) will be evaluated for each alternative.

Threatened and Endangered Species - Any threatened or endangered species in the study area, or in any other potentially impacted area will be identified. Life histories for each species will be determined and used to evaluate any alternative induced impacts.

Cultural Resources - A literature search will be conducted for all project areas to identify all previously recorded cultural resources and determine any areas that have been previously inventoried for cultural resources. The results will be plotted on a GIS layer for all alternatives. Reclamation will consult with the North Dakota and Minnesota State Historic Preservation Officers and tribes about the identification of historic properties in the area of potential effects of each alternative. Identification efforts will include predictive modeling, pedestrian survey, and evaluation of cultural resources.

Whenever possible construction features will be designed to avoid adverse effects to historic properties, but data recovery may be necessary to mitigate adverse effects. Reclamation will ensure

that all compliance activities associated with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, will be completed prior to any ground disturbing activities. It is anticipated that a programmatic agreement with the Advisory Council on Historic Preservation, State Historic Preservation Officers, tribes and Reclamation (in cooperation with the C-District and State Water Commission) will be needed.

Socioeconomic - Socioeconomic impacts on affected communities in relation to long term water supply and management will be determined. In addition, environmental justice, particularly whether or not water management activities have a disproportionately high and adverse effect on minority and low-income populations will be evaluated.

Permits and Consultation - The U.S. Fish and Wildlife Service will be consulted under Section 7 of the Endangered Species Act concerning potential impacts to threatened and endangered species. The Fish and Wildlife Service may also prepare a Fish and Wildlife Coordination Act Report.

An application for a permit for Section 404 and Section 401 (water quality) of the Clean Water Act will be submitted, as needed, to the proper source after final designs and before construction. Also, the appropriate State of North Dakota water and construction permits will be obtained at the same time. In addition, all other pertinent state and federal compliance requirements, which relate to any component of the selected alternative, will be addressed as required.

Biota Transfer

Biota transfer. Some of the alternatives involve importation of Missouri River water into the Red River basin. This requires an assessment of impacts of biota transfer. The objectives of this assessment are to:

- Identify potentially damaging biota, understand their life history, determine the physical and biological mechanisms that could affect their distribution, and how these mechanisms differ among alternatives.
- Determine ecological, economic, and natural resource consequences that could ensue if the identified biota were to be spread by the project. Natural resource damages include, but are not limited to, damages to ecosystems and changes that decrease the utility of uses of resources, or increase the cost of utilizing these resources.
- Reduce uncertainty regarding the risk of adverse ecological, economic, and natural resource impacts from transfer of damaging biota to the Red River basin.

- Determine if such damages are preventable and avoidable by selection of alternatives (including in-basin alternatives), design modifications, or biota containment measures; and assess the biological, engineering, and cost feasibility of containment measures that operate during the life of the project for those alternatives that involve importation of Missouri River water into the basin.
- Present findings in a manner that will allow ecological, economic, and natural resource risks and damages associated with and compared to other adverse and beneficial impacts of each alternative, to facilitate an accurate assessment of benefit-cost and feasibility for each alternative.

PRELIMINARY ALTERNATIVES TO MEET PROJECTED DEMANDS

The Red River Valley Water Needs Assessment, Phase II report (Appraisal of Alternatives to Meet Projected Shortages) developed eight alternatives to meet the MR&I water needs of the Red River Valley. The DWRA now includes water quality, aquatic environment, recreation, and water conservation measures, as additional needs which were not addressed in the Phase II report. Some commenting agencies raised concerns about some aspects of the Phase II report. These concerns were documented in the Phase II addendum and will be addressed in the draft Needs and Options Report and in the DEIS.

The alternatives were divided into three groups: No-Action, in-basin, and inter-basin. The No-Action alternative is required in a DEIS and is defined below. The in-basin alternatives use water resources within the Red River Basin. The inter-basin alternatives require a transport of water from the Missouri River to the Red River Basin.

The Phase II report defined two projected water needs: Reclamation's projected 2050 MR&I needs and participants projected 2050 MR&I needs. The Phase II report never resolved the difference between water needs projected by Reclamation and Red River Valley participants. The needs will be reassessed in this study. All of the alternatives (except No-Action) in the Phase II report met the water needs as projected by Reclamation. Only the alternatives involving inter-basin transfer of the Missouri River meet the water needs using the participants projected 2050 MR&I needs.

All of the alternatives developed in the Phase II report included water conservation measures. The draft Needs and Options Report studies will further investigate potential water conservation measures which could reduce water needs in the Red River Valley and include these measures in the alternatives as appropriate.

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Alterative 1 - No Action (Future Without)

The National Environmental Policy Act requires that a No-Action alternative be considered in the DEIS. The No-Action alternative represents the most likely future condition if no new major federally funded water supply project is constructed.

In-Basin Alternatives

Alternative 2 - Kindred Reservoir

The main feature is the construction of a new water supply reservoir on the Sheyenne River near Kindred, ND. The alternative also includes a pumping plant and pipeline to upper Red River, additional surface storage in 22,000-acre-foot ring dike, and distribution and delivery to rural water systems.

Alternative 3 - Enlarged Lake Ashtabula

The main feature involves raising the height of Baldhill Dam on the Sheyenne River near Valley City, ND, to increase water storage. The alternative also includes a pumping plant and pipeline to upper Red River, additional surface storage in two 22,000-acre-foot ring dikes, development of Spiritwood Aquifer well field, and purchase of some irrigation water rights for rural water system use.

Alternative 4 - Groundwater Expansion

The alternative generally involves the development of groundwater resources in the North Dakota Red River Valley. The alternative includes a pumping plant to distribute surface water from the Sheyenne River to the upper Red River, two 22,000-acre-foot ring dikes, a new well field in the Spiritwood Aquifer, purchase of 30% of existing irrigation groundwater water rights, a 10,000-acre-foot aquifer storage and recovery system, and numerous desalinization plants (total capacity 45-MGD) using water from the Dakota Aquifer.

Inter-Basin Transfer Alternatives

Alternative 5 - Bismarck to Fargo Pipeline

The alternative involves the import of Missouri River water via a pipeline from Bismarck to Fargo. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping

plant on Missouri River near Bismarck, branch pipeline to upper Red River, two ring-dike reservoirs for pipeline re-regulation, and surface-water diversions and distributions for rural water systems.

Alternative 6 - Lake Oahe to Wahpeton Pipeline

The alternative involves the import of Missouri River water via a pipeline from Lake Oahe south of Bismarck, ND, to the vicinity of Wahpeton, ND. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on Lake Oahe near Linton, ND, a ring-dike reservoir for pipeline re-regulation, and surface-water diversions and distributions for rural water systems.

Alternative 7 - Garrison Diversion Unit Supply Works to Sheyenne River

This alternative involves the import of Missouri river water to the upper Sheyenne River utilizing existing Garrison Diversion Unit principal supply works. Four sub-alternatives were developed for this option.

Alternative 7A - The alternative includes a pumping plant on McClusky Canal to deliver water to New Rockford Canal, a biota treatment plant (as defined in Chapter 5 of the Phase II report) at the end of New Rockford Canal, a pipeline from New Rockford Canal to the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7B - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on McClusky Canal to deliver water to the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7C - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on McClusky Canal to deliver water to New Rockford Canal, a second biota treatment plant at the end of New Rockford Canal with pipeline discharging into the upper Sheyenne River, a pumping plant and pipeline to the upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 7D - The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant on the McClusky Canal to deliver water to the upper Sheyenne River with an additional 25-cfs pipeline delivering water treated to remove biota to the Grand Forks area, a pumping plant and pipeline to upper Red River, and surface-water diversions and distributions for rural water systems.

Alternative 8 - Western Red River Valley Pipeline

This alternative involves the import of Missouri River water via a system of closed pipelines from the Garrison Diversion Unit principal supply works to cities, industries, and rural water systems of the Red River Valley. The alternative includes a biota treatment plant (as defined in Chapter 5 of the Phase II report) and pumping plant at the end of New Rockford Canal with pipeline delivery of water treated to remove biota to most sites within the study area.

Other Alternatives

Alternatives Identified in the Public Scoping Process

A public involvement and scoping process will be conducted as part of the development of the draft Needs and Options Report and the associated DEIS. The public involvement and scoping process will be used to assure there is a cooperative approach for adequate and timely public involvement in the study. The scoping process will disclose summary information on the studies and seek public input on water needs, issues, and alternatives, to be evaluated in the draft Needs and Options Report. Through the scoping process additional alternatives may be generated by the public or interested parties and these alternatives will be evaluated as part of the report.

Alternatives Generated through Further Study

Through the process of reviewing the previous Red River Valley water supply reports, other alternatives may be developed as existing and new data are reviewed. All of the alternatives proposed in previous reports will be reviewed and revised as necessary so that these accurately depict future conditions. This review process may result in additional alternatives to be considered under this study.

For example, water conservation was a feature considered in the Phase II Report. Water conservation measures could be an alternative that could satisfy needs or could be used in conjunction with other alternatives. Water conservation measures will be studied independently using existing and new data to determine effects, benefits, and costs.

Develop Criteria for Alternative Selection

A realistic range of alternatives that could reasonably accomplish the purpose and need of the project will be considered. Criteria will be developed for elimination of alternatives that are not technically feasible or reasonable. The technical team will recommend a list of criteria for this alternative selection process for application by the interdisciplinary NEPA team preparing the DEIS.

Examples of reasons for elimination are: "1) failure of the alternative to meet the requirements of the purpose of and need for the action, 2) the alternative cannot be technically implemented, 3) the alternative is prohibitively greater in cost of in environmental impacts than the other alternatives, or 4) the alternative cannot be reasonably implemented....The issue of reasonableness is a judgement call by Reclamation" (Reclamation NEPA Handbook 2000:8-11).
Screening criteria could include such items as "cost limits, geographical boundaries, scheduling goals, or time constraints" (Reclamation NEPA Handbook 2000:8-11).

DRAFT REPORT ON RED RIVER VALLEY WATER NEEDS AND OPTIONS

The report will provide an evaluation of the alternatives and best apparent option for meeting the MR&I water supply requirements of the Red River Valley. The study will use available information and new data to develop an evaluation that will help establish the future direction of the project.

Outline of draft Report on Red River Valley Water Needs and Options

1. Executive Summary
2. Introduction and Background
3. Existing and Proposed MR&I Water Demands
4. Minimum Flow Demand Assessment
5. Treatment Required for Boundaries Water Treaty
6. Features Considered for Addressing Water Demands
7. Alternatives Considered to Address Water Demands
8. Alternatives Evaluation
9. Financial Analysis
10. Findings and Conclusions
11. Appendixes

DRAFT ENVIRONMENTAL IMPACT STATEMENT

In compliance with the National Environmental Policy Act, Reclamation and the State of North Dakota will jointly prepare and complete a DEIS concerning all feasible options to meet water needs of the Red River Valley.

1. DEIS Outline
2. Cover sheet
3. Executive summary

4. Table of contents
5. Purpose and need for action
6. Alternatives including the proposed action
7. Affected environment
8. Environmental consequences
9. List of preparers
10. Distribution list
11. Index
12. Appendices