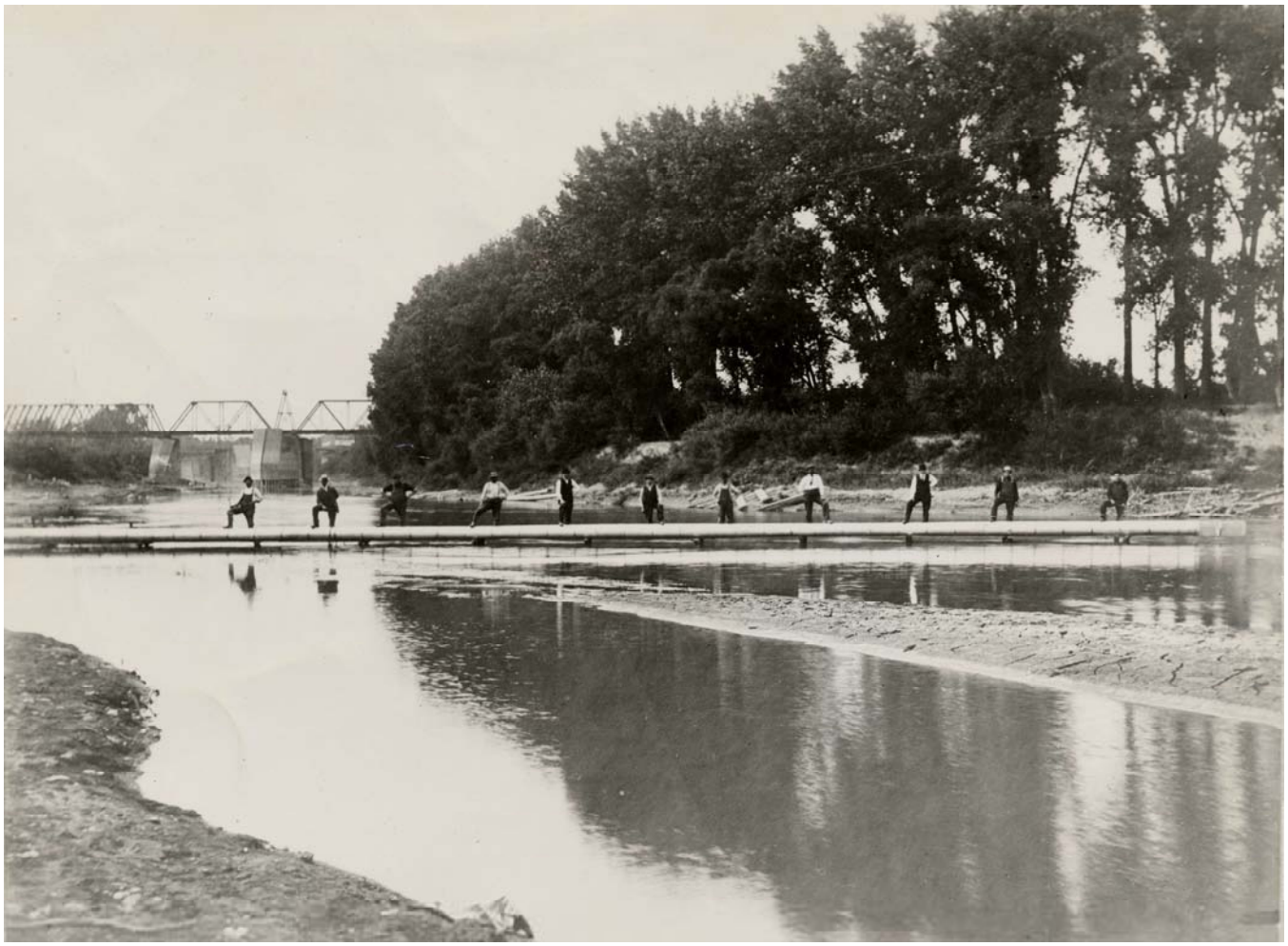
RECLAMATION
Managing Water in the West

Comprehensive Report
Red River Valley Water Supply Project



U.S. Department of the Interior
Bureau of Reclamation
Great Plains Region
Dakotas Area Office

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Introduction

Without the Project During a 1930s-Type Drought, 1,200 Truckloads of Water Would Be Needed Each Day in Fargo to Supply Basic Indoor Water Needs

The residents and industries in the Red River Valley in North Dakota and Minnesota face a potential water supply crisis. Most of the people living in the Red River Valley rely on the drought-prone Red River of the North and its tributaries as their primary or sole source of water. For this reason the Project (Red River Valley Water Supply Project) is being proposed. Studies predict that the present water supplies would be inadequate during a severe drought similar to one that occurred in the Red River Valley during the 1930s. For example, in 1934 there were nearly five consecutive months of zero flow in the Red River at Fargo, North Dakota. During such a shortage, it would take 1,200 truckloads of water per day to supply Fargo's basic indoor household water needs. That is a truckload of water arriving every minute around the clock for five months to meet the current water needs. Given the predicted future population growth in the valley, the projected water supply shortages will become even greater in the future.

The Proposed Project is in the Red River Basin in North Dakota and Minnesota.

Planning for future droughts is necessary because droughts have affected the northern Great Plains numerous times during the past 2,000 years. Two of the most severe regional droughts in USGS (U.S. Geological Survey) records were in the 1930s and the 1980s. Meridian Environmental Technology, Inc. concluded from a drought frequency study that the 1930s drought was not an anomaly occurring every 1,000 years; it typifies the type of drought that could realistically be repeated before 2050. According to the United States Drought

Monitor, in 2006 the Red River Valley experienced a moderate to severe drought. In fact, the National Weather Service ranked 2006 as one of the 10 driest years on record, and noted that the state has had "at least one major drought in every decade since 1900, except for the 1940s" (*Grand Forks Herald*, December 26, 2006).

The proposed Project would supply water to meet the comprehensive water needs of people and industries in the Red River Valley through the year 2050. Analyses in the FEIS (final environmental impact statement) focus on water shortages that would occur during a drought similar in severity to the 1930s. The future demands for water include projected increases in population and industrial growth.

Purpose of the Comprehensive Report

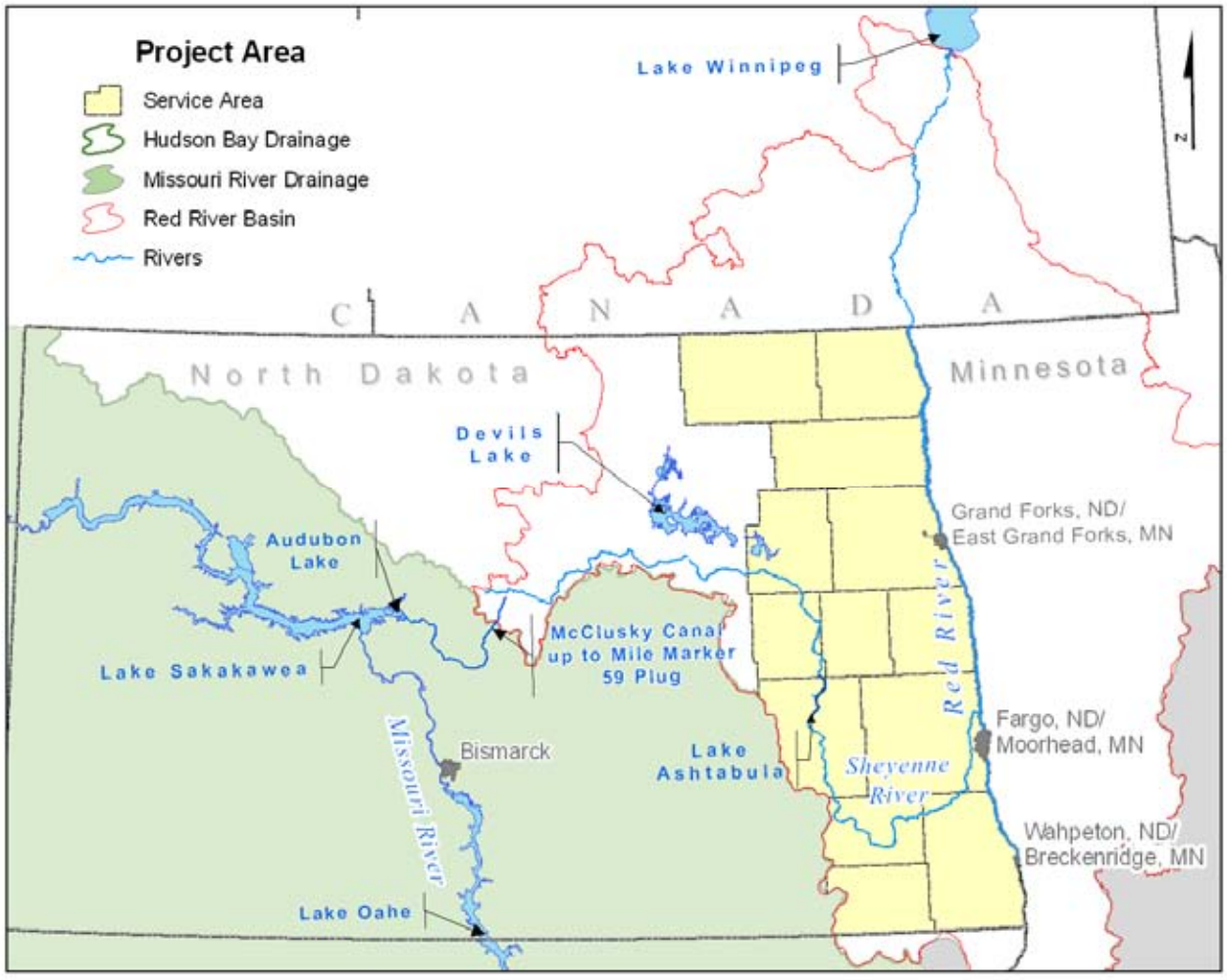
The DWRA (Dakota Water Resources Act) Section 8 requires preparation of three documents for the Project: (1) a Needs and Options Report (*Report on Red River Valley Water Needs and Options)*, which is a needs assessment and engineering study prepared by Reclamation (U.S. Department of the Interior, Bureau of Reclamation), on behalf of the Secretary, and (2) an EIS (environmental impact statement) jointly prepared by Reclamation (the lead federal agency) and the state of North Dakota, represented by Garrison Diversion Conservancy District, and (3) this Comprehensive Report (*Comprehensive Report for the Red River Valley Water Supply Project*).

The Comprehensive Report describes the proposed Project feature, summarizes issues evaluated in the Project's FEIS, discusses the likely effects of the Project on other states, and explains how the proposed Project feature complies with the Boundary Waters Treaty of 1909. Compliance with the treaty is necessary because the Red River flows north into Canada. DWRA (Public Law 106-554), Section 8(a)(3)(A) directs the Secretary of the Interior, Bureau of Reclamation to prepare this report, as follows:

> Dakota Water Resources Act Section 8(a)(3)(A)
> *If the Secretary selects a project feature under this section that would provide water from the Missouri River or its tributaries to the Sheyenne River water supply and release facility or from the Missouri River or its tributaries to such other conveyance facility as the Secretary selects under this section, no later than 90 days after the completion of the final environmental impact statement, the Secretary shall transmit to Congress a comprehensive report which provides—*
>
> *(i) a detailed description of the proposed project feature;*
> *(ii) a summary of major issues addressed in the environmental impact statement;*
> *(iii) likely effects, if any, on other States bordering the Missouri River and on the State of Minnesota; and*
> *(iv) a description of how the project feature complies with the requirements of section 1(h)(1) of this Act (relating to the Boundary Waters Treaty of 1909).*

Proposed Action

The Department of the Interior, Reclamation and the state of North Dakota propose to construct the Project to develop and deliver a bulk water supply to meet both short-term and long-term future water needs of the Red River Valley in North Dakota and Minnesota. The proposed action would include construction of facilities needed to develop and deliver sufficient water to existing infrastructure for distribution to MR&I (municipal, rural, and industrial) water users in the service area (see Project map).



Area of the Proposed Project

Purpose and Need for the Project

The proposed Project would supply water to meet the needs of people and industries in the Red River Valley through the year 2050. The purpose of the proposed action in the FEIS was established by Congress and is to meet the "comprehensive water quality and quantity needs of the Red River Valley" [DWRA Section 8(c)(2)(A)]. The quality and quantity needs are defined by DWRA as MR&I water supplies, water quality, aquatic environment, recreation, and water conservation measures [DWRA Section 8(b)(2)]. The DWRA directs construction of features that meet water supply needs, including MR&I water supply demands, groundwater recharge, and streamflow augmentation [Section 8(a)(2)].

These needs were quantified in the Final Needs and Options Report. This report was prepared and published pursuant to DWRA Section 8(b).

MR&I, Recreation, and Water Conservation Needs

Studies indicate there is a need to provide water to people and industries in the service area, which includes the 13 eastern counties of North Dakota, plus the Minnesota communities of Breckenridge, Moorhead, and East Grand Forks (see Project map). The population of the service area is 315,522, and the current water demand is 65,664 ac-ft (acre-feet). The estimated population in the service area in 2050 would be 479,252, and total maximum annual water demand would be 113,702 ac-ft. This water demand includes water for recreation and incorporates water conservation measures.

Water Quality Need

Historic water quality in the Red River Valley was evaluated by USGS. USGS found that historically water quality in the Red River Basin was generally suitable for intended uses, but there have been exceedances of standards or criteria. Most exceedances were brief, and many occurred prior to the current levels of wastewater treatment. The report states, "concentrations of major ions, including sulfate and specific conductance, have approached and occasionally exceeded water-quality standards or criteria and may continue to do so. These exceedances are to be expected because of base flow that is sustained from groundwater discharge from several aquifers, some of which are known to contain high concentrations of dissolved salts that contain sulfate and other ions." Given the generally adequate historic and predicted future water quality in streams, the water quality need identified through the Final Needs and Options Report and other studies did not significantly influence the development of the Project alternatives.

Aquatic Environment Need

Aquatic environment needs take the form of flow targets or minimum volumes of water that would be reserved for aquatic use. The FEIS includes two approaches to define the aquatic need for the Red River Valley study area: 1) a basic aquatic need and 2) target flows on the Sheyenne and Red Rivers recommended by North Dakota Game and Fish Department. Both aquatic needs would be met, along with the other needs, by the proposed Project.

Authorization and History

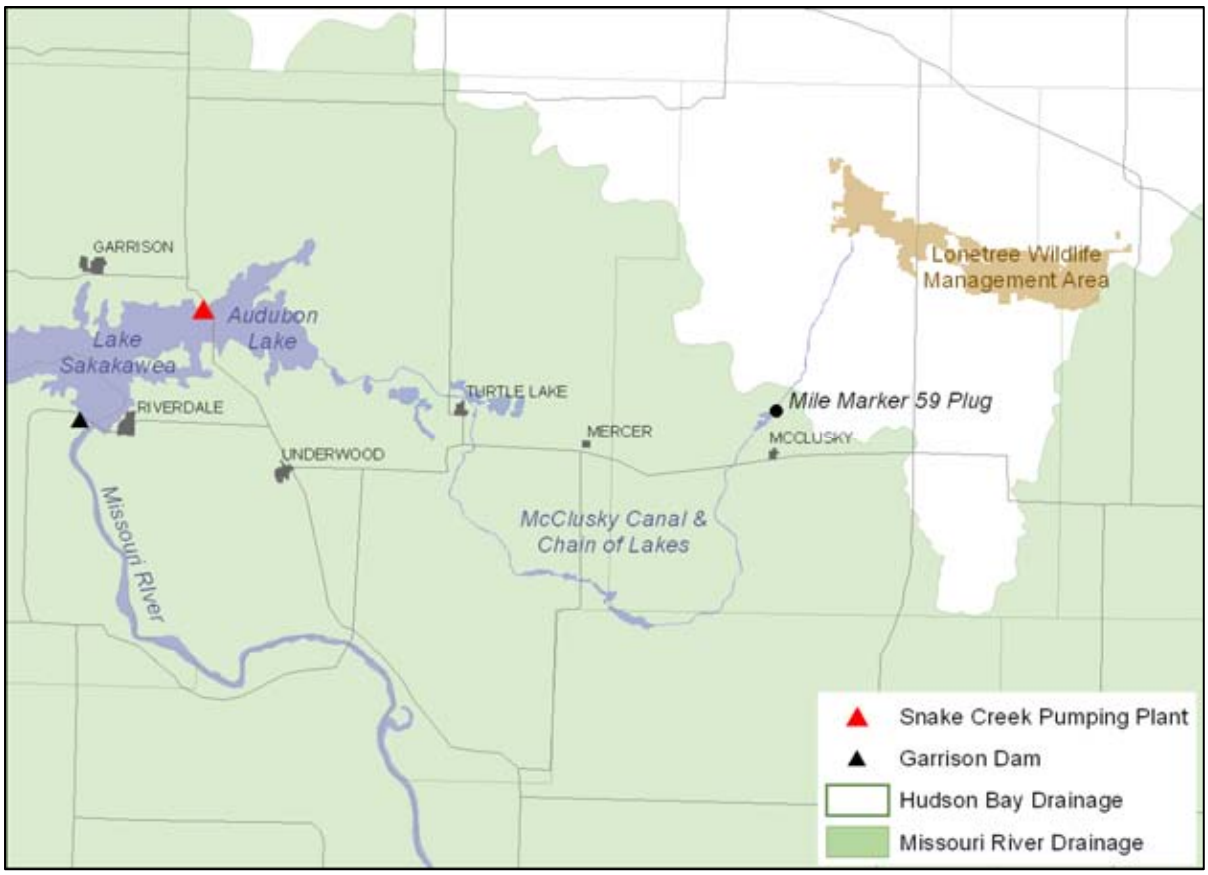
DWRA provides the underlying authority for the Project. Section 8 directs the Secretary of the Interior to conduct a comprehensive study of the water quality and quantity needs of the Red River Valley in North Dakota and possible options for meeting those needs. It also directs the Secretary of the Interior and the state of North Dakota to "jointly prepare and complete a draft environmental impact statement concerning all feasible options to meet the comprehensive water quality and quantity needs of the Red River Valley and the options for meeting those needs including delivery of Missouri River water to the Red River Valley [Section 8(c)(2)(A)]…Not later than 1 year after filing the draft environmental impact statement, a final environmental impact statement shall be prepared and published" [Section 8(c)(A)(3)].

The DWRA authorizes the construction of features that meet water supply requirements, including MR&I water supply needs, groundwater recharge, and streamflow augmentation [Section 8(a)(2)]. If the Secretary of the Interior selects an alternative that includes the delivery of Missouri River water, additional Congressional approval is required prior to commencing construction of such an alternative [Section 8(a)(3)(B)].

DWRA is an amendment to previous legislation. In 1944 the U.S. Congress passed the Flood Control Act, of which the Missouri-Basin Pick Sloan Act is a part, which authorized construction of dams on the Missouri River and its tributaries. The initial stage of GDU (Garrison Diversion Unit) was authorized in 1965, and construction began in 1967. The GDU project was designed to divert Missouri River water to central and eastern North Dakota for irrigation, municipal and industrial water supply, fish and wildlife conservation and development, recreation, flood control, and other project purposes.

Most of the currently authorized GDU Principal Supply Works have been completed (Snake Creek Pumping Plant, McClusky Canal, and New Rockford Canal). Although the Lonetree Reservoir, which would have connected the McClusky and New Rockford Canals, has been deauthorized [DWRA Section 2(i)(5)]. The former reservoir location is now the Lonetree Wildlife Management Area.

The McClusky Canal currently delivers water for fish and wildlife, recreation, and irrigation. Although the canal was constructed to cross into the Hudson Bay Basin, a plug at mile marker 59 blocks flow out of the Missouri River Basin, in accordance with an agreement with Canada. The New Rockford Canal has never been put into service.



GDU Principal Supply Works, Except for the New Rockford Canal

The GDU project was reauthorized in 1986, which reduced emphasis on irrigation and increased emphasis on meeting the MR&I water needs throughout North Dakota. The 1986 Reformulation Act, which amended the 1965 Act, authorized a Sheyenne River water supply and release feature, including a water treatment plant capable of delivering 100 cfs of water to eastern North Dakota. Appraisal-level studies of water needs and options in the Red River Valley began in 1994 and were completed in 2000. These studies laid the foundation for the Final Needs and Options Report.

The Final Needs and Options Report and the EIS documents were prepared with the assistance of public involvement. While the NEPA (National Environmental Policy Act) provides guidance on public involvement for preparation of an EIS, Section 8(b)(3) of DWRA describes a public involvement process for the Needs and Options Report.

It states:

> DWRA, Section 8(b)3)
> *In conducting the study, the Secretary through an open and public process shall solicit input from gubernatorial designees from states that may be affected by possible options to meet such needs as well as designees from other Federal agencies with relevant expertise. For any option that includes an out-of-basin solution, the Secretary shall consider the effect of the option on other states that may be affected by such option, as well as other appropriate considerations. Upon completion, a draft of the study shall be provided by the Secretary to such states and Federal agencies. Such states and agencies shall be given not less than 120 days to review and comment on the study method, findings and conclusions leading to any alternative that may have an impact on such states or on resources subject to such Federal agencies' jurisdiction. The Secretary shall receive and take into consideration any such comments and produce a final report and transmit the final report to Congress.*

After passage of DWRA two teams of stakeholders (the Technical Team and Study Review Team) were formed to incorporate public involvement in study planning. These two teams were later combined into a single Technical Team. Gubernatorial designees from states that could be affected by the Project and other representatives of federal, state, local agencies, tribes, and environmental groups were invited to serve on the teams.

Technical Team members reviewed and commented on plans of study and draft reports. The Draft Needs and Options Report was distributed to the Technical Team, the public, federal agencies, and potentially affected states for a 120-day review. Comments received from reviewers were given serious consideration and were used in preparing the Final Needs and Options Report.

Technical Team Meeting Participants

- City of Fargo, North Dakota
- City of Grafton, North Dakota
- City of Moorhead, Minnesota
- City of West Fargo, North Dakota
- City of East Grand Forks, Minnesota
- City of Grand Forks, North Dakota
- City of Valley City, North Dakota
- Department of Fisheries and Oceans – Canada
- Eastern Dakota Water Users
- Environment Canada
- Garrison Diversion Conservancy District and Consultants
- Lake Agassiz Water Authority
- Manitoba Water Stewardship
- Meridian Environmental Technology, Inc.
- Minnesota Chapter of the American Fisheries Society
- Minnesota Department of Natural Resources
- Minnesota Department of Health
- Minnesota Pollution Control Agency
- Missouri Department of Natural Resources
- National Audubon Society
- National Wildlife Federation
- North Central Division of American Fisheries Society
- The North Dakota Chapter of The Wildlife Society
- North Dakota Game & Fish Department
- North Dakota State Health Department
- North Dakota State Water Commission
- North Dakota State University
- Red Lake Band of Chippewa
- Red River Basin Commission
- South Dakota Department of Environment and Natural Resources
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- U.S. Environmental Protection Agency

A Cooperating Agency Team was established to provide data, assist in review, conduct analyses, and contribute to the compilation of the EIS. Federal, tribal, state, and local governmental agencies were invited to be cooperating agencies if they had jurisdiction by law or special expertise with respect to any environmental issues related to this proposed federal action. Cooperating agencies provided information on their special expertise or jurisdiction related to the Project, assisted with analyses, and reviewed the DEIS (draft environmental impact statement) and the SDEIS (supplemental draft environmental impact statement) chapters and analyses. Cooperating Agency Team meetings were held ten times from January 2003-February 2007.

Cooperating Agencies

- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. Geological Survey
- Three Affiliated Tribes
- North Dakota State Historic Preservation Office
- Minnesota Department of Natural Resources
- City of Fargo, North Dakota
- City of Grand Forks, North Dakota
- Lake Agassiz Water Authority
- City of Moorhead, Minnesota
- City of West Fargo, North Dakota

Reclamation and North Dakota established a public involvement program early in the NEPA process. The program was designed to provide the public and agencies with a variety of methods to learn about, participate in, and comment on the Project. The program included a scoping notice, multiple public scoping meetings, a website, and periodic newsletter. A DEIS was distributed for public comment, and public hearings were held in various locations in North Dakota and Minnesota. In response to numerous comments on the DEIS, a SDEIS was prepared, and public hearings were held in Bismarck, Fargo, Fort Yates, and New Town, North Dakota. Coordination with federal and state agencies and tribes occurred throughout the NEPA process.

Proposed Feature

GDU Import to Sheyenne River Alternative

The FEIS evaluated six alternatives; one no action and five action alternatives. Each alternative would supplement existing water supplies with new or expanded use of water sources in the Red River Basin or would import water from the Missouri River. Water conservation measures were incorporated into all alternatives that would reduce water consumption by approximately 1.4 billion gallons (4,300 ac-ft) of water annually.

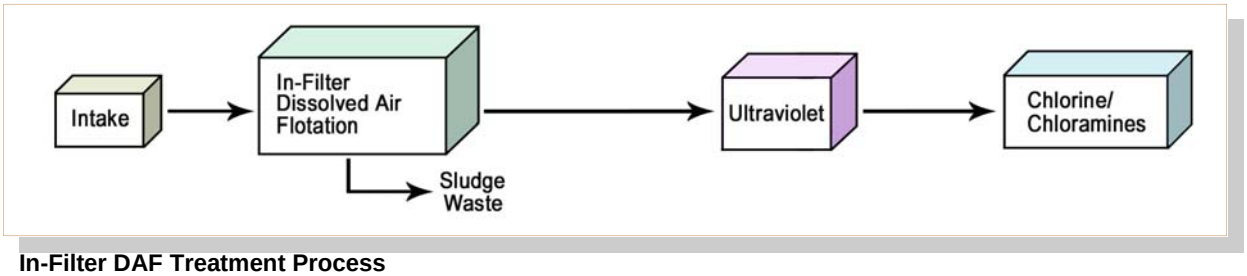
The proposed Project feature, GDU Import to Sheyenne River Alternative, would supplement existing water supplies in the service area to meet future water needs with a combination of the Red River, other sources in the Red River Basin in North Dakota, and imported Missouri River water. The alternative would use eight water supply components including water conservation (table 1). The primary component of this feature would be a 122 cfs (cubic feet per second) buried pipeline from the McClusky Canal to Lake Ashtabula that would release treated Missouri River water into the Sheyenne River approximately 8 miles above the reservoir. The pipe would be sized so peak-day demands could be met by Lake Ashtabula releases into the Sheyenne River.

GDU Import to Sheyenne River Alternative

Table 1. GDU Import to Sheyenne River Alternative Components.

Proposed Components	Description of Proposed Components
Biota Water Treatment Plant	Build McClusky Canal biota water treatment plant with a capacity of 122 cfs. Includes intake structures and clearwell pumps to convey water to the Sheyenne River release structure.
Cass Rural Water Users District Interconnection With Fargo	Install a 2.1 cfs service connection with Fargo.
GDU Principal Supply Works	Repay the incremental costs of the GDU Principal Supply Works based on capacity used by the alternative.
Grand Forks-Traill Water District Interconnection With Grand Forks	Build a 2.8 cfs service connection with Grand Forks.
McClusky Canal to Lake Ashtabula Pipeline	Construct 123 miles of 122 cfs pipeline from McClusky Canal Mile Marker 58 to Lake Ashtabula. Includes Sheyenne River release structure.
Pipeline to Industries in Southeastern North Dakota	Build 48 miles of 9 cfs pipe from Fargo to Wahpeton to serve industries.
Relocate Grafton River Intake	Relocate Grafton's existing 5 cfs river intake 5 miles north on Red River.
Water Conservation	Save approximately 1.4 billion gallons project-wide.

The feature would use a biota water treatment plant adjacent to the McClusky Canal to reduce the risk of transferring invasive species into the Hudson Bay Basin. The In-filter DAF (dissolved air flotation) or a comparable, cost effective treatment process was identified for this feature. This water treatment component, In-filter DAF, was recommended by Manitoba Water Stewardship in their comments on the DEIS. The treatment process includes DAF pre-treatment, filtration, ultraviolet disinfection, and chlorination. Aquatic life is very sensitive to chlorine, so any residual concentrations would be removed prior to releasing Project water into the Sheyenne River above Lake Ashtabula.



In-Filter DAF Treatment Process

The feature would use the existing Principal Supply Works constructed as part of the GDU, so repayment of a portion of these original construction costs is included in the cost estimate (table 2). The Cass Rural Water Users District and Grand Forks-Traill Water District would connect to the Fargo and Grand Forks municipal systems. The Grafton intake would be relocated north on the Red River behind an existing lowhead dam to improve reliability during low river flow. The feature would include a buried pipeline from Fargo to the Wahpeton area to serve industrial water demands in southeastern North Dakota.

The feature has sufficient capacity to serve MR&I water systems in northeastern North Dakota from the pipeline running to Lake Ashtabula. Most of these water systems currently use groundwater sources, but it is reasonable to assume that the systems may want service in the future. Because this is a bulk water supply Project, the cost of distributing water in northeastern North Dakota is not included.

Table 2. GDU Import to Sheyenne River Alternative Cost Estimate.

Features	Construction Cost (2005 dollars)*	Annual Operation, Maintenance, and Replacement Cost*
Biota Water Treatment Plant (includes McClusky Canal Intake) [1]	$124,403,000	$2,625,000
Cass Rural Water Users District Interconnection With Fargo	$6,437,000	$170,000
GDU Principal Supply Works	$11,030,000	$90,000
Grand Forks-Traill Water District Interconnection With Grand Forks	$7,474,000	$144,000
McClusky Canal to Lake Ashtabula Pipeline	$465,396,000	$1,011,000
Pipeline to Industries in Southeastern North Dakota	$41,404,000	$46,000
Relocate Grafton River Intake	$3,689,000	$30,000
Water Conservation		$780,000
Total	**$659,833,000**	**$4,896,000**

* Costs in table are rounded to the nearest $1,000.
[1] Biota water treatment plant costs (not including the intake) were updated in June 2007.

The cost estimate shown in table 2 should only be used for comparative purposes when evaluating the differences between Project alternatives. Updated and detailed feasibilty-level design and cost estimates will be developed before seeking appropriations from Congress.

Financing of the Project is addressed in Sections 1, 7, and 10 of DWRA (see below). The cost of construction of biota water treatment plant is a federal expense, which would be non-reimbursable. This is based on the premise that compliance with the Boundary Waters Treaty of 1909 is a federal responsibility. The operation, maintenance, and replacement costs associated with a biota water treatment plant would also be funded by the federal government and are considered non-reimbursable. All other operation, maintenance, and replacement costs are reimbursable by Project beneficiaries.

DWRA authorized $200 million in federal loans for Project construction. The interest rate applied for use of GDU facilities for MR&I water supplies is 3.225%, which was the rate in 1965 when the GDU was authorized. Since enactment of DWRA in 2000, the indexed cost of the original $200 million is estimated to be $250 million.

DWRA, Section 1 - Garrison Diversion Unit Section Authorized

(f) Costs -

(1) Estimate - The Secretary shall estimate—

(A) the actual construction costs of the facilities (including mitigation facilities) in existence as of the date of enactment of the Dakota Water Resources Act of 2000; and

(B) the annual operation, maintenance, and replacement costs associated with the used and unused capacity of the features in existence as of that date.

(2) Repayment Contract - An appropriate repayment contract shall be negotiated that provides for the making of a payment for each payment period in an amount that is commensurate with the percentage of the total capacity of the project that is in actual use during the payment period.

(3) Operation and Maintenance Costs - Except as otherwise provided in this Act or Reclamation Law—

(A)The Secretary shall be responsible for the costs of operation and maintenance of the proportionate share of unit facilities in existence on the date of enactment of the Dakota Water Resources Act of 2000 attributable to the capacity of the facilities (including mitigation facilities) that remain unused;

(B) The State of North Dakota shall be responsible for costs of operation and maintenance of the proportionate share of existing unit facilities that are used and shall be responsible for the full costs of operation and maintenance of any facility constructed after the date of enactment of the Dakota Water Resources Act of 2000; and

(c) The State of North Dakota shall be responsible for the costs of providing energy to authorized unit facilities.

Section 1(h) Boundary Waters Treaty of 1909 -

(2) Costs- *All costs of construction, operation, maintenance, and replacement of water treatment and related facilities authorized by this Act and attributable to meeting the requirements of the treaty referred to in paragraph (1) shall be nonreimbursable.*

DWRA, Section 7(a) -

(3) - *Upon execution of the cooperative agreement required under this subsection, the Secretary is authorized to convey to the State of North Dakota, on a nonreimbursable basis, the funds authorized in section 10(b)(1) of this Act. Unless otherwise provided in this Act, the non-Federal share of the total cost of construction of water systems for which the State of North Dakota receives funding pursuant to this section shall be 25 percent, committed prior to the initiation of construction. The State may use the Federal and non-Federal funds to provide grants or loans for municipal, rural, and industrial water systems. The State shall use the proceeds of repaid loans for municipal, rural, and industrial water systems. Proceeds from loan repayments and any interest thereon shall be treated as Federal funds. The non-Federal share of the cost of operation, maintenance, and replacement of each municipal, rural, and industrial water system funded by this section shall be 100 percent. The Southwest Pipeline Project, the Northwest Area Water Supply Project, the Red River Valley Water Supply Project, and other municipal, industrial, and rural water systems in the State of North Dakota shall be eligible for funding under the terms of this section. Funding provided under this section for the Red River Valley Water Supply Project shall be in addition to funding for that project under section 10(a)(1)(B). The amount of non-Federal contributions made after May 12, 1986, that exceeds the 25 percent requirement shall be credited to the State for future use in municipal, rural, and industrial projects under this section.*

Section 7(c) - *Nonreimbursability Of Costs –*

With respect to the Southwest Pipeline Project, the Northwest Area Water Supply Project, the Red River Valley Water Supply Project, and other municipal, industrial, and rural water systems in North Dakota, the costs of the features constructed on the Missouri River by the Secretary of the Army before the date of enactment of the Dakota Water Resources Act of 2000 shall be nonreimbursable.

DWRA Section 10(a) – Water Distribution Features –

(1) – In General -

(B) - *Red River Valley Water Supply Project- There is authorized to be appropriated to carry out section 8(a)(1) $200,000,000.*

(e) Indexing - *The $200,000,000 amount under subsection (b)(1)(B), the $200,000,000 amount under subsection (a)(1)(B), and the funds authorized under subsection (b)(2) shall be indexed as necessary to allow for ordinary fluctuations of construction costs incurred after the date of enactment of the Dakota Water Resources Act of 2000 as indicated by engineering cost indices applicable for the type of construction involved. All other authorized cost ceilings shall remain unchanged.*

DWRA requires that the repayment of costs for existing GDU Principal Supply Works be based only on the proportion of the installed capacity of each feature used by the Project. DWRA also requires that assigned construction and operation, maintenance, and replacement costs of GDU supply facilities be repaid at 3.225%. Although the proposed Project feature would provide improved basic aquatic need and improved flow rates for recreation and/or water quality, no construction costs were allocated to these incidental benefits.

The funding sources for the proposed Project feature have not been finalized, but the best available information at this point assumes a Project funding strategy very similar to the EIS Option described in FEIS Appendix K.1. The Project's current authorization includes four funding sources. The biota treatment plant would be a non-reimbursable federal cost because of the federal government's responsibilities under Boundary Waters Treaty. The remaining costs would be funded equally from three sources; local funding, state grant, and reimbursable federal loan, which is authorized under DWRA. A financial analysis based on these funding sources is in FEIS Appendix K.1. The analysis specifies federal and non-federal costs, reimbursable and non-reimbursable costs, and end user costs on a per household and per 1,000 gallons basis. The Project will be paid for by customers, as specified in DWRA.

The GDU is exempt from the requirement to use Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (Principles and Guidelines) analyses to demonstrate Project economic feasibility. The GDU Reformulation Act of 1986 authorized the implementation of recommendations of the GDU Commission Final Report dated December 20, 1984. The 1986 Reformulation Act amended the original 1965 GDU authorization. The Commission Final Report serves as a surrogate for a normal feasibility report, and all language referring to Reclamation's November 1962 report (Supplement to HD 325) was

removed from the revised authorization. Since 1987, the Secretary of the Interior continues to submit budget proposals to Congress with no Principles and Guidelines or benefit costs analysis.

Even though GDU is exempt from Principles and Guidelines analyses, the FEIS includes an estimate of National Economic Development and Regional Development benefits in FEIS Appendix K.2. The National Economic Development benefit/cost ratio was calculated for all alternatives. These analyses were not a requirement but were conducted voluntarily to address comments received from the review of the DEIS. In the FEIS the proposed Project feature has a benefit/cost ratio of 2.

Summary of Major Issues

Primary issues of controversy identified by Reclamation and the State of North Dakota during preparation of the FEIS were as follows:

- Cumulative depletions of water from the Missouri River were of concern. Specific concerns included accounting for a 1930s-type drought in the Missouri River Basin, sedimentation, and how the Project depletions would affect the different Missouri River uses and resources, including flood control, navigation, hydropower, water supply, recreation, fisheries, Federally listed species protected under the Endangered Species Act, natural resources, historic properties, and Tribal water rights.

- The potential effect of the Project on the water quality in the Sheyenne and Red Rivers was raised as an issue because of the Boundary Waters Treaty of 1909. The Red River flows north from the United States into Canada. The BWT provides that "boundary waters and waters flowing across the [United States - Canadian] boundary shall not be polluted on either side to the injury of health or property on the other [side of the international boundary]."

- The risk of biological invasions associated with any alternatives that imported water from the Missouri River is a significant issue. Numerous comments stated that basic treatment (pretreatment with ultraviolet disinfection and without filtration) would not meet the requirements of the BWT. Another frequent comment was that the risks and consequences of biological invasions were underestimated in the risk analyses conducted by U.S. Geological Survey.

These issues were discussed in detail in the FEIS. The proposed Project feature provides the most effective means to minimize or avoid environmental harm and meet the comprehensive water quality and quantity needs of the Red River Valley through year 2050. Nonetheless, certain adverse environmental effects of the selected alternative cannot be avoided.

Adverse effects to historic properties are anticipated, but consultation with the North Dakota State Historic Preservation Office, Advisory Council on Historic Preservation, and Tribes on a programmatic agreement is in progress. The site-specific effects of the selected alternative will

be determined in accordance with the National Historic Preservation Act prior to any ground disturbing activities.

There would be temporary adverse impacts to natural resources. The U.S. Fish and Wildlife Service estimates that there currently are 953,258 acres of wetlands in counties potentially affected by the proposed Project. Analysis of the proposed construction corridor estimates a total wetlands impact index of 778. The wetland index indicates that the right-of-way corridor contains 164 acres of wetlands and crosses 598 wetlands and 16 streams. Analysis of the construction corridor estimates impacts to 946 acres of native prairie and impacts to 28 acres of woodlands. The majority of these impacts would be avoided where practical and would be short-term or temporary.

Regarding Indian trust assets, these are defined as legal interests in property held in trust by the United States for Indian Tribes or individuals. Indian trust assets include lands, minerals, hunting and fishing rights, and water rights. The selected alternative would not affect Indian trust assets. It would not affect Tribal lands or mineral rights and would improve fisheries in the Red River Basin with augmented flows in the Sheyenne and Red Rivers. Most Tribes have not quantified their reserved water rights within the Missouri River Basin. If Tribes quantify their reserved water rights on the Missouri River and put the water to use, the volume of water available for other water users in the basin may or may not be affected.

Comments and Responses to Comments

The primary issues raised in comments on the DEIS and SDEIS are described in the summary comments below. Each of these issues was addressed in the FEIS, as explained in each summary response. Responses to comments on the FEIS are also included in the summary responses.

Purpose and Need for the Project – General

Summary Comment

Some comment letters raised concerns about the purpose and need for the Project. Comments recommended that residents of the Red River Valley should “live within their means” from a water source standpoint. Comments suggested that future water demand estimates were inflated by unrealistic population projections and excessive industrial water demands. Comments observed that if future water demands were smaller, there would be less of a need for the Project.

Summary Response

The Red River, which is the primary source of water for the service area, was dry for approximately five consecutive months during the 1930s drought. Hydrologic modeling of current (2005) Red River Valley water demands predicts that the present water supplies would be inadequate during such a drought, which would cause severe economic impacts. Water demands in the region are projected to increase through 2050, and a 1930s-type drought in the future would have even more devastating economic consequences without the Project. The proposed Project feature has a benefit/cost ratio of 2.

In response to comments on the DEIS, the water demands were revisited and extensive consultation with the water users was conducted, which resulted in the determination that the lower water demands being considered were reasonable. The higher water demands were eliminated from consideration in the SDEIS. In addition, independent population reports confirm Reclamation estimates as being reasonable.

Population Projections for the Project

Summary Comment

Many comment letters raised the concern that Project population projections were too high resulting in excessive water demands, increased water shortages during droughts, and an enhanced need for the Project.

Summary Response

In addition to Reclamation's population projection report, an independent report by Northwest Economic Associates estimated population growth 6.9% less than Reclamation. This is not a significant difference. The Minnesota State Demographic Center reached that same conclusion. As stated in their letter, "Despite my various criticisms, I should note that the "best estimate" projection is only about 26,000 more than the more conventional "trend migration" projection after 50 years, a difference of less than 5 percent. This is not a huge difference in the world of population projections." In addition, in response to a comment, Reclamation reviewed a 2006 Fargo-Moorhead Metropolitan Council traffic study that included independently developed population projections for the Fargo-Moorhead metro area. The report's 2035 population estimates were 1.5% lower than the Reclamation report, again demonstrating the Reclamation population projections are reasonable.

Water Conservation

Summary Comment

Some comment letters suggested that Reclamation should revise the *Water Conservation Potential Assessment* report prepared for the Project and estimate higher water conservation savings.

Summary Response

Reclamation reviewed 16 supply and demand management conservation measures in the *Water Conservation Potential Assessment*. The report developed reasonable, sustainable, and cost effective conservation measures based upon sound science and engineering. A review of historic water use in North Dakota by USGS shows that North Dakota has the lowest per capita water use as compared to the other 10 Missouri River Basin states. This demonstrates successful conservation measures are already in use and limits implementation of additional measures without economic impacts.

Missouri Basin State Average Water Use (gallons per capita per day)

Colorado = 239.7
Iowa = 158.9
Kansas = 166.4
Minnesota = 132.6
Missouri = 182.8
Montana = 224.4
Nebraska = 237.4
North Dakota = 129.0
South Dakota = 149.3
Wyoming = 263.5

Drought Contingency Measures

Summary Comment

Some comment letters suggested that drought contingency measures should be included in future water demand estimates in addition to water conservation measures.

Summary Response

Drought contingency measures do not reduce water shortages. Rather, these are implemented to reduce water demands in certain water use sectors during water shortages. The EIS discloses that water users could implement drought reduction measures of 7.5% without experiencing severe economic losses.

Global Climate Change

Summary Comment

The effects of climate change should be evaluated in the EIS, including the effects of such a change on the viability of water sources in the Red River and Missouri River Basins.

Summary Response

Current climate models are inconclusive in regard to projected changes in streamflow in the Northern Great Plains. Depending upon which model is used, average annual runoff in both the Missouri River and the Red River could either increase or decrease during the next 50 years as a result of climate change. There is even greater uncertainty regarding the occurrence of extreme events, such as an extended drought.

Climate - 1930s Drought

Summary Comment

Some comment letters suggested that a drought more severe than the 1930s should be used to evaluate Project alternatives while other comment letters suggested the historic drought of the 1930s was too severe and would not be repeated through the planning period of 2050.

Summary Response

A drought frequency study for Project by Meridian Environmental Technology, Inc. and several peer-reviewed scientific studies present credible scientific data suggesting that a 1930s-type drought could occur in the Red River Valley before 2050. Flow gage data from the 1930s were used to size the alternatives to meet water shortages.

Garrison Diversion Conservancy District Representing the State of North Dakota

Summary Comment

Comments raised a concern about a conflict of interest of the Project proponent, Garrison Diversion Conservancy District, representing the state of North Dakota in preparing the Project EIS. A question also was raised as to whether the Governor of North Dakota had the authority to appoint Garrison Diversion Conservancy District to be the EIS co-lead, and if this appointment violated state law.

Summary Response

The Governor of North Dakota has the authority to designate Garrison Diversion Conservancy District to represent the state in preparing the EIS. As the chief executive of the state, the Governor is responsible for administering state business, pursuant to the North Dakota Constitution, Article 5, Section 7. Chief executives act by discharging their duties through the "instrumentality or agency of others" (State ex rel. Peterson v Olson, 307 N.W.2d 528, 533 (N.D. 1981)).

Garrison Diversion Conservancy District is defined as an instrumentality of the state for the purpose of working with Reclamation on GDU related activities (Letter Opinion 2004-L-56,

August 31, 2004.) The Governor specifically reserved matters of policy for the purposes of the EIS to be addressed by the State Engineer. North Dakota's role as a state co-lead was appropriately delegated to Garrison Diversion Conservancy District.

There is no conflict of interest in Garrison Diversion Conservancy District's involvement in the EIS process. At the initiation of the EIS process, the Garrison Diversion Conservancy District directors resolved to review all alternatives without bias and without favoring a predetermined alternative. A project proponent can assist in the preparation of an EIS. Even if a proponent evidences a clear preference for a particular project alternative, the EIS process is deemed without bias or conflict so long as the lead federal agency evaluates the EIS and takes responsibility for its objectivity within the NEPA guidelines (40 CFR Section 1501.6(a)(2)). Reclamation has done so.

Missouri River Import Alternatives vs. In-Basin Alternatives

Summary Comment

Some comment letters suggested in-basin alternatives were inadequately analyzed, which gave Missouri River import alternatives an advantage in the EIS environmental effects analyses.

Summary Response

The EIS evaluated a full range of alternatives, including three in-basin alternatives that would not use the Missouri River as a water supply source. The EIS also considered a number of other in-basin water sources, which were investigated and considered but eliminated. Potential groundwater sources were evaluated in the Red River Valley in North Dakota and Minnesota. In addition, Reclamation entered into an agreement with USGS to assess predicted water use from Minnesota aquifers. The Minnesota State Planning Office, Environmental Quality Board, and Minnesota Department of Natural Resources staff also participated in the study.

Missouri River Depletions – Drought, Endangered Species, and Tribal Concerns

Summary Comment

Many comments focused on the Missouri River depletion analysis. Specific areas of concern included accounting for a 1930s-type drought, sedimentation, and how the Project depletions would affect the different Missouri River uses and resources including navigation, hydropower, water supply, federally listed species protected under the Endangered Species Act, and tribal water rights.

Summary Response

In response to comments on the DEIS, Reclamation and North Dakota contracted with the Corps (U.S. Army Corps of Engineers) to complete an analysis of impacts to Missouri River uses and resources during a 1930s-type drought (1930-1941). This depletion analysis included MR&I needs, industrial needs and other reasonably foreseeable uses of the Missouri River, which encompassed the future growth of the water use.

In response to comments on the SDEIS about sedimentation, additional study by the Corps analyzed the effects of forecasted depletions and sedimentation on the Missouri River Mainstem Reservoir System. The Corps' 2008 analysis found that, in general, most of the effects of the water withdrawals for the Project on Missouri River uses and resources would be relatively small, because the volume of water that would be withdrawn would be minor. The impacts are discussed in FEIS chapter four and in the Corps' (2006; 2007) reports, which were attached to the FEIS as supporting documents.

Regarding species protected under the Endangered Species Act, Reclamation has completed a biological assessment on the proposed Project feature. The biological assessment finds that the proposed Project feature, the GDU Import to the Sheyenne River Alternative, is not likely to adversely affect any federally listed species, including the least tern and piping plover. The U.S. Fish and Wildlife Service has concurred with these determinations.

Regarding potential impacts to Indian water rights, the EIS does not attempt to determine, regulate, or quantify any currently unquantified water rights that tribes are, or may be, entitled to by treaty or law. If tribes quantify their reserved water rights on the Missouri River and put the water to use, the volume of water available for other users in the basin may or may not be affected. The quantification of Indian water rights is outside the scope of the EIS.

Risks of Invasive Species

Summary Comment

Numerous comments focused on the risk of biological invasions associated with the Missouri River import alternatives. Comments stated that Basic Treatment (pretreatment with ultraviolet disinfection and without filtration) would not be adequate to meet the requirements of the Boundary Waters Treaty. Another frequent comment was that the risks and consequences of biological invasions were underestimated in the risk analyses conducted by USGS.

Summary Response

Three of the action alternatives propose to use water from the Missouri River as an additional source of Project water. The DEIS evaluated two treatment methods designed to reduce the risk of invasive species transfer (Basic Treatment and Microfiltration). In response to comments on the DEIS, an additional treatment method, In-filter DAF, recommended by Manitoba Water

Stewardship was evaluated in the SDEIS and FEIS. All of the treatment methods would be effective in removing or inactivating a broad range of organisms, including all of the potentially invasive species evaluated.

In-filter DAF or a comparable, cost effective treatment process was identified as a component of each of the Missouri River import alternatives considered in the FEIS. All alternatives evaluated in the FEIS include a multiple barrier treatment process with disinfection and filtration that would meet the treatment goals proposed by the Province of Manitoba. Ultimately, the determination of adequate treatment was made by the Secretary of the Interior, in consultation with the Secretary of State and the Administrator of the Environmental Protection Agency, as required by DWRA.

Reclamation and North Dakota do not concur that USGS underestimated the risks and consequences of biological invasions in their analysis. The risk analysis was based on the best available scientific information and was extensively peer-reviewed by technical experts both within and outside of USGS.

Cumulative Effects to Groundwater

Summary Comment

The primary concern raised about using groundwater as a Project water source relates to cumulative effects from existing use, Project use, and potential for future non-Project use.

Summary Response

Reclamation and North Dakota took a hard look at North Dakota and Minnesota aquifer data. The best available information was used, including the USGS investigations appended to the FEIS. Groundwater is a feasible option, but it could be the most technically challenging. All aquifer withdrawals would be done in compliance with state and federal permit regulations. The permitting process would adequately address potential interference of Project wells with existing wells and with surface waters.

Water Quality

Summary Comment

Water quality was raised as an issue because of the Boundary Waters Treaty of 1909.

Summary Response

There have been historic exceedances of the water quality standards for several analytes, and the results of water quality modeling indicate that future exceedances are likely to occur under No Action, as well as the action alternatives. However, the standard used to determine if there

would be a significant adverse impact to water quality in the Sheyenne and Red Rivers was whether there would be a change in beneficial use of the water.

Beneficial use is an intended or established use of water, such as irrigation, domestic, industrial, recreation, or maintaining the aquatic environment. Water quality modeling by USGS generally showed that the proposed Project feature and No Action would have similar impacts, and both would have temporary and minimal effects. There is no evidence to suggest that the proposed Project feature would cause a permanent change in beneficial use, in comparison to No Action.

Effects on States Bordering the Missouri River and on Minnesota

The effects of the Project on Missouri River uses and resources in states bordering the river were evaluated in the Project's FEIS. Water would be withdrawn from the Missouri River system by the proposed Project feature to serve water systems in the Red River Valley. The potentially affected states are Montana, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri. The effects of the proposed Project feature on the state of Minnesota were evaluated regarding changes in water quantity and water quality in the Red River, impacts to the aquatic environment, and the risks of transferring invasive species from the Missouri River Basin to the Red River Basin.

For the purposes of the NEPA, analysis of the proposed Project considered a wide geographic scope, because the range of alternatives covered a large geographic area. The geographic scope encompassed portions of two major drainage basins – the Missouri River Basin, which would serve as a source of water for some alternatives and the Red River Basin, which is the location of the Project and part of the Hudson Bay Basin. The direct impacts of excavating pipeline corridors and constructing other feature components would be limited to areas in North Dakota.

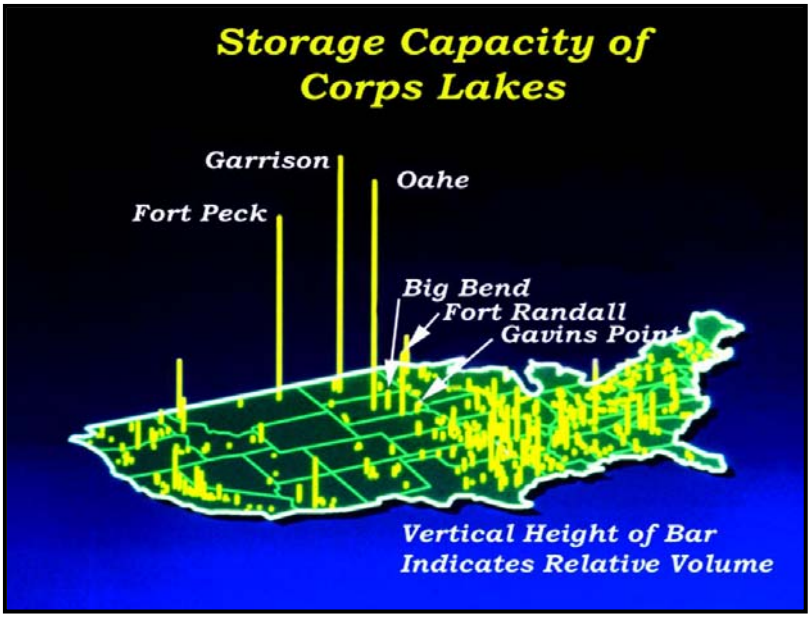
Missouri River at Bismarck, North Dakota – Average Flow is 22,500 cfs

The direct and indirect effects of the Project on Missouri River uses and resources in states bordering the river also were evaluated in the Project's FEIS. Water would be withdrawn from the Missouri River system by the proposed Project feature to serve water systems in the Red River Valley. This section summarizes the effects of the proposed Project feature on states bordering the Missouri River and on Minnesota, as required by DWRA.

Missouri River Basin –

Impacts to Missouri River Uses and Resources

Existing Conditions



Map of the Storage Capacity of Corps Reservoirs in the U.S. Showing the Missouri River Reservoirs as the Largest in North America.

The Missouri River extends 2,619 miles from its source at Hell Roaring Creek in Montana to its confluence with the Mississippi River in the State of Missouri. The Missouri River is the longest river in the United States, draining one-sixth of the country. It is the main river in the Missouri River Drainage Basin. The Corps operates six dams and reservoirs on the Missouri River that are located in Montana, North Dakota, South Dakota, and Nebraska. This system of dams and reservoirs has a capacity to store 73.4 million ac-ft of water, which makes it the largest reservoir system in North America.

The Corps operates the system to serve congressionally authorized project purposes of flood control, navigation, irrigation, hydropower, water supply, water quality, recreation, and fish and wildlife. This multipurpose reservoir system was designed to use water stored in the upper three reservoirs during extended drought to meet a diminished level of service to congressionally authorized project purposes, except flood control.

Garrison Dam is located about 75 river miles northwest of Bismarck, North Dakota, and impounds Lake Sakakawea, which is the largest Corps reservoir on the Missouri River or in the continental United States. The reservoir is 178 miles long and up to 6 miles wide and contains almost one-third of the total storage capacity of the Missouri River mainstem system, nearly 24 million ac-ft. The proposed Project feature would withdraw water from this reservoir.

Missouri River at Bismarck, North Dakota – Average Flow is 22,500 cfs. The Proposed Project Feature Could Withdraw up to 122 cfs from Lake Sakakawea.

Flows in the Missouri River between Garrison Dam and Lake Oahe depend on Garrison Dam releases. The average annual discharge from Garrison Dam for the period of 1968–2001 was 22,500 cfs. The proposed Project feature could withdraw up to 122 cfs. The discharge varies during the year depending on a number of factors. Winter flows average 18,000 to 22,000 cfs in December and increase to 22,000 to 30,000 cfs in January and February to accommodate peak power demands. In the spring and the fall releases during non-drought years are 20,000 to 30,000 cfs, and in drought years average 10,000 to 15,000 cfs. Summer releases average 19,000 to 26,000 cfs when water supply is near normal, and 10,000 to 15,000 cfs during periods of drought.

Analysis of Existing Conditions

The Corps ran a base simulation of the Missouri River under the Missouri River water control plan to document current conditions (2002). The Corps employed models developed for their Missouri River Master Manual EIS for this simulation, which used revised present-level (2002) Missouri River depletions developed by Reclamation. Reclamation updated monthly depletions from Missouri River reaches for the period of record, 1930-2002, and applied these depletions to the historic natural flow record to determine present-level streamflows. Table 3 shows average 2002 annual depletions for each reach of the Missouri River for the period of record.

The depletions in table 3 are greater than those used in the Daily Routing Model for the Corps' Missouri River Master Manual EIS. The differences reflect changes in water use that have occurred in the basin since 1987, which is an additional 200,000 ac-ft of depletions annually.

Table 3. Average Annual Missouri River Depletions by Reach (2002).

Average Annual Missouri River Depletions by Missouri River Reaches	Average Annual Current (2002) Depletions (thousands of ac-ft)
Above Ft. Peck	2,506
Ft. Peck to Garrison	4,115
Garrison to Oahe	342
Oahe to Big Bend	17
Big Bend to Ft. Randall	79
Ft. Randall to Gavins Point	1,063
Gavins Point to Sioux City	363
Sioux City to Omaha	399
Omaha to Nebraska City	11,063
Nebraska City to St. Joseph	249
St. Joseph to Kansas City	1,397
Kansas City to Boonville	408
Booneville to Hermann	190
Total	22,191

Some of the 22.191 million ac-ft depletions from the Missouri River do not reach customers due to water system leaks. In addition, some depletions can be attributed to natural causes, such as evaporation. The Corps estimates the total average annual water loss due to evaporation on all Missouri River Reservoirs at 3,055,000 ac-ft. The average annual water loss due to evaporation on Lake Sakakawea is 903,000 ac-ft, while the loss in Lake Oahe is 932,000 ac-ft. The average evaporation from each mainstem system reservoir amounts to 3 feet annually.

Persistent drought has affected the Missouri River Basin for the past 7 years. Below-normal snow accumulation and sparse precipitation have lowered reservoirs to record levels and reduced flows in the basin. Even though drought conservation measures through reduced navigation and winter releases have been implemented, record low storage levels have been recorded in either 2005 or 2006 for Fort Peck Lake, Lake Sakakawea, and Lake Oahe.

The Corps Master Manual FEIS identified approximately 1,600 water intakes on the Missouri River along lake and river reaches from Fort Peck Reservoir to St. Louis, including 302 intakes used by American Indian Tribes. Intakes on the Missouri River are primarily for municipal, industrial, and individual water supplies, fossil and nuclear-fueled power plant cooling, and irrigation withdrawals.

On Lake Sakakawea there are 300 water supply intakes and intake facilities. On the Missouri River between Garrison Dam and the top of Lake Oahe, there are 123 water supply intakes. As part of the Corps' depletion analysis for this Project, municipal intakes at greatest risk of losing water access during a 1930s-type drought were identified. The Corps report found that access at two existing intakes (Parshall, North Dakota, and Wakpala, South Dakota) would be lost under current conditions during a 1930s-type drought.

Ninety-four percent of the population served from the Missouri River is located downstream of Gavins Point Dam in Nebraska and South Dakota, which is the furthest downstream dam. In

addition, 73% of generation by thermal power plants using the Missouri River occurs below Gavins Point Dam.

Comparison of the Effects of the Proposed Project Feature to the Effects of the No Action Alternative

Under NEPA, the net impact on relevant resources is analyzed by comparing the cumulative impacts of the action alternative (the preferred Project feature plus the No Action Alternative) in 2050 to the impacts of the No Action Alternative. No Action is the future in 2050 without the proposed Project feature. In this case Missouri River resources would potentially be affected by the withdrawal of water from the Missouri River by the proposed Project feature (GDU Import to the Sheyenne River). This is compared to all other cumulative withdrawals in the Missouri River Basin that would occur under the No Action Alternative without the proposed Project feature.

The Missouri River resource impacts evaluated in the FEIS are: 1) water storage, 2) flood control, 3) water supply, 4) hydropower, 5) navigation on the Missouri and Mississippi Rivers, 6) recreation, 7) fisheries, 8) Federally protected species, 9) wetlands, 10) riparian habitat, and 11) historic properties.

Methods

To address these issues, a study was initiated with the Northwestern Division of the Corps to analyze impacts from the proposed transfer of water from the Missouri River to the Project service area. This study assessed the effects of Project depletions on Missouri River uses and resources for the DEIS.

Due to changes in the alternatives in the SDEIS and an increase in the Missouri River Basin depletions to account for additional population and industrial growth in that basin, the Corps updated its analysis of Missouri River resources in 2006. For that study Reclamation projected Missouri River Basin annual water demands for public water systems and future industries through 2050. The forecasted growth through 2050 would use an additional 402,200 ac-ft. This demand was added to the 155,300 ac-ft that accounted for future water projects in the Missouri River Basin, for a total depletion of 557,500 ac-ft for the No Action Alternative.

To evaluate the effects of the proposed withdrawal of water by the proposed Project feature, the monthly withdrawal volumes for this feature were averaged over a 10-year period that corresponds with the modeled drought years (table 4). The total annual water withdrawal from the Missouri River system by the proposed Project feature during a 1930s-type drought would be 80,239 ac-ft. During non-drought years in the Red River Valley smaller amounts of water would be diverted.

Subsequent to the 2006 modeling, the Corps conducted an analysis of the Missouri River system for the Western Area Power Administration, which added another element to simulations - sedimentation. In response to this new information Reclamation and North Dakota requested that sediment accumulation in the Missouri River mainstem reservoir system reservoirs in future years be included in Corps modeling for the FEIS.

Table 4. Withdrawals by the Proposed Project Feature Averaged Over a 10-Year Drought.

Month	GDU Import to Sheyenne River (ac-ft)
January	7,113
February	5,578
March	6,514
April	5,069
May	5,370
June	6,891
July	7,468
August	7,490
September	7,248
October	7,319
November	7,035
December	7,145
Total Annual Depletion	**80,239**

As sediments accumulate in each reservoir, the amount of storage available at a given surface elevation diminishes. Depending on the rates of sediment deposition and increased depletions, the reservoir levels could be higher or lower during the modeling period. Generally, as sedimentation increases, the water surface elevations in the reservoirs increase relative to declines in the Missouri River mainstem reservoir system storage.

For the FEIS, the Corps evaluated the proposed withdrawal of water by Project during a drought with the new sedimentation data. Several additional analyses using various modeling techniques were also updated in the FEIS to address special concerns by interests in the Missouri River Basin. For this study the period of record from 1930-2002 was analyzed as well as the effects of water withdrawals during a drought like that of the 1930s (1930-1941). The Corps' Daily Routing Model was used to develop hydrologic, hydropower, and navigation data for use in economic and environmental impacts models.

A January 18, 2008, letter from the Missouri Department of Natural Resources identified an underestimation of depletions in the modeling analysis. In response to this concern, the Corps reviewed the data and discovered an error in the transfer of depletion data into the hydrologic model. The impact modeling runs were redone by the Corps in 2008 prior to Reclamation's signature of the Record of Decision. The results of this updated analysis are summarized below.

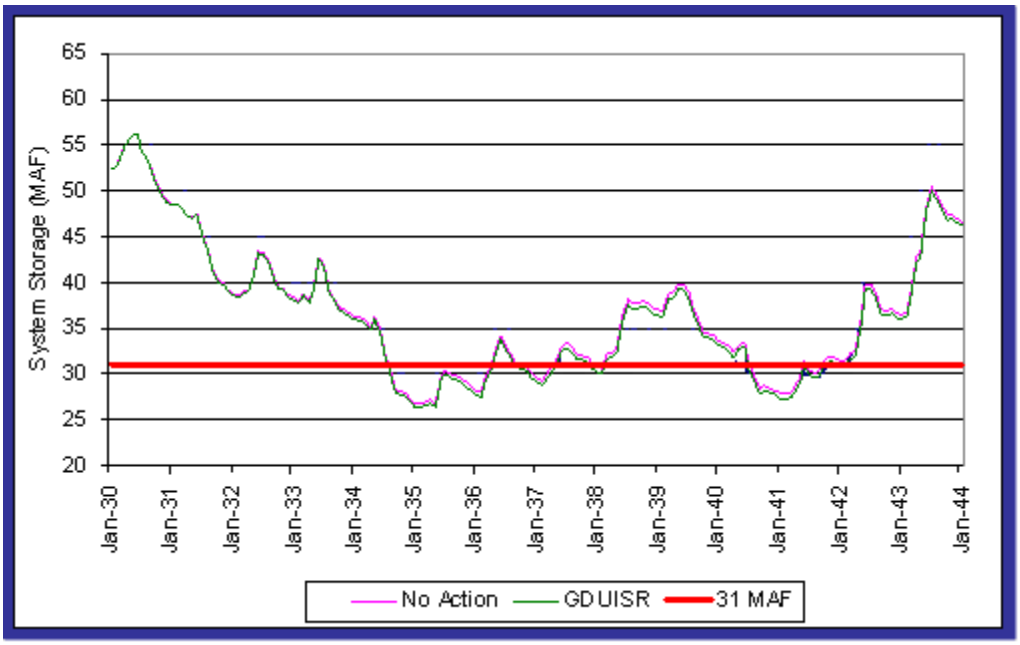
Results of Effects Analysis

It is important to recognize that the estimated effects are for comparative purposes only and may not represent actual economic returns under the different alternatives considered in the FEIS. All of the models developed by the Corps were designed expressly for comparing the effects of alternatives, not to forecast the future.

Water Storage Effects

The figure below shows the change in overall Missouri River Basin storage during a 1930s-type drought on the Missouri River (1930–1941), plus a two-year recovery period at the end of the

drought. The figure compares No Action and the proposed Project feature. In this graph the Project feature is similar to No Action, because the change in depletions by the Project feature differs from No Action by no more than 80,239 ac-ft per year.

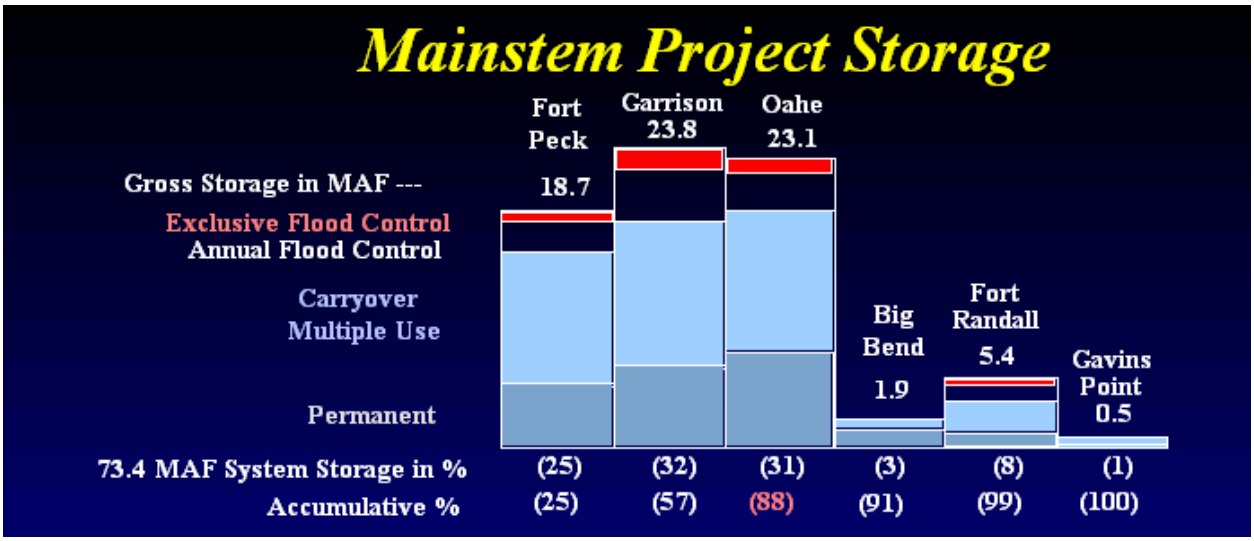


Comparison of Storage in Missouri River System Reservoirs in 2050 During a 1930s-type Drought With the Proposed Project Feature (GDUISR) and With No Action

During the worst year of a 1930s-type drought, the Missouri River system mainstem reservoirs would store approximately 27 million ac-ft of water. The Project feature would withdraw about 0.30% of the water stored in the upper Missouri River system mainstem reservoirs.

To put this volume of water in perspective, the future 557,500 ac-ft total annual depletion for No Action plus 80,239 ac-ft per year for the proposed Project feature is about 3.8% of the 16.9 million ac-ft of average yearly inflow into Lake Sakakawea from 1967-2004. Since 1898, annual inflows into the Missouri River have averaged 25.2 million ac-ft, ranging from a low of 10.7 million ac-ft (in 1931) to 49.0 million ac-ft (in 1997). This means the proposed feature depletion would be 0.32% of the average annual inflow.

Looking at the 80,239 ac-ft annual depletion in another way, the combined storage capacity of all 6 reservoirs is 73.4 million ac-ft. The annual depletion by the proposed Project feature is 0.11% of total system storage. The combined storage capacity of all six reservoirs is 73.4 million ac-ft, which is about three times the annual runoff. This high storage-to-runoff ratio lends an unusual degree of flexibility to the operation of the multipurpose reservoir system. If the amount of storage in the system used for exclusive flood control is excluded, the storage holds 68.7 million ac-ft, which gives the Corps substantial flexibility to operate the system.



Missouri River System Mainstem Project Storage (from the Reservoir Control Center, Northwestern Division, Corps of Engineers).

The cumulative depletion of 637,739 ac-ft per year is about 3.5% of the average annual storage in Lake Sakakawea, which is about 18.2 million ac-ft for 1967-2004. The cumulative depletion includes the proposed Project feature (80,239 ac-ft) plus No Action (557,500 ac-ft). Considering that the upper reservoirs were designed to store extra water needed to meet all of the system's Congressionally authorized Project purposes during low water years, then the 637,739 ac-ft per year is about 1.7% of the "carryover multiple use" storage, or 0.97% of the "gross storage" in these reservoirs.

Because of the small volume of water to be withdrawn from the Missouri River for the proposed Project feature, the Corps would not change operation of the Missouri River system under their current Master Manual if Congress authorized construction of the Project. The Corps would operate the Missouri River system the same, with or without the proposed Project feature.

Flood Control Effects

As would be expected, removing small amounts of water, as compared to overall storage in the system, would have minor impacts on flood control. The difference between No Action and the proposed Project feature for a 1930s-type drought is zero or a 0% change. The difference between No Action and the proposed Project feature for the full period of analysis from 1930 to 2002 is a little greater in magnitude at $0.12 million. The dollar value represents a percentage change of essentially 0%.

Water Supply Effects

Existing water users who depend on the Missouri River system for their water supply are concerned about the availability of water when other withdrawals are proposed, as would be the case with this proposed Project feature. Economic benefits accrue to the use of water for thermal power plants, agriculture, public and private drinking water, and other industrial uses of water

not served by public systems. In addition, most Missouri River thermal power generating facilities rely on having adequate water for cooling.

The Corps' Missouri River effects study estimated the average annual water supply benefits to the Missouri River Basin and effects during a 1930s-type drought (1930-1941). The Missouri River mainstem system was designed to use stored water during extended drought periods to meet a diminished level of service for all Congressionally authorized project purposes, except for flood control. However, typically costs increase during an extended drought when the reservoir levels drop and river flows fall. Costs are associated with ensuring that water intakes function, including intake extensions, or power plant modifications on the lower river meet discharge requirements for waste heat.

The No Action Alternative would increase the withdrawal of water in 2050 by 557,500 ac-ft annually, which would result in an annual decrease of water supply benefits ranging from $7.5 million during a 1930s-type drought to $1.3 million for the period of record. The analysis shows little change between No Action and the proposed Project feature in these benefits.

While this analysis addresses water supply benefits, the Corps also conducted a special analysis to identify the municipal intakes at greatest risk of losing access to water, and if there would be a difference among the alternatives in terms of losing access on Lake Oahe or Lake Sakakawea. The issue of dropping reservoir levels and potential intake access issues was identified during the comment period on the DEIS and SDEIS. The Corps' analysis found that two intakes would lose access to water, and this access was already compromised under current conditions. Because this impact would occur under current conditions, there would be no additional impact from the proposed feature.

There is no difference in annual water supply benefits for the proposed Project feature in comparison with No Action during a 1930s-type drought and the period of record. Therefore, no water supply effects would occur.

Hydropower Effects

Hydropower production is separated into two categories in the FEIS. One category includes benefits and marketing revenues that are measured in dollars. The second category of hydropower production includes hydropower and thermal generation capacity at risk, which is measured in megawatts and gigawatt-hours, respectively.

The Corps evaluated two types of hydropower impacts measured by economic impact in dollars: 1) hydropower benefits and marketing revenues and 2) hydropower thermal capacity and energy. Hydroelectric power on the Missouri River plays an important role in meeting the electricity demands of the upper Midwest in the U.S. The six mainstem dams on the Missouri River support 36 hydropower units with a combined plant capacity of 2,501 megawatts of potential power generation. Hydropower benefits are computed for the capacity provided and the energy generated by the hydropower units at the six Missouri River dams. The benefits represent cost savings provided by generating electricity at the dams verses building additional generating

facilities in the basin. These additional facilities would be a mix of base load and peaking power plants, and the cost for the power from them would be more costly than the hydropower.

Hydropower impacts were estimated using the Daily Routing Model, a hydrologic model, and the hydropower analysis estimates developed by the Corps. The results of the Corps analysis showed very small differences in hydropower resources when the proposed Project feature was compared with the No Action Alternative.

Hydropower Benefits and Revenues The hydropower benefits and revenues represent changes compared to No Action for the simulation periods 1930-1941 and 1930-2002, as shown in the analysis of Missouri River effects report. Hydropower benefits represent the net effect of changes in power generation to the nation as a whole, while hydropower revenues represent a change in receipts for sale of hydropower and are a measure of regional impact. For the 1930–1941 modeling period, the proposed Project feature's hydropower benefits were $2.4 million lower than No Action. No Action has a value of $542.1 million and the feature has a value of $539.8 million, a difference of $2.4 million. The change in hydropower benefits would be less than 1% for both modeling periods of 1930-1941 and 1930-2002, as compared to No Action. With the proposed Project feature hydropower revenues would decrease by 2% for the modeling period of 1930-1941 and decrease 4% for the period of 1930-2002, as compared to No Action.

Hydropower Thermal Capacity and Energy The Corps evaluated hydropower thermal capacity and energy impacts as an impact to power generating capacity in megawatts and energy production in gigawatt-hours for the period of 1930-1941. For the proposed Project feature, the hydropower capacity at risk increased from 1,404 megawatts to 1,405 megawatts, or a change less than 1%, as compared to No Action. The hydropower energy at risk increased from 679 gigawatt-hours to 678 gigawatt-hours, or a change of less than 1%.

Missouri River Navigation

The results of the Corps analysis showed very small differences in navigation benefits when comparing No Action and the proposed Project feature. Missouri River navigation benefits represent the cost savings provided by navigation on the Missouri River from Sioux City, Iowa, to the mouth versus movement of those commodities by the next least costly mode of transportation. Generally, this least costly transportation is rail or truck transport to St. Louis where Mississippi River navigation is used to transport the commodity to the ultimate destination for downstream movements and vice versa for upstream movements.

The Corps report also estimated the impacts on Missouri River system navigation season lengths during the modeling period of 1930-1941. The net effect of the additional depletions due to the No Action or the proposed Project feature would be 5 days of lost navigation over the 12-year period, with 4 of these days occurring in 1939. For the proposed Project feature, there would be a decrease of $0.01 million in navigation benefits, compared to No Action in the 1930-1941 modeling period, and a $0.15 million decrease in the 1930-2002 modeling period or a 0 to 3% decrease for both modeling periods. Therefore, the impacts to navigation would be minor.

Mississippi River Navigation With the proposed Project feature navigation on the Mississippi River would be affected by the lower flows from the Missouri River in 1939, as cited above. This would affect navigation on the Mississippi River "even though Mississippi River navigation is not an authorized purpose for the operation of the Missouri River Mainstem Reservoir System. A reduction of Missouri River navigation by 5 days during the 1930s drought between the No Action and GDUISR [proposed feature] alternatives would affect Mississippi River flows for more than 5 days during the 1930s drought" (Corps 2008:16).[1]

As further explained in the Corps (2008:16) report:

> The difference in Missouri River flows would mean that navigation would likely have to be suspended 4 days earlier for the preferred alternative. At a cost of $5 million a day, the total increased inefficiency costs for shallow and deep draft navigation on the Mississippi River would be an estimated $20 million. This increased inefficiency cost is relatively small when one considers that the annual Mississippi River shallow draft navigation benefits alone are about $2 billion ($20M/$2000M*100=1%).
>
> Using another potential response by those relying on Mississippi River navigation, there may be no difference in cost for the 4-day earlier suspension of navigation in a year like 1939. Depending on the accuracies of forecasts, it is likely that a complete shutdown for the late fall and winter period could have been forecast. The navigation industry could have been prepared to accelerate all planned movements. Any commodities to be moved on the Mississippi River would have had to be moved out by the sometime during the third or fourth week of October 1939. For the proposed Project, the rush to complete the movement of the commodities from St. Louis would have been slightly greater, and if completely successful, the difference in cost could have been as low as zero.

Missouri River Recreation Effects

The effects of No Action and the proposed Project feature on Missouri River recreation were evaluated based on the economic benefits, measured in millions of dollars. The Corps analysis showed relatively small differences in recreational resources when the proposed Project feature was compared to No Action. With the proposed Project feature, the percent decrease in recreation benefits compared to No Action would be between 0% and 1%, or $0.2 to $0.8 million. Therefore, the impacts to recreation would be minor for this proposed Project feature.

Fisheries Effects

The Corps analysis of the effects of the proposed Project on Missouri River Basin resources evaluated five fisheries categories. The five categories are habitats for reservoir coldwater fish, riverine coldwater fish, riverine warmwater fish, native river fish, and young fish production.

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[1] *Red River Valley Water Supply Project Supplemental Analysis of Missouri River Effects*, Missouri River Basin Water Management Division, Northwestern Division, Corps of Engineers, 2008.

Tables 5 (for 1930-1941) and 6 (for 1930-2002) compare the proposed Project feature to the No Action Alternative using the percentage change from No Action as a metric to measure effects. The Corps analysis found that, in general, most of the effects of the proposed Project feature would be relatively small, because the projected volume of water withdrawn would be small. The proposed Project feature would minimally impact Missouri River Basin fisheries. Comparison between No Action and the proposed Project feature shows slight impacts of -3% or less, during a 1930s-type drought and -1% to 1% over the long-term (1930-2002).

Table 5. Effects to Missouri River Fisheries by the Proposed Project Feature During a Drought (1930- 1941), as Compared to No Action.

Missouri River Water Uses and Resources	No Action Alternative	GDU Import to Sheyenne River Alternative
	Average Annual Value[1]	Percent Change from No Action
Reservoir Coldwater Fish Habitat	4.24	-3%
Riverine Coldwater Fish Habitat	149.1	0%
Riverine Warmwater Fish Habitat	77.5	0%
Young Fish Production	2.49	-1%
Native River Fish Physical Habitat	80.7	0%

[1] Units vary among the various economic use and environmental resource categories.

Table 6. Effects to Missouri River Fisheries by the Proposed Project Feature During the Period of Record (1930-2002), as Compared to No Action.

Missouri River Water Uses & Resources	No Action Alternative	GDU Import to Sheyenne River Alternative
	Average Annual Value[1]	Percent Change from No Action Value
Reservoir Coldwater Fish Habitat	9.7	-1%
Riverine Coldwater Fish Habitat	181.8	0%
Riverine Warmwater Fish Habitat	53.31	1%
Young Fish Production	2.3	0%
Native River Fish Physical Habitat	81.1	0%

[1] Units vary among the various economic use and environmental resource categories.

Federally Protected Species

Regarding species protected under the Endangered Species Act, Reclamation has completed a biological assessment on the proposed Project feature. The biological assessment finds that the feature is not likely to adversely affect any Federally listed species, including the least tern and piping plover. The U.S. Fish and Wildlife Service has concurred with these determinations.

Wetland, Riparian Habitat and Historic Properties Effects

Tables 7 (for 1930-1941) and 8 (for 1930-2002) compare the effects of the proposed Project feature to the No Action Alternative using a percentage change from No Action as a metric to measure effects on wetlands, riparian habitat, and historic properties. Impacts to wetlands and riparian habitat were measured in acres. Impacts to historic properties were evaluated by

calculating the number of months that recorded historic and archaeological sites would be susceptible to erosion and converting that number into an index value. Comparison between No Action and the proposed Project feature shows only slight impacts of -1% or less for both periods of analysis.

Table 7. Effects to Wetlands, Riparian Habitat, and Historic Properties by the Proposed Project Feature During a Drought (1930-1941), as Compared to No Action.

Missouri River Water Uses and Resources	No Action Alternative	GDU Import to Sheyenne River Alternative
	Average Annual Value[1]	Percent Change from No Action
Wetlands (1,000 acres)	111.6	-1%
Riparian Habitat (1,000 acres)	148.6	0%
Historic Properties (erosion index)	7029	0%

[1] Units vary among the various economic use and environmental resource categories.

Table 8. Effects to Wetlands, Riparian Habitat and Historic Properties by the Proposed Project Feature During the Period of Record (1930-2002), as Compared to No Action.

Missouri River Water Uses and Resources	No Action Alternative	GDU Import to Sheyenne River Alternative
	Average Annual Value[1]	Percent Change from No Action
Wetlands (1,000 acres)	147.6	-1%
Riparian Habitat (1,000 acres)	88.2	-1%
Historic Properties (erosion index)	5207	0%

[1] Units vary among the various economic use and environmental resource categories.

Red River Basin –

Impacts to the State of Minnesota

Impacts generally would be temporary and associated with construction of the Project in North Dakota or be minimal. The proposed Project feature would use the Sheyenne and/or Red Rivers to convey water, which is an existing condition that would continue into the future with No Action. Flow analysis shows that the feature would not increase erosion of riverbanks, cause flooding, or adversely affect aquatic resources in the Red River Basin. In fact, the proposed Project feature would augment stream flows in the Sheyenne and Red Rivers and would meet most of the aquatic needs targets recommended by the North Dakota Game and Fish Department, which is a beneficial effect. In terms of water quality, there have been historic exceedances of

the water quality standards for several analytes, but water quality modeling indicates that future exceedances could occur under No Action, as well as with the proposed Project feature.

Risks of Invasive Species

Minnesota agencies have also expressed concerns about the risks of transferring invasive species from the Missouri River Basin into the Red River Basin. The proposed Project feature would import Missouri River water into the Hudson Bay Basin, which has the potential of introducing invasive species. The feature includes a biota water treatment plant, which would reduce the risk of a successful invasion. All of the action alternatives considered in the FEIS, whether importing Missouri River or not, demonstrate a similar level of risk associated with the potential to transfer invasive species. This is because the proposed Project feature's biota water treatment plant would provide reasonable protection from a successful invasive species invasion in the Hudson Bay Basin. Under No Action the threat of invasive species from existing pathways successfully invading the Hudson Bay Basin would continue.

Compliance with the Boundary Waters Treaty of 1909

The Dakota Water Resources Act of 2000 (Section 1(h)) requires that,

> Dakota Water Resources Act Section 8
> *Prior to construction of any water systems authorized under this Act to deliver Missouri River water into the Hudson Bay Basin, the Secretary, in consultation with the Secretary of State and the Administrator of the Environmental Protection Agency, must determine that adequate treatment can be provided to meet the requirements of the Treaty between the United States and Great Britain relating to Boundary Waters Between the United States and Canada, signed at Washington, January 11, 1909 (26 Stat.2448; TS 548) (commonly known as the Boundary Waters Treaty of 1909).*

In order to comply with this provision of the DWRA, Reclamation, representing the Secretary of the Interior, the U.S. Department of State and U.S. Environmental Protection Agency developed a Memorandum of Understanding to address the Secretary of the Interior's responsibilities. The intent of the a Memorandum of Understanding was to establish an approach to ensure the mandatory Congressional directive that the determination of the Secretary of the Interior pursuant to Section 1(h) of Public Law 89-108, as amended, was made with full and appropriate consultation with the Secretary of State and the Administrator of the Environmental Protection Agency. The Memorandum of Understanding set up a process whereby the Interior, the Environmental Protection Agency and the U.S. Department of State shared information and worked together in a collaborative manner to address the complex scientific, technical and policy issues associated with the adequacy of treatment determination. The outcome of this process was that the Secretary of the Interior reached an agreement with the Secretary of State and the Administrator of the Environmental Protection Agency on the relevant treatment issues. The ultimate decision of compliance with the Boundary Waters Treaty was made by the Department of State.

Acronyms

ac-ft	acre feet
cfs	cubic feet per second
Comprehensive Report	*Comprehensive Report for the Red River Valley Water Supply Project*
Corps	U.S. Army Corps of Engineers
DAF	Dissolved Air Flotation
DEIS	Draft Environmental Impact Statement
DWRA	Dakota Water Resources Act
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
GDU	Garrison Diversion Unit
MR&I	Municipal, Rural, and Industrial
NEPA	National Environmental Policy Act
Needs and Options Report	*Report on Red River Valley Water Needs and Options*
Principles and Guidelines	*Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*
Project	Red River Valley Water Supply Project
Reclamation	Bureau of Reclamation
SDEIS	Supplemental Draft Environmental Impact Statement
USGS	U.S. Geological Survey