

Executive Summary

Final Environmental Impact Statement

Fargo-Moorhead Flood Risk Management Project

**Minnesota Department
of Natural Resources**



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Executive Summary

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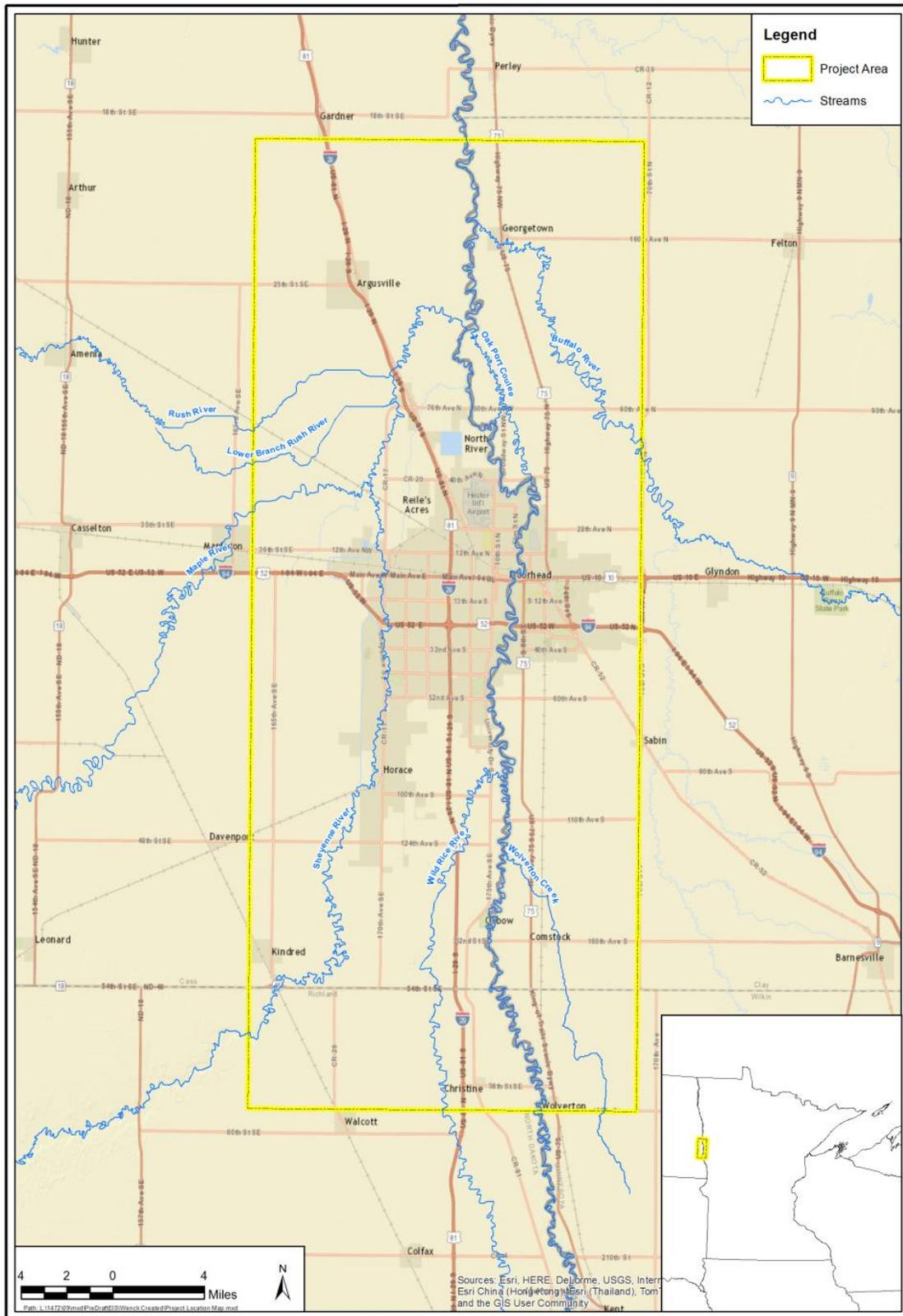
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Introduction

The Flood Diversion Board of Authority (Diversion Authority) is proposing to construct the Fargo-Moorhead Flood Risk Management Project (Project) with an estimated cost of \$1.8 billion (October 2011 dollars). The Project is an approximately 30-mile long diversion channel on the North Dakota side of the Fargo-Moorhead (F-M) urban area (cities of Fargo, Moorhead, and surrounding high-population density cities), including a 6-mile long connecting channel, an overflow embankment, and tieback embankment with control structures on the Wild Rice River and Red River. The Project also consists of environmental mitigation projects, which would be located inside and outside the project area (ES Figure 1). When operated, the Project would divert a portion of the Red River flow upstream of the F-M urban area, intercept flow at the Wild Rice, Sheyenne, Maple, Lower Rush and Rush Rivers, and return it to the Red River downstream of the F-M urban area. Project operation would result in an approximately 32,000-acre upstream staging area. Because the Project includes the construction of a Class I dam (i.e., embankment system and control structures), an environmental impact statement (EIS) is required under Minnesota Rules, part 4410.4400, subpart 18.

This Executive Summary (ES) describes the process of developing the EIS, including other alternatives to the Project that were considered based on evaluation criteria, environmental analysis, and in accordance with Minnesota Rules, part 4410.2300. The ES provides an overview of the Project, its alternatives, potential environmental and socioeconomic effects, and mitigation and monitoring measures proposed or recommended to minimize potential environmental impacts.

Introduction (continued)



ES Figure 1 Project Location Map

Environmental Review Process

What is the need for this Environmental Impact Statement?

An EIS is mandatory for the Fargo-Moorhead Flood Risk Management Project (Project) pursuant to Minnesota Rules, part 4410.4400, subpart 18, which requires preparation of an EIS for proposed construction of a Class I dam. The control structures and embankment features of the Project meet the definition of a Class I dam under Minnesota Dam Safety program rules (Minnesota Rules, part 6115.0340). Any embankment upstream of the control structure that is at or below the elevation of the top of the dam and impounds water due to the presence of the control structure would be considered to be part of the dam.

The Minnesota Department of Natural Resources (MNDNR), as the Responsible Governmental Unit (RGU), has prepared an EIS to evaluate the proposed project in accordance with the Minnesota Environmental Policy Act (MEPA), Minnesota Statutes, section 116D. This EIS was developed to meet applicable requirements of Minnesota Rules, part 4410 (Environmental Quality Board; Environmental Review Program) that govern Environmental Review in Minnesota.

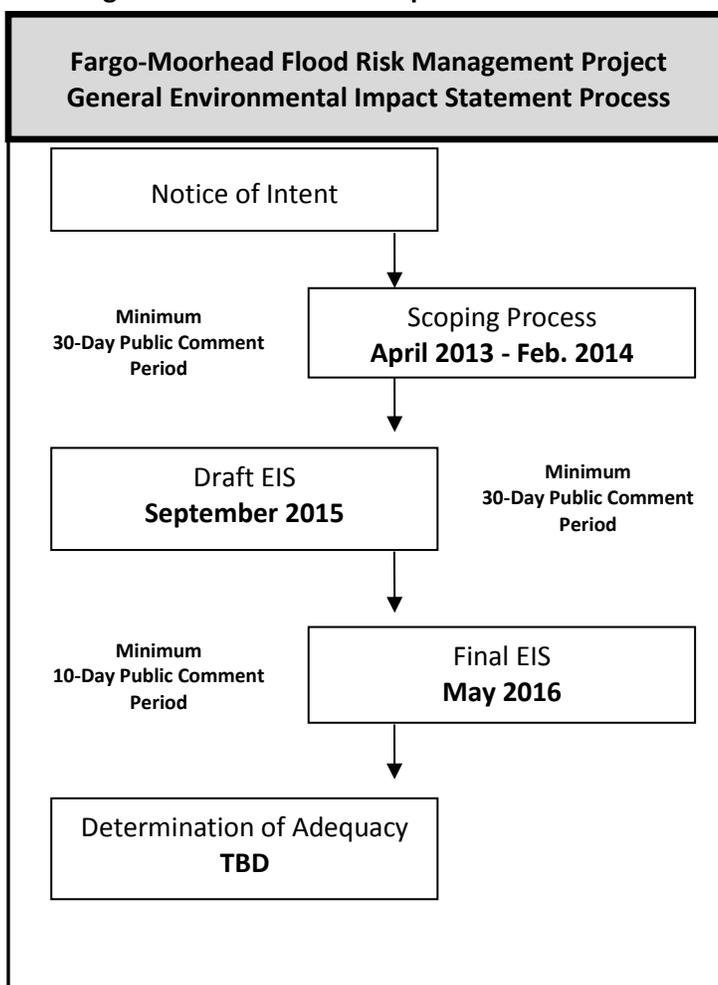
The purpose of an EIS is to:

- Evaluate the project's potentially significant environmental effects;
- Consider reasonable alternatives;
- Explore mitigation measures for reducing adverse effects;
- Provide information to the public and project decision-makers; and
- To aid in making permit decisions.

The EIS is intended to provide information to units of government on the environmental and socioeconomic impacts of a proposed project before approvals or necessary permits decisions are made and to identify measures necessary to avoid, reduce, or mitigate adverse environmental effects. The EIS is not a means to approve or disapprove a project; however, the EIS needs to be completed and determined to be adequate prior to permit approvals.

Minnesota Rules require that an EIS include at least one alternative of each of the following types, or provide an explanation of why no alternative is included in the EIS (Minnesota Rules, part 4410.2300, item G): alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through public comments. The alternative of no action is also required to be addressed in the EIS. The Project alternatives are evaluated in the EIS.

ES Diagram 1 Environmental Impact Statement Process



Environmental Review Process (continued)

What is the public's role in this environmental review process?

Public comment periods are included as part of the EIS process that allow public and local governments the opportunity to participate in the EIS process. This Final EIS was published and circulated in accordance with the rules and requirements of Minnesota Rules (EQB Rules), part 4410. Citizens, organizations, tribal entities, and government entities are given a comment period (slightly over 30 days) in which to submit written comments on the Fargo-Moorhead Flood Risk Management Project Draft EIS. Additionally, a public meeting was held in Moorhead, Minnesota on October 14, 2015 to present information on the Draft EIS, answer questions, and provide a forum for oral and written public comments. Substantive comments received have been taken into account in assessing potential Project impacts and potential mitigation for the EIS. Responses to substantive comments have been prepared and are included in the Final EIS. The MNDNR will receive comments on the adequacy of the EIS during a second, minimum 10-day public comment period, after which, the MNDNR will make a determination of EIS adequacy.

Environmental Impact Statement Development

MNDNR, as the Responsible Governmental Unit (RGU), developed and prepared this EIS, which evaluated the Project in accordance with the Minnesota Environmental Policy Act (MEPA) (Minnesota Statutes 2008, section 116D), and the rules governing the environmental review process, included in Minnesota Administrative Rules, part 4410. Utilization of the existing federally prepared environmental review documents was done as required by Minnesota Rules, part 4410.3900, subpart 3, which allows for the substitution of federal documents for state environmental review documents, insofar as the applicable documents satisfy the state level environmental review information needs as established through Minnesota Rules, part 4410 and the EIS scoping process.

In July 2011 the USACE, with cooperation from the City of Fargo and the City of Moorhead (non-Federal sponsors), issued a Final Feasibility Report and Environmental Impact Statement (FFREIS) for the Project. The USACE's Record of Decision (ROD) was issued in April 2012. The USACE designated the Locally Preferred Plan (LPP) as its Selected Plan, or Federally Recommended Plan. The MNDNR submitted comments on the federal Draft EIS, federal Supplemental Draft EIS and the FFREIS.

In April 2013, the MNDNR issued the Scoping Environmental Assessment Worksheet (SEAW) and Draft Scoping Decision Document (DSDD) for the Project (ES Diagram 1). Public review of and comment on the Scoping EAW and DSDD was conducted in accordance with Minnesota Rules, part 4410.2100. The scoping documents were made available for public comment from April 15 to May 15, 2013, with a notice of availability in the April 15, 2013, EQB *Monitor*. A public information meeting was held in Moorhead on May 8, 2013. The comments received during the scoping period were considered in making revisions to the DSDD prior to the MNDNR issuing the Final Scoping Decision Document (FSDD) on February 2014.

In September 2015, the MNDNR issued the Draft EIS for the Project (ES Diagram 1). Public review and comment on the Draft EIS was conducted in accordance with Minnesota Rules, part 4410.2600. The Draft EIS was made available for public comment from September 14 through October 28, 2015, with a notice of availability in the September 14, 2015 EQB *Monitor*. A public information meeting was held in Moorhead on October 14, 2015. Comments received during the Draft EIS comment period were considered when completing the Final EIS. Responses to substantive comments are included as Appendix L.

Environmental Review Process (continued)

The FSDD serves as the “blueprint” for preparing the EIS for the Project. The FSDD defines what topics have been adequately addressed in previous reviews and those that will be included for further analysis in the EIS. Topics carried forward in the EIS include those that require additional information but are not likely to be significantly impacted and those topics where there is the potential for significant impacts.

In preparing the FSDD, the MNDNR considered all substantive comments received during the scoping period to develop the FSDD. Information in the federal Supplemental EA was also incorporated as applicable as well as any supplemental data or data updates provided from the Project Proposer so that potential environmental and socioeconomic effects that were identified in the SEAW and DSDD were described in greater detail in the FSDD. To determine which topics should be included for further analysis in the EIS, potential issues from the state scoping process were reviewed and compared to the FFREIS to determine which, if any, additional scoped issues required further evaluation.

The Draft EIS was released for public review on September 14, 2015. The public comment period closed on October 28, 2015. During the public comment period, a public informational meeting was held on October 14, 2015 in Moorhead, Minnesota at the Courtyard by Marriott Hotel Conference Center.

Topics Adequately Analyzed in Previous Documents

The following topics were considered to be adequately analyzed in the FFREIS, Supplemental EA and the MNDNR’s Scoping EAW, including documentation submitted by the project proposer or the USACE after the USACE Record of Decision. Either the topic is not relevant, the potential impact is so minor that it will not be addressed in the EIS, or the topic is significant but the FFREIS adequately addresses the Project’s potential impacts.

- Water surface use
- Vehicle related air emissions
- Stationary source air emissions
- Water use
- Erosion and sedimentation from construction activities
- Water quality: surface water runoff
- Water quality: wastewaters
- Geological hazards and soil conditions
- Solid wastes, hazardous wastes, storage tanks
- Traffic
- Odors, noise and dust
- Visual impacts

Environmental Review Process (continued)

No Significant Impacts Expected

The MNDNR determined that the following topics are not expected to present potentially significant impacts, but would be addressed in the EIS using information beyond that in the FFREIS, Supplemental EA, and Scoping EAW. These topics include:

- Potential environmental hazards due to past site uses
- Cover types
- Fish passage and biological connectivity
- State listed species and special status species
- Wildlife resources
- Cultural resources
- Project hydrology
- Socioeconomics analysis
- Dam safety and public waters regulations and permitting

Potentially Significant Impacts

The MNDNR identified the following topics in the FSDD that may result in potentially significant impacts and therefore, this EIS will provide additional information beyond what was previously provided in the FFREIS, Supplemental EA, and Scoping EAW:

- Stream stability
- Wetlands
- Cold weather impacts on aqueduct function and biotics
- FEMA regulations and the CLOMR process

Environmental Impact Statement

Participants/Preparers

The Project Team

A project team was established early on in the environmental review process. The Project Team is comprised of the MNDNR, Diversion Authority, and USACE. The intent of the Project Team was to provide a coordinated effort between the entities in gathering, reviewing, preparing, and disseminating data and information during the state environmental review process. The MNDNR served as the RGU in

The Project Team is comprised of the MNDNR, Diversion Authority, and USACE. The MNDNR served as the lead agency in preparing the EIS and facilitating the state EIS process.

preparing the EIS and facilitating the state EIS process. The Diversion Authority and USACE provided data and information to help inform the EIS. The Project Team reviewed and commented on data and analyses, EIS evaluations, and draft versions of the EIS document prior to publication and formal public review.

The Project Team also provided a direct line of communication between the entities, who met on a regular basis throughout the environmental review process. This collaboration allowed for issue discussion and regular exchange of data and information.

The Project Proposer

The project proposer is the Diversion Authority. The USACE has partnered with the Diversion Authority to plan, secure funding for, and construct the Project. Operation and future maintenance of the Project would be the responsibility of the Diversion Authority and/or other potential non-Federal sponsors.

The Diversion Authority was created by a joint powers agreement between the Cities of Fargo, North Dakota and Moorhead, Minnesota, along with Cass County, North Dakota, Clay County, Minnesota, the Cass County Joint Water Resources District, and the Buffalo-Red River Watershed District effective July 11, 2011. The Diversion Authority is led by nine board members from the stakeholder entities. The purpose of the Diversion Authority is to build and operate a flood diversion channel along the Red River to reduce the flood risk of the stakeholder communities and counties. Additional information on the Diversion Authority is available on their website: www.fmdiversion.com.

The Non-Federal Sponsor

Prior to formation of the Diversion Authority, the USACE was brought in by the Cities of Fargo and Moorhead to help them determine what could be done to reduce flood risk in the metropolitan area. Together, they worked to create the Fargo-Moorhead Metro Flood Risk Management Feasibility Study (Feasibility Study) to develop the flood diversion channel project. In order to further advance the diversion channel concept, the Cities officially partnered with USACE as a non-Federal sponsor and proceeded with federal environmental review.

The Diversion Authority should not be confused with "local sponsor," which is synonymous with "non-Federal sponsor." The USACE defines the non-Federal sponsor as 1) a legally constituted public body (including a federally recognized Indian tribe); or 2) a nonprofit entity with the consent of the affected local government that has full authority and capability to perform the terms of its agreement and to pay damages, if necessary, in the event of failure to perform. Fargo and Moorhead were the two non-Federal sponsors during the Project feasibility study and for the original Design Agreement (executed September 12, 2011). A Design Agreement Amendment #1 was executed on December 19, 2013 which added the Diversion Authority as a non-Federal sponsor. Thus, as of the production of the EIS, the non-Federal sponsors are considered the City of Moorhead, City of Fargo, and the Diversion Authority.

Description of the Proposed Project

What is the purpose and need of the Project?

The following purpose and need statements were developed by the Diversion Authority to meet the needs of the state environmental review process and are not the same as those used in the FFREIS.

The purpose of the Project is to reduce flood risk, flood damages, and flood protection costs related to flooding in the F-M Metropolitan area. To the extent technically and fiscally feasible, the Project will:

1. Reduce flood risk potential associated with a long history of frequent flooding on local streams including the Red River, Sheyenne, Wild Rice (North Dakota), Maple, Rush and Lower Rush Rivers passing through or into the F-M metropolitan area,
2. Qualify substantial portions of the F-M metropolitan area for 1-percent chance flood (i.e., 100-year flood) accreditation (i.e., meets the standard to be shown on Flood Insurance Rate Maps as providing protection) by the Federal Emergency Management Agency (FEMA) under the National Flood Insurance Program; and
3. Reduce flood risk for floods exceeding the 100-year flood or greater, given the importance of the F-M metropolitan area to the region and recent frequencies of potentially catastrophic flood events.

The purpose of the Project is to reduce flood risk potential on local streams, qualify substantial portions of the F-M urban area for 100-year flood accreditation, and reduce flood risk for floods exceeding the 100-year flood or greater.

The need for the Project is due to the high risk of flooding in the F-M metropolitan area. The Red River, Wild Rice River, Sheyenne River, Maple River, Lower Rush River, and the Rush River all contribute to the flood risk. Average annual national economic flood damages in the F-M metropolitan area are estimated to be more than \$51 million. Flooding in the F-M area typically occurs in late March and early April as a result of spring snowmelt. Flooding poses a significant risk of damage to urban and rural infrastructure and disrupts transportation throughout the metropolitan area. The F-M urban area is a regional center for healthcare, education, government, and commerce. Infrastructure at risk in the F-M urban area includes several regional medical centers, three college campuses, and city and county government offices.

The Red River has exceeded the National Weather Service flood stage of 18 feet at the United States Geological Survey (USGS) gage in Fargo (Fargo gage) in 52 of the past 114 years (1902 through 2015), and recently every year except 2012 from 1993 through 2013. The record-setting Red River flood stage in 2009 at Fargo was 40.82 feet on the Fargo gage. The hydrologic record of the Red River shows a trend of increasing magnitude and frequency of flooding in recent decades.

Official estimates vary for the 1-percent chance flood (100-year flood) flow and stage. Up until recently, the base flood stage (100-year flood) established by the Federal Emergency Management Agency (FEMA) corresponded to a flood stage of 38.3 feet on the Fargo gage. FEMA has recently revised the 100-year flood stage of 39.3 feet. However, FEMA's effective 100-year flood flow of 29,300 cfs is based on hydrology that dates to the 1970s. An updated standard hydrologic analysis would increase the 100-year flood flow from 29,300 cfs to 33,000 cfs, which would increase the 100-year flood stage to something between 40.7 feet and about 41.5 feet, the exact value depending on levee effectiveness and a more detailed analysis than has been completed to date for a flow of 33,000 cfs.

Description of the Proposed Project (continued)

The USACE went beyond a standard hydrologic analysis by engaging a panel of experts (Expert Opinion Elicitation Panel, or EOEP) in hydrology and climate change to discuss flooding trends in the Red River basin. The panel concluded that the hydrologic record showed a “dry” period in the early decades of the 20th century and a “wet” period in later years continuing to the present and recommended developing revised flow frequency curves separately for the dry and wet periods. The EOEP use of the terms “wet cycle” and “dry cycle” were not intended to imply wet or dry climatic conditions. Rather, the EOEP used those terms to identify periods of generally lower and higher river flows. The EOEP did not reach any conclusion about why flows on the Red River at Fargo have been higher since the 1940s. Flood discharge frequency data (e.g., the 100-year flood discharge) are based on statistical analyses of historical gage station records when those data are available – not precipitation data.

What is the Proposed Project?

The Project would be located in the F-M area, within an area approximately 12 miles west to six miles east of the Red River and from 20 miles north to 20 miles south of Interstate 94. The Project primarily consists of a dam and diversion channel system including the following major components: a tieback embankment and overflow embankment; excavated channels; diversion inlet control structure; aqueducts on the Maple and Sheyenne Rivers; control structures on the Red and Wild Rice Rivers; an upstream flood water staging area (staging area); inlet control structures on tributaries; a rock ramp diversion outlet structure; the City of Oxbow, Village of Hickson, Bakke Subdivision (OHB) ring levee; Comstock ring levee; levees and floodwalls in the F-M urban area; non-structural features (such as buyout, relocation, or raising individual structures); and recreation features (such as multipurpose trails). The Project also consists of environmental mitigation projects, which would be located inside and outside the project area.

The dam would extend from high ground in Minnesota to high ground in North Dakota and would be constructed to connect the Red River, Wild Rice River, and diversion inlet control structures. The dam and control structures would impound

The Project would create a 30-mile long diversion channel on the west side of the Fargo-Moorhead urban area with a tieback embankment and control structures spanning the Wild Rice River and Red River. Project operation would divert a portion of water flow from upstream rivers and streams into the channel, while creating a staging area upstream of the embankment.

water in the inundation areas and meet the definition of a Class I dam under Minnesota Rules, part 4410.4400, subpart 18. The dam would be designed to meet USACE dam safety standards.

As proposed, the Project would create a 30-mile long diversion channel on the North Dakota side of the F-M area. There would be a 6-mile long connecting channel between the Red River and the diversion inlet control structure. When operated, the Project would divert a portion of the Red River flow upstream of the F-M urban area, intercept flow at the Wild Rice, Sheyenne, Maple, Lower Rush and Rush Rivers, and return it to the Red River downstream of the F-M urban area.

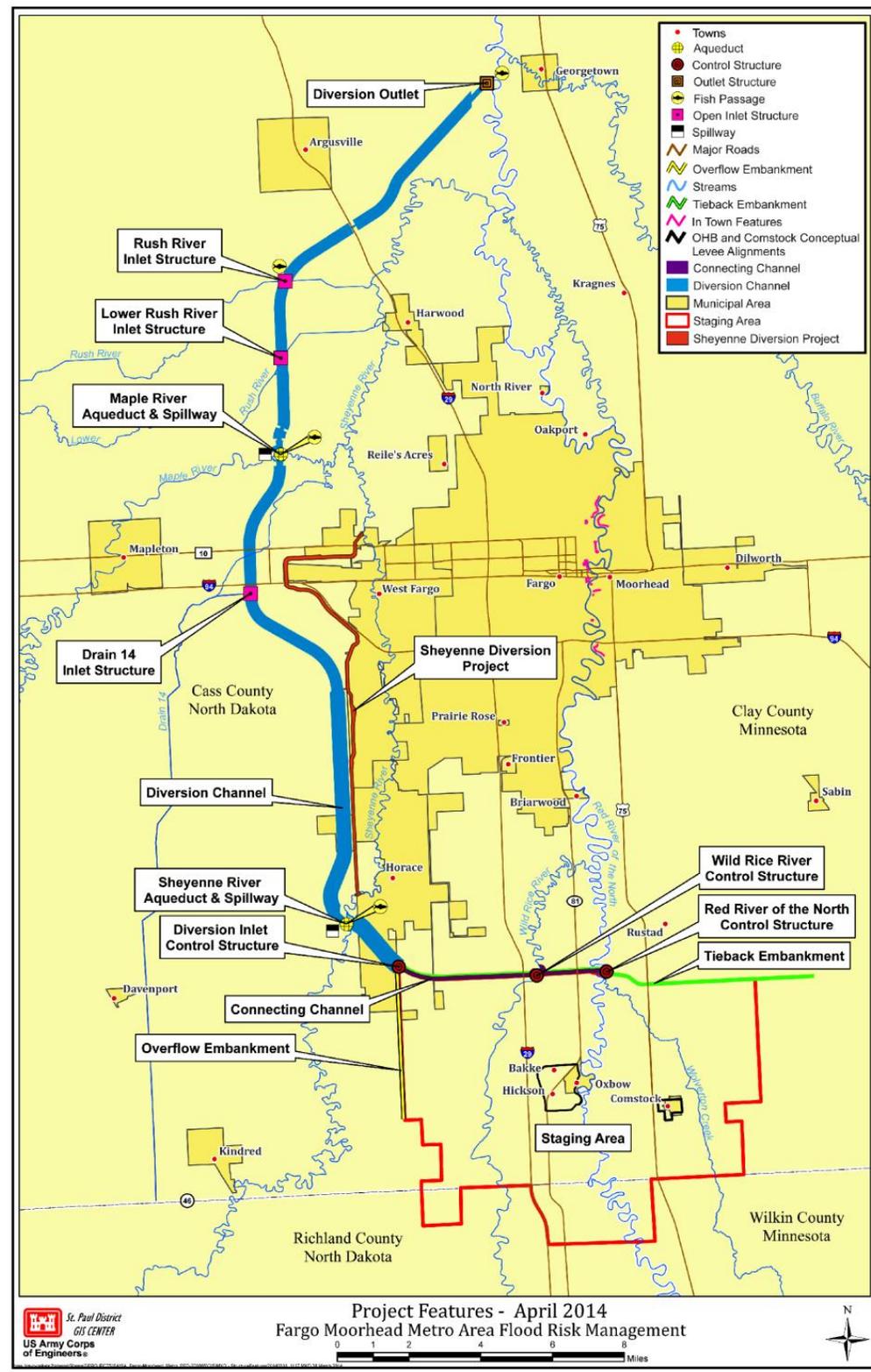
Operation of the Project would occur when it becomes known that a stage of 35.0 feet would be exceeded at the Fargo gage. At this stage, the flow through Fargo would be approximately 17,000 cubic feet per second (cfs). A flow of 17,000 cfs at the Fargo gage is approximately a 10-percent chance flood (10-year flood). Operation begins by partially closing the gates at the Red River and Wild Rice River control structures. Once the gates are partially closed, water would begin to accumulate in the inundation areas, south of the tieback embankment. Water would not be released through the diversion inlet control structure gates until the Red River and Wild Rice River control structures are partially closed. The diversion inlet control structure gates would be opened only after the initial diversion

Description of the Proposed Project (continued)

tributary (Sheyenne River, Maple River, Lower Rush River, and Rush River) flow peaks have made it to the diversion.

The Project would be federally-sponsored and would be designed and constructed to federal standards. The Project would be owned and operated by the non-Federal sponsors. Project operation, maintenance, and monitoring would be the responsibility of the non-Federal sponsors. With continual, sufficient funding, construction is expected to take a minimum of eight and one half years.

Description of the Proposed Project (continued)



ES Figure 2 Project Features

Description of the Proposed Project (continued)

The Project would reduce flood damages and flood risk in the F-M urban area, but it would not completely eliminate flood risk. The Project would reduce flood stages on the Red River in the cities of Fargo and Moorhead and would also reduce stages on the Wild Rice, Sheyenne, Maple, Rush and Lower Rush Rivers between the Red River and the diversion channel. With the Project operational, the stage from a 100-year flood on the Red River would be reduced from approximately 42.1 feet (assuming emergency levees confine the flow) to 35.0 feet at the Fargo gage. The following provides a description of the Project components.

Dam

The dam includes the three control structures (i.e., Red River, Wild Rice, and Diversion Inlet) and embankments. The control structures are gated structures that span the river to control the flow of water downstream. The embankments are raised structures constructed of soil and include the tieback embankment and the overflow embankment.

The length of dam between high ground in Minnesota to the diversion inlet control structure would be approximately 12 miles (six miles in Minnesota and six miles in North Dakota) and would be generally in an east/west direction. A four-mile long overflow embankment would be built south of the diversion inlet control structure along Cass County Highway 17 (a north/south configuration). This portion of the dam would act as an emergency spillway for extreme events that exceed the 0.2-percent chance (i.e., 500-year flood).

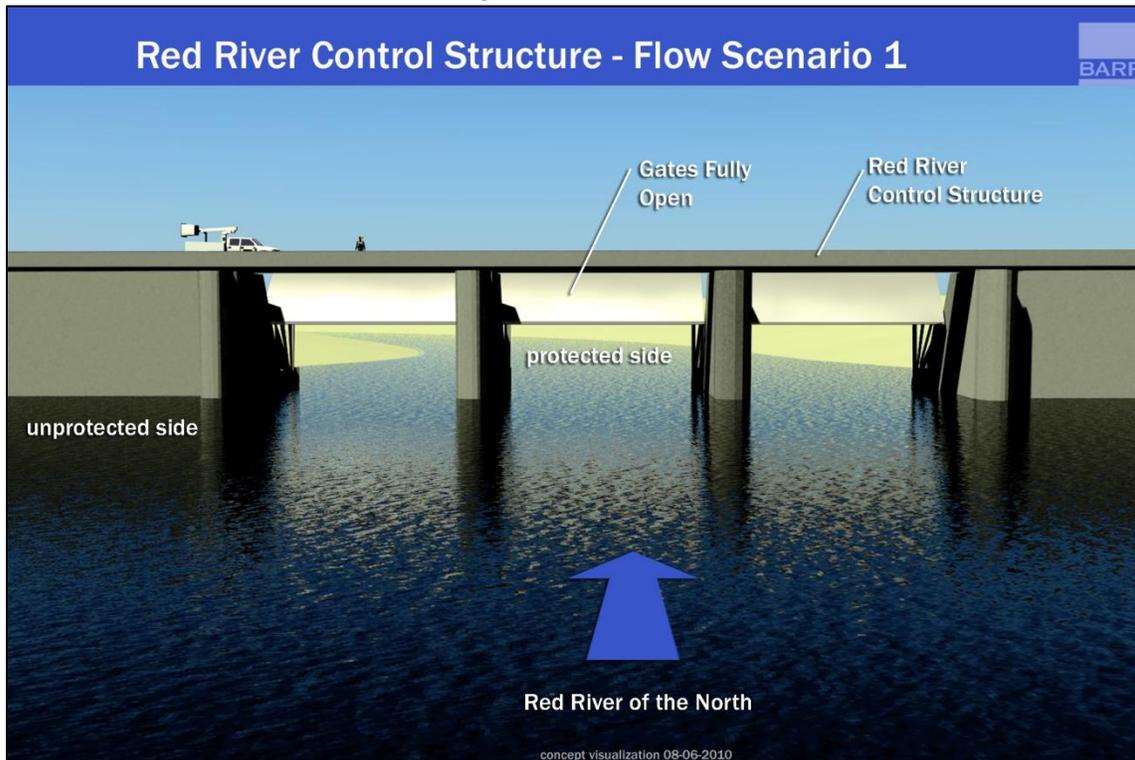
Red River and Wild Rice River Control Structures

A gated control structure (ES Illustration 1) would be constructed adjacent to the Red River in Holy Cross Township (Clay County), Minnesota. A similar control structure would be constructed adjacent to the Wild Rice River in Pleasant Township (Cass County), North Dakota. The structures would be constructed adjacent to the existing channels in order to keep the sites dry during construction.

Once the control structures are built, the Red River and Wild Rice River would be rerouted through the control structures. When operated during flood events, these structures would limit flows downstream in the natural channels and cause the water to accumulate in the inundation areas.

Description of the Proposed Project (continued)

ES Illustration 1 Control Structure Design for the Red River



Source: Diversion Authority, 2015

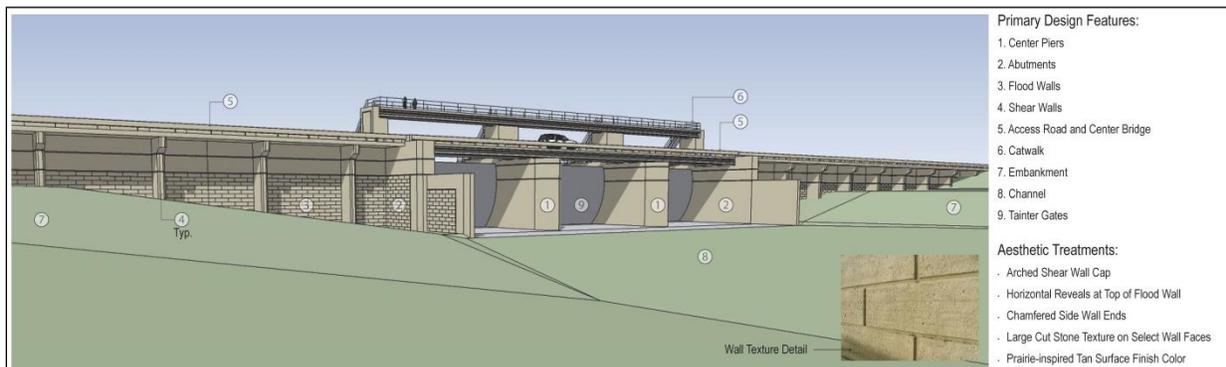
Connecting Channel

The Project would include a six mile long connecting channel between the Red River and the diversion inlet control structure. The connecting channel bottom width would be approximately 100 feet and would slope toward the Wild Rice and Red Rivers to drain the inundated areas when flood flows have receded.

Diversion Inlet Control Structure

The diversion inlet control structure would be located near Cass County Highway 17 and consist of a 135-foot wide spillway with operable gates to control flows going into the diversion channel (ES Illustration 2).

ES Illustration 2 Diversion Inlet Control Structure



Source: Diversion Authority, 2015

Description of the Proposed Project (continued)

Staging Area

The staging area boundary contains 75,000 acre-feet of existing floodplain storage for the 100-year flood. In order to minimize downstream impacts, an additional 150,000 acre-feet of storage would be needed. 225,000 acre-feet is the total amount of storage in the staging area for both the 100-year and the 500-year floods. Roughly 32,000 acres would be required for the storage needed for Project operation. This required area is generally referred to as the staging area. Water would begin to pool and inundate behind the dam when the Red and Wild Rice River control structure gates are partially closed to limit flows through the F-M urban area. Red River and Wild Rice River control structures would be operated to raise water surface elevations to approximately 922.2 feet (North American Vertical Datum (NAVD) 88) at the diversion inlet for all events up to a 500-year flood. The staging area would be regulated so that the required volume is maintained.

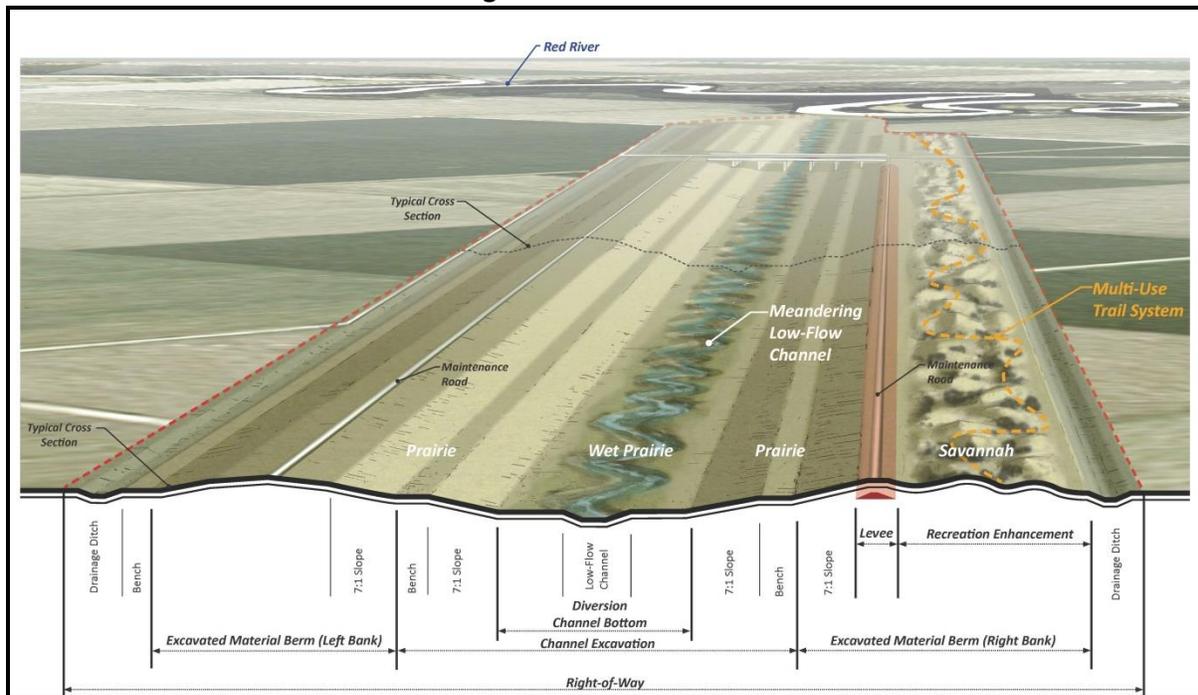
The perimeter of the inundated area within the staging area would experience additional flood depths of zero to one foot, while the majority of the land within the staging area would see additional depths greater than one foot. There are some areas within the staging area that would not become inundated during Project operation. In contrast, there are areas outside of the staging area that would become newly inundated or would experience additional depths of flooding as a result of Project operation. The majority of these inundated areas outside the staging area boundary would experience less than one foot of additional flood depth and are not considered as part of the required volume for Project operations. The term “staging area” is used when referring to a Project component as in discussing where mitigation applies. The term “inundation area(s)” is used to describe any land that becomes flooded, regardless of depth. “Inundation area” is not tied to use with any specific flood event or to the Project or Project alternatives.

Diversion Channel

The diversion channel (ES Illustration 3) would start from the diversion inlet control structure near Cass County Highway 17 and extend approximately 30 miles downstream to its outlet north of the confluence of the Red and Sheyenne Rivers. The diversion channel would route west of Horace, North Dakota and then continue north, crossing the Sheyenne, Maple, Lower Rush and Rush Rivers.

Description of the Proposed Project (continued)

ES Illustration 3 Diversion Channel Design



Source: Diversion Authority, 2015

The diversion outlet structure, located where the diversion channel returns to the Red River in Wisner Township (Cass County), North Dakota, would consist of a rock ramp with a crest width of 300 feet designed to allow fish passage (ES Illustration 4).

Description of the Proposed Project (continued)

The depth of the diversion channel would range from 15 to 25 feet deep excluding the low-flow channel and 20 to 30 feet deep including the low-flow channel. The side slopes away from the 300-foot bottom width and would be one vertical step to seven horizontal steps. This includes geotechnical “benches” of 0 to 30 feet wide, as needed, to provide additional stability to meet the required factors of safety.

Soil excavated from the diversion channel would be placed into excavated material berms adjacent to the channel to a typical height of 16 feet. The excavated material berms would be as wide as necessary to contain the excavated material. Portions of the berms on the east side of the channel would be constructed to serve as levees when the water surface in the channel is higher than the natural grade. The maximum width of the footprint along the diversion channel would be approximately one half mile including the diversion channel and excavated material berms.

Drainage ditches adjacent to the berms would be necessary to intercept local drainage and direct it to the nearest downstream diversion inlet control structure. The drainage ditches would run along the exterior excavated material berm toe on both sides of the diversion channel.

Maple River and Sheyenne River Aqueducts

Aqueducts (bridge-like structures that convey water over the diversion channel) would be constructed for the Maple River (ES Illustration 6) and Sheyenne River that would allow for the continuous connectivity of these two rivers.

ES Illustration 6 Maple and Sheyenne Rivers Aqueduct Design



Source: Diversion Authority, 2015

During flood events, fixed-crest weir spillways would direct flood flows into the diversion channel and allow for flows in the diversion channel to pass underneath the aqueducts while allowing the existing river bankfull (i.e., flows at which water fills the channel without overtopping the banks – the average recurrence for the Maple River is 1.16 years and 1.67 years for the Sheyenne River (West 2012)) to continue downstream. The intent of the Sheyenne and Maple River aqueducts, as planned and operated, would be to maintain biological connectivity and fish passage in the rivers. The two aqueducts are similar in concept; each includes a grade

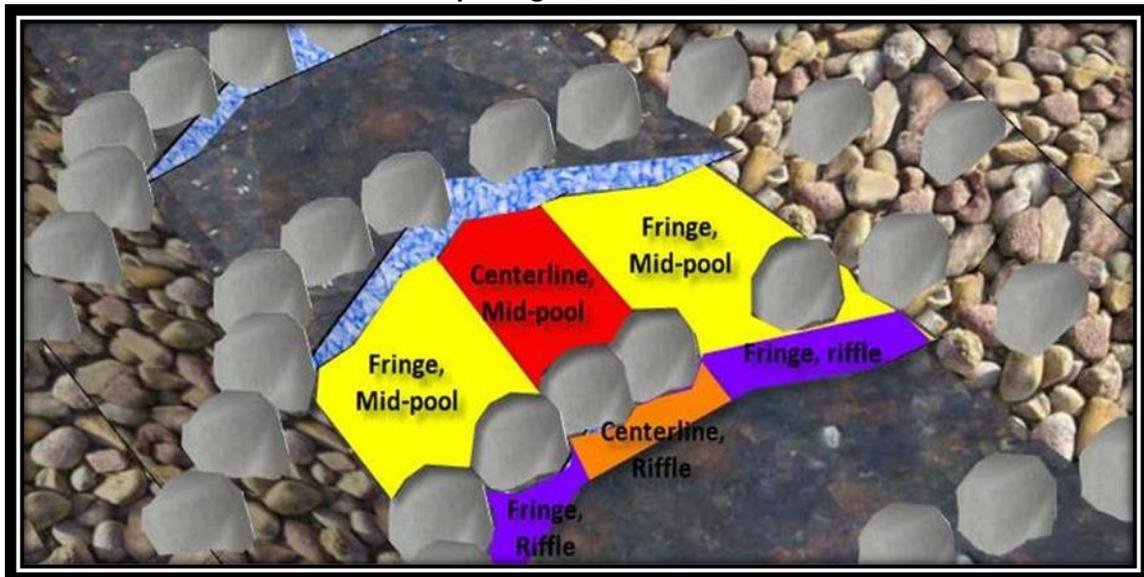
Description of the Proposed Project (continued)

control structure to prevent headcutting on the tributary, an inlet structure to control diversion of tributary flows, heating components for cold weather operation, and an aqueduct to pass a limited flow over the diversion channel to maintain the desired downstream flow. The aqueducts would be constructed off-channel with the river diverted across the aqueduct upon completion.

Lower Rush River and Rush River Rock Ramps

At the Lower Rush River and Rush River, rock ramps (ES Illustration 7) would be used to continuously divert the entire flow into the diversion channel. The Lower Rush River and Rush River would be diverted into the diversion channel and no longer would flow into the Sheyenne River downstream.

ES Illustration 7 Rush River Rock Ramp Design



Source: Diversion Authority, 2015

Inlets, Ditches, and Smaller Control Structures

Ditches and smaller control structures would be required to accept existing drainages intersected by the diversion channel. Ditches running outside and parallel to the diversion channel would direct local drainage to a reasonable number of inlet structure locations. Existing ditches, field swales, and drain tile would be directed into these parallel ditches. The larger inlet structures would be open with concrete drop structures or rock ramps like the Lower Rush River and Rush River. The smaller inlet structures would be culvert structures with flap gates at the outlet to prevent backflow from the diversion channel after peak flows.

Uncontrolled inlet structures (inlet structures without backflow prevention) would be placed at drainages that have either natural or manmade levees which would prevent widespread flooding from diversion channel backflow for events up through the 100-year flood. The project design purpose is to maintain the existing 100-year flood floodplain in adjacent upstream drainages.

Oxbow/Hickson/Bakke Ring Levee

Under Project operation, the City of Oxbow, Village of Hickson, and Bakke Subdivision (OHB) in North Dakota would be inundated up to eight feet during the 100-year flood. A ring levee

Description of the Proposed Project (continued)

around these communities was proposed by the USACE in the Supplemental EA as a modification to the Project to address these impacts. The OHB ring levee would be constructed to the Project operation elevation for the 100-year flood plus four feet of freeboard (ES Figure 3). OHB ring levee construction requires roadway modifications. The existing sanitary sewer system, water main, and storm sewer system would be modified to accommodate the ring levee and new residential areas.



Source: HMG, 2015

ES Figure 3 Oxbow/Hickson/Bakke Ring Levee Design

Description of the Proposed Project (continued)

Comstock Ring Levee

A ring levee would be also constructed around the city of Comstock, Minnesota, which under existing conditions, is located outside of the 100-year floodplain. Operation of the Project would cause new inundation in this community during and above the 100-year flood. The design of the Comstock Ring Levee is conceptual at this time. The details that follow are subject to revision pending further design and coordination between the Diversion Authority and the City of Comstock. Clay County Highway 2 would be raised at both places where it crosses the ring levee. The Burlington Northern Santa Fe (BNSF) Moorhead Subdivision Rail Line on the north and south side would require protection measures above a 100-year flood.

Transportation and Utility Modifications

Interstate 29, U.S. Highway 75, and the BNSF Hillsboro Subdivision Rail Line near U.S. Highway 75 would be raised slightly above the 500-year flood elevation to maintain access during flood inundation. Other roads within the inundation areas, except OHB and Comstock ring levee access roads, would be allowed to flood when the Project operates. Utilities located in the inundation area would be evaluated during final Project design. Known utilities include, but are not limited to, electric power lines, rural water supply, and sewer facilities. Utilities that cannot withstand occasional flooding would be abandoned, modified or relocated, depending on the situation in accordance with applicable regulations.

Along the length of the diversion channel, 19 road crossings, including four railroad bridges, and highway relocations would occur at approximately three mile intervals, primarily for county roads. Other roads may be terminated at the diversion channel or rerouted to the local road network, which would be determined during final Project design. The four new railroad bridges would be needed where existing railroads intersect the diversion channel.

Project Operation

The gates at the Red River and Wild Rice River control structures would be fully open and the gates at the diversion inlet control structure would be fully closed when the Project is not operating. The decision, as to whether the Project would begin to operate or not, would be based on measurements at the USGS gages in Fargo, Enloe and Abercrombie. Project operation would start if the Fargo gage stage would exceed 35.0 feet of water which corresponds to a flow of 17,000 cfs. A flow of 17,000 cfs at the Fargo gage is approximately a 10-percent annual exceedance probability event using the updated EOEP hydrology.

The MNDNR utilized the recommendations of the EOEP in the EIS. Unless mentioned otherwise, all discussions in the EIS use EOEP hydrology. Similarly, all elevations are relative to NAVD 88, unless noted.

Operation would begin with partially closing the gates at the Red River and Wild Rice River control structures. Once the gates are partially closed (i.e., partially lowered), water would begin to accumulate upstream of the control structures. Water would not be released through the diversion inlet control structure gates until the Red River and Wild Rice River control structures are partially closed.

Project operation on the rising limb of the flood hydrograph (i.e., flood discharges are increasing) is based on minimizing downstream impacts, and therefore, the diversion inlet control structure gates would be opened only after the initial diversion tributary (Sheyenne River, Maple River, Lower Rush River, and Rush River) flow peaks have made it to the diversion.

Description of the Proposed Project (continued)

Project operation on the falling limb of the flood hydrograph (i.e., flood discharges are decreasing) is based on minimizing the duration of upstream impacts without causing upstream stages to fall faster than what has been experienced during historic floods. If the staging area elevations drop too quickly, it could cause environmental concerns (e.g., fish stranding and streambank instability).

Flood stages through the F-M urban area and upstream of the control structures would depend on the peak discharge from the Red River and Wild Rice River hydrographs. As long as it is clear that 34,700 cfs would not be exceeded, the Fargo gage stage would be limited to 35.0 feet, the maximum flow allowed through the diversion inlet control structure would be 20,000 cfs, and there would be a maximum elevation of 922.2 feet in the staging area just upstream of the control structures.

If the forecasted peak flow at Fargo is greater than 34,700 cfs, the target stage at the Fargo gage would be increased from 35.0 feet up to 40.0 feet, depending on the flood forecast. Emergency flood fighting measures are required once the target stage is increased above 35.0 feet. The maximum target stage of 40.0 feet is comparable to the stage experienced during the 2009 flood. Since this operating procedure allows more flow to be passed through town (resulting in the higher stages), it allows the staging area to crest at 922.2 feet for 100-year through 500-year events. The maximum flow allowed through the diversion inlet control structure would be 20,000 cfs up through the 500-year flood.

For events greater than a 500-year flood, a stage of 40.0 feet would be maintained at the Fargo gage and the staging area elevation would be allowed to rise above 922.2 feet. The rise of the staging area would be minimized as much as possible by further opening the diversion inlet control structure gates to allow more flow into the diversion. At the point of minimum acceptable freeboard, flow out of the staging area would be maximized at the diversion inlet structure and over the overflow embankment along the west side of the staging area. Flow exiting the staging area via the overflow embankment would flow overland into the Sheyenne River basin.

An evacuation order would be issued for the F-M urban area as the staging area elevation approaches the minimum acceptable freeboard level. Once the upstream staging elevation reaches the point of minimum acceptable freeboard, the Red River and Wild Rice River control structure gates would be opened further to maintain the minimum freeboard and stages would rise above 40.0 feet at the Fargo gage.

The non-Federal sponsors would be responsible for all operations, maintenance, repair, rehabilitation and replacement (OMRR&R) of the Project. The cost share agreement between the USACE and the non-Federal sponsors requires the non-Federal sponsors to operate the Project in accordance with the Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) Manual to be prepared by the USACE.

Floodwalls and In-Town Levees

The Project would include floodwalls and levees in Fargo and Moorhead, which would allow more flows to pass through town and reduce Project operation frequency. The in-town levees would be such that FEMA would be able to accredit the levees for the 100-year flood once the Project is complete.

Description of the Proposed Project (continued)

Non-structural Project Features

There are several non-structural mitigation measures included in the Project to address impacts of increased flooding within the inundation area. Examples of proposed mitigations include fee acquisitions or relocations, construction of accredited ring levees and the acquisition of flowage easements. The April 2015 FEMA/USACE Coordination

Non-structural Project features include fee acquisitions, construction of ring levees, and acquisition of flowage easements. Each property would be analyzed throughout the inundation area to determine appropriate mitigation.

Plan (the Coordination Plan) states that all impacts to insurable structures within the FEMA revision reach (i.e., where the Project would alter the Red River profile flood elevation by more than 0.5 feet) would be mitigated through agreed methods consistent with those specified by the National Flood Insurance Program based on the depth of flooding at each structure. In accordance with the FEMA/USACE Coordination Plan (April 2015) impacted homes, structures, and businesses that have greater than two feet of flooding for the 100-year flood with the Project are proposed to be purchased or relocated and those with up to two feet of flooding would be evaluated for non-structural measures such as accredited ring levees, relocation, or elevating structures. The FEMA revision reach includes the entire staging area as well as some areas upstream of the staging area.

The Coordination Plan requires that the areal extent of flood inundation required for operation of the Project within the staging area be mapped as floodway in order to ensure that the required volume is available for the Project during the 100-year flood. Flowage easements are proposed to be obtained for all floodway designated areas. Any additional flood inundation within the FEMA revision reach that is outside of the staging area would be mapped as floodplain in order to portray the elevated flood risk outside of the required staging area.

Areas outside the FEMA revision reach (and thereby outside of the staging area) such as those along the Red River, Wild Rice River and connected drainages may also be affected by Project operation. Inundation outside of the designated staging area is estimated to be less than one foot of additional flood depth for a 100-year flood and would be impacted by the Project primarily in the spring. It is anticipated that for agricultural lands in most areas, farming could continue without significant impacts. The USACE has proposed performing an analysis to determine if a takings has occurred on a case-by-case-basis to define mitigation needs within this area. Flowage easements would be obtained for land and structures only where this analysis determines that an impact rises to the level of a taking under the Fifth Amendment of the U.S. Constitution¹ and applicable state laws (see Appendix O). This analysis would include evaluation of property impacts such as land value, water supply, and septic systems. Landowners would be compensated appropriately for any takings. In accordance with Minnesota Rules Chapter 6120 mitigation is required for existing insurable structures in Minnesota with any impact and Minnesota Rules, part 6115.0470 require a permittee to acquire all necessary interests or permissions prior to proceeding. Additional permit requirements may be needed from the North Dakota Office of the State Engineer for impacted properties in North Dakota. (See Section 3.2 –

¹ The 5th Amendment of the US Constitution requires just compensation when private property is taken for public use. CFR 49 Part 24 - Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, PL 91-646, as amended, details benefits to the property owner and/or displaced residential renters for Federal and Federally Assisted Programs.

Description of the Proposed Project (continued)

FEMA Regulations and the (Conditional Letter of Map Revision) CLOMR Process for more details on the takings).

Recreation Features

The conceptual recreation plan for the Project includes one concrete multi-purpose trail and one aggregate equestrian trail loop with a combined length of approximately 47-miles. These trails are in addition to the aggregate maintenance road that is included in the Project. In addition to the proposed trail system, other activities have been identified and planned for in key locations. These locations are known as Activity Hubs, which would function as primary trail access locations as well as recreation destinations. While the individual hubs would vary in character, recreation features would include parking, restrooms, trail way-finding signage, picnic facilities, drinking water, interpretative signage, fishing, and boat access. Activity Nodes are similar to hubs but provide less intensive site-specific activities and could serve as secondary access points to the trails. Landscaping of trees and shrubs at the trailheads, Activity Hubs and Nodes are proposed along with trees, native prairie grasses and forbs along the trail. All proposed recreation facilities would meet the guidelines for Americans with Disabilities Act (ADA) and the Architectural Barriers Act (ABA).

Description of the No Action Alternative

What is the No Action Alternative?

The No Action Alternatives provide the context for the potential environmental and socioeconomic effects that would occur if the Project is not developed. There are two No Action alternatives considered for the Project: 1) Base No Action Alternative; and 2) No Action Alternative (with Emergency Measures).

Base No Action Alternative

The Base No Action Alternative includes the potential flood risk reduction impact of already completed and currently funded projects such as levee construction and property buyouts and does not include the use of emergency measures.

There are two No Action Alternatives considered for the Project: Base No Action and No Action (with Emergency Measures).

No Action Alternative (with Emergency Measures)

The No Action Alternative (with Emergency Measures) is similar to the Base No Action Alternative, but also acknowledges the emergency measures currently being pursued in the project area and assumes that those would continue to be implemented as necessary due to flooding. Emergency measures have lower reliability, higher risk for loss of life than permanent flood risk reduction features and cannot be certified or accredited by the USACE or FEMA, respectively; and therefore, are being discussed under a second No Action Alternative option. Emergency measures are intended to temporarily protect specific areas from flooding that do not have permanent flood damage reduction (FDR) projects in place or enhance existing FDR projects, where there are gaps in levee protection between each of the individual FDR projects, for example. Where gaps in FDR project protection exist, a temporary levee may be constructed to tie into existing levees to reduce flood risk from occurring behind the levee or overtopping an existing levee.

Permanent FDR projects are a key component to both the Base No Action Alternative and the No Action Alternative (with Emergency Measures). Since the 1997 flood, the Cities of Fargo and Moorhead have implemented flood risk reduction measures, including acquisition of floodplain houses, constructing levees and floodwalls, raising and stabilizing existing levees, installing permanent pump stations and improving storm sewer lift stations and the sanitary sewer system. FDR projects have been designed for protection at the current, effective FEMA 100-year flood. Because of the difference between the FEMA hydrology and the EOEP hydrology, some of the FDR projects are at elevations above the EOEP 100-year flood elevation, but do not have sufficient freeboard and/or tie-in elevations for FEMA accreditation under the EOEP hydrology. This means there could be actual protection, but not accredited protection under the EOEP hydrology (see Appendix N for more discussion on the differences between flood elevations when applying different hydrology methodologies). For the purposes of EIS analysis, non-accredited structures are considered as flooded for the Base No Action Alternative.

Alternatives Considered and Evaluated in the Environmental Impact Statement

Pursuant to Minnesota Rules, part 4410.2300, item G, the EIS is required to include one or more alternatives of each of the following categories or provide a concise description of why no alternative in a particular category is included in the EIS.

- Alternative Sites
- Alternative Technologies
- Modified Designs or Layouts
- Modified Scale or Magnitude
- Alternatives that incorporate reasonable mitigation measures identified through the comment periods for EIS scoping or for the Draft EIS.

The MNDNR conducted an independent assessment of potential projects within the above categories, considering the alternatives discussed in the FFREIS and combining other measures with those alternatives. As part of the scoping, the MNDNR prepared the Alternatives Screening Report: Fargo-Moorhead Metropolitan Area Flood Risk Management Project (December 2012) (Alternatives Screening Report).

Reasonable alternatives were considered for their relevance to meet the proposer's defined Project purpose and need, as well as their feasibility to improve environmental and/or socioeconomic benefits, while reducing potential environmental impacts that may result. Alternative sites and alternative technologies were evaluated in the EIS. Other alternatives were considered, but dismissed from further evaluation in the EIS, include modified designs and layouts, and modified scale and magnitude. Alternatives incorporating reasonable mitigation measures were also evaluated in the EIS for each topic area as it related to the mitigation.

An alternative may be excluded from analysis in the EIS if it does not meet the underlying need for or purpose of the project; it would likely not have significant environmental benefit compared to the project as proposed; or another alternative of any type that is analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts (Minnesota Rules, part 4410.2300, item G).

Was an alternative site evaluated?

Minnesota Rules, part 4410 requires an evaluation of site location alternatives. Minnesota Rules, part 4410 allows the RGU to exclude alternative sites if other sites do not have significant environmental benefit compared to the project as proposed, or if other sites do not meet the underlying need and purpose of the Proposed Project. The Alternatives Screening Report determined that the reasonably available alternate diversion sites in Minnesota and/or North Dakota do not produce benefits for environmental resources or socioeconomic factors, and therefore the EIS will not evaluate alternative sites.

What alternative technologies were analyzed?

Six potential technology alternatives were studied in the Alternatives Screening Report. Two of these alternatives, tunneling and Interstate 29 Viaduct, had a similar effectiveness to the Project but did not present a significant environmental benefit. In addition, they are expected to transfer potential impacts of the Project downstream, and they have excessive capital costs, and therefore will not be evaluated in the EIS.

Alternatives Considered and Evaluated in the Environmental Impact Statement (continued)

The remaining alternative technologies (non-structural measures; flood barriers; flood storage; and flood storage combined with a control structure) did not effectively meet the Project purpose by themselves. However, it was initially thought that a combination of these alternatives could potentially meet the Project purpose and present increased environmental benefit. Therefore the Distributed Storage Alternative, which is principally a modified design alternative that incorporates these alternative technology aspects, was further evaluated as part of the alternatives evaluation (see below Modified Design/Layout section).

What modified designs or layouts were evaluated?

The MNDNR considered two modified designs or layouts alternatives in the EIS: Northern Alignment Alternative (NAA) and Distributed Storage Alternative (DSA).

The NAA was conceptualized during the public comment and alternative screening process as part of the state environmental review for the Project. During the EIS scoping process, it was thought that moving the tieback embankment north of the proposed location might provide greater environmental and/or socioeconomic benefits than the proposed Project. The Alternatives Screening Report has details on the alternatives considered and the screening criteria used to select alternatives that could meet Project purpose while providing other potential benefits. As a result, the MNDNR included the NAA in the FSDD for further evaluation in the EIS.

The Distributed Storage Alternative (DSA) was conceptualized during the public comment and alternative screening process as part of the state environmental review for the Project. During the EIS scoping process, many public comments received suggested that distributed storage, or a similar approach, might provide greater environmental benefits than the proposed Project. As a result, the MNDNR included the DSA alternative in the FSDD for further screening to determine if it should be an alternative evaluated in the EIS.

Northern Alignment Alternative

The Northern Alignment Alternative components and operation are similar to those described for the Project and therefore the Project description should be referenced for details. The NAA would locate the tieback embankment and connecting channel north of the Project approximately 1.5 miles. The southern boundary of the NAA staging area is between approximately 1.5 miles and three miles north of the Project staging area southern boundary (EIS Figure 7).

Features of the NAA that result in design or operational changes from the Project include the location of the dam and control structures, staging area, Comstock ring levee, and NAA operation. Other features of the NAA would be similar to those described for the Project.

The Northern Alignment Alternative is a modified version of the Project design and layout, and was evaluated in the EIS.

Red River and Wild Rice River Hydraulic Structures

A gated control structure would be constructed adjacent to the Red River in Kurtz Township Clay County, Minnesota. A similar control structure would be constructed adjacent to the Wild Rice River in Stanley Township, Cass County, North Dakota.

Alternatives Considered and Evaluated in the Environmental Impact Statement (continued)

Staging Area

In order to nearly eliminate downstream impacts, approximately 150,000 acre-feet of additional storage is required upstream of the dam and diversion channel inlet. The Red River and Wild Rice River control structures would be operated to raise water surface elevations to approximately 919.3 feet at the diversion inlet for all events up to a 500-year flood. The remaining features of the staging area would be the same as those described for the Project.

Comstock Ring Levee

The community of Comstock, Minnesota is located near the NAA inundation area; however, the community would not be impacted directly, and therefore a ring levee is not anticipated for the NAA. The lagoons for the community are located in the NAA inundation area and may require mitigation.

Northern Alignment Alternative Operation

Operation of the NAA would be similar to the Project with the exception of the upstream staging elevation. A maximum stage of 35.0 feet would be maintained at the Fargo gage until the upstream staging elevation reaches 919.3 feet, which is anticipated to occur with the 100-year flood event. The remaining NAA operational details would be the same as those described for the Project.

Distributed Storage Alternative- Screening Analysis and Determination of Non-inclusion to the EIS as a Project Alternative

MNDNR first evaluated the conceptualized DSA to determine if it would meet the Project purpose as defined by the Diversion Authority. Second, MNDNR evaluated the following two variations to the DSA to see whether they could provide additional benefits to meet the Project purpose: 1) the DSA in combination with a new Sheyenne River Diversion, and 2) the DSA in combination with other non-structural measures (e.g., wetland and grassland restoration).

The screening analysis of the DSA indicates:

1. The DSA is limited in meeting the project purpose;
 - a. The DSA provides the communities on the Red River mainstem with limited protection from catastrophic events or from peak tributary flows;
2. The DSA is not a feasible or practical alternative to the proposed project; and
 - a. Roughly 96 impoundment sites would be required to achieve the desired 20 percent flow reduction basin-wide. Since 1997, only three impoundment projects have been completed upstream of Halstad, Minnesota.
 - b. It would be very challenging for the Diversion Authority or the USACE to work with all interested parties across the basin to implement this number of storage sites within a reasonable time period.

Alternatives Considered and Evaluated in the Environmental Impact Statement (continued)

3. The DSA, in combination with other measures, does not substantially improve the performance of the alternative toward meeting the project purpose.
 - a. Sheyenne Diversion: The addition of the Sheyenne Diversion has the potential to increase flood flows downstream of the F-M urban area; and the cost of adding the Sheyenne Diversion, while not a prime consideration, would decrease the feasibility of DSA.
 - b. Wetland/Grassland Restoration: it is unlikely that adding wetland/grassland restoration to the DSA measures would have a sufficient impact to allow the DSA to meet the Project purpose as it relates to catastrophic flood events.

Distributed Storage is a positive basin-wide approach and should be pursued wherever feasible. Distributed Storage would provide both local and mainstem benefits to the region, and if considered in conjunction with the Project along with flood fighting efforts, the Project would have a greater chance of achieving 500-year flood protection. Additional upstream storage would greatly benefit many downstream communities in the Red River Basin, including Fargo and Moorhead, but individual communities would still need additional flood protection for large or catastrophic flood events.

The analysis of this alternative determined that the DSA: 1) does not fully meet the project purpose; and 2) is not a feasible or practical alternative to the proposed project. Minnesota Rules, part 4410.2300, item G allows for alternatives that were included in the EIS scope to be eliminated from further consideration based on information developed as part of the EIS.

Was scale or magnitude evaluated as an alternative?

The MNDNR considered one scale or magnitude alternative in the EIS: More Flows Through Town. The More Flows Through Town Alternative was first conceptualized in 2011 by the USACE as part of the FFREIS as a potential fish mitigation measure. Since then, the concept of sending more flows through town has been discussed many times between the USACE and MNDNR, including during development of this EIS. MNDNR technical staff suggested that the concept of sending more flows through town during Project operation might provide greater environmental and social benefits than the proposed Project. The MNDNR screened the concept to see if additional flow through town should be included as an alternative suitable for further evaluation in the EIS.

More Flows Through Town – Screening Analysis and Determination of Non-inclusion to the EIS as a Project Alternative

The analysis of the More Flows Through Town Alternative determined: 1) the alternative marginally meets the project purpose; and 2) the alternative is not a feasible or practical alternative to the Project. While this alternative would provide incremental environmental benefits, the social benefits are not substantial enough—the staging area footprint is projected to be the same, and mitigation (i.e., buyouts) would still be required. Therefore, it was determined that this alternative offers similar environmental benefits (an incremental benefit) but fails to provide substantially less social impacts. Therefore, the More Flows Through Town Alternative does not present a feasible and prudent alternative. Despite the fact that the More Flows Through Town Alternative will not receive full evaluation in the EIS, increasing flows does offer incremental environmental benefits and will be included as a recommended mitigation measure.

Alternatives Considered and Evaluated in the Environmental Impact Statement (continued)

Alternatives Carried Forward For Evaluation in the EIS:

- Modified designs and layouts
 - Northern Alignment Alternative
- Base No Action Alternative
- No Action Alternative (with Emergency Measures)

Alternatives Dismissed From Further Evaluation in the EIS:

- Modified designs and layouts
 - Distributed Storage Alternative
- Modified scale and magnitude
 - More Flows Through Town Alternative

Summary of Major Differences Between Alternatives

Unlike Federal Council of Environmental Quality (CEQ) regulations, which require federal agencies to identify an agency-preferred alternative, the State's statutes have no such requirement. As such, this EIS will not name a "preferred alternative." Rather, the purpose of environmental review is to provide information to the public and units of government on the environmental impacts of a project before approvals or necessary permits are issued. After projects are completed, unanticipated environmental impacts can be costly to undo, and environmentally-sensitive areas can be impossible to restore. Environmental review creates the opportunity to anticipate and correct these problems before projects are built (EQB, 2015). While, as stated above, the EIS must be used as a guide, the summary information presented in ES Table 1 (below) will add utility to the document as a guide in issuing, amending, and denying permits and carrying out other responsibilities of governmental units to avoid or minimize adverse environmental effects and to restore and enhance environmental quality.

The Summary of Impacts between EIS Alternatives (ES Table 1) goes further to serve the purposes of Minnesota Statutes, section 116D.04, subdivision 6 that states:

"Subdivision 6. Prohibitions. No state action significantly affecting the quality of the environment shall be allowed, nor shall any permit for natural resources management and development be granted, where such action or permit has caused or is likely to cause pollution, impairment, or destruction of the air, water, land or other natural resources located within the state, so long as there is a feasible and prudent alternative consistent with the reasonable requirements of the public health, safety, and welfare and the state's paramount concern for the protection of its air, water, land and other natural resources from pollution, impairment, or destruction. Economic considerations alone shall not justify such conduct."

Regulatory authorities can use ES Table 1 to get a general sense of which alternative poses less environmental consequences and greater social/economic benefit. Full details of bulleted items in ES Table 1 can be referenced and reviewed in Chapter 3 under the respective topic subsection (Chapter 3 subsections listed under each topic name in the table) and in Chapter 5—Comparison of Alternatives. When weighing information presented in the table, economic considerations alone shall not be used as a basis to deny or grant a permit. Similarly, environmental impacts should be taken in context when making the judgment of which alternative to permit (see Context & Comments column). When considering permit, regulatory authorities should also reference Chapter 6—Proposed and Recommended Mitigation and Monitoring, which identifies additional proposed mitigation measures that could reasonably eliminate or minimize environmental impacts of the Project.

Summary of Major Differences Between Alternatives (continued)

ES Table 1: Summary of Environmental and Socioeconomic Impacts Between EIS Alternatives

Topic	Major Differences between Proposed Project and Northern Alignment Alternative	Context & Comments
Hydrology and Hydraulics (see Section 3.1)	Project: <ul style="list-style-type: none"> 1,577.10 (1%) fewer total inundation acres in project area, 100-year flood. NAA: <ul style="list-style-type: none"> 4,716.50 (26%) fewer newly inundated acres in project area, 100-year flood. 6,293.60 (9%) fewer acres protected in Project area, 100-year flood. 	<ul style="list-style-type: none"> Flood elevations, depths, and duration would differ depending on location (i.e., moving staging area approximately 1.5-3 miles north minimizes inundation impacts in Richland and Wilkin Counties, but increases inundation impacts between the NAA and Project alignments).
FEMA Regulations and the CLOMR Process (see Section 3.2)	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> Flood inundation limits, exact structures mitigated and floodway/floodplain limits would differ depending on location (i.e., moving staging area approximately 1.5-3 miles north minimizes impacts in Richland and Wilkin Counties, but increases impacts between the NAA and Project alignments).
Stream Stability (see Section 3.3)	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> Impacts would be shifted 1.5-3 miles downstream of the Project. Geomorphology Report relies on aerial photo and on-site surveys, so tree composition, root density and root depth could not be verified. Some studies have been completed; however, additional studies would need to be completed to determine role of vegetation and other aspects of bank stability conditions within the project area. Final design details of the dam and dam components as well as a final operating plan are not available at this time; therefore, the potential effects of the Project on bed and channel scour are not known. Monitoring the drawdown of the inundated area would help to determine extent of sedimentation impacts.
Wetlands (see Section 3.4)	NAA: <ul style="list-style-type: none"> Estimated 8 fewer wetland acres (approximately 5 acres for Comstock levee and 3 acres indirect in inundation area; 0.4%) impacted. 	<ul style="list-style-type: none"> Wetlands between the Project and NAA alignments have yet to be field verified, so exact acreages are unknown. About 84% of footprint wetlands are considered to be of low function, including the 8 acres that differ. The majority of the mitigation will be in the bottom and side slopes of the diversion channel. Drayton Dam: Most of the wetland areas within the footprint are along the MN bank.
Cold Weather Impacts on Aqueduct Function	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> If the aqueduct freezes, it is likely the natural channel would also freeze. Maple River Aqueduct: The USACE Engineer Research and Development Center (ERDC) Cold

Summary of Major Differences Between Alternatives (continued)

Topic	Major Differences between Proposed Project and Northern Alignment Alternative	Context & Comments
<p>and Biotics (see Section 3.5)</p>		<p>Regions Research and Engineering Laboratory (CRREL) completed a report, which included the analysis of different operating scenarios and applying predicted results from computer modeling and analysis.</p> <ul style="list-style-type: none"> • Post-construction and Project operation monitoring efforts would be a key component in determining aqueduct impacts to the riverine systems and any adaptive management response.
<p>Cover Types (see Section 3.6)</p>	<ul style="list-style-type: none"> • Known differences include: <ul style="list-style-type: none"> ○ NAA: Less direct construction impact under NAA without Comstock ring levee. 	<ul style="list-style-type: none"> • Cover Types between the Project and NAA alignments have yet to be field verified, so exact acreages are unknown. • Row crops would not be allowed on exterior embankments, but cutting/bailing of established grasses would be possible (permanent vegetation cover and associated roots are critical to soil strength and overall structural integrity). • The floodplain forest is the only natural forest habitat in the project area, with impacts totaling approximately 62 acres (less than one percent of all floodplain forest wetland acres in project area).
<p>Potential Environmental Hazards (see Section 3.7)</p>	<ul style="list-style-type: none"> • No Major Differences. 	<ul style="list-style-type: none"> • Several Environmental Site Assessments (ESA) (assessments that investigate the potential for environmental hazards at a site) have been completed within the project area; however, these were completed utilizing earlier Project designs so more would need to be completed once Project designs are refined in Project impact areas (applies to NAA as well). • Results from ESAs would go informing the USACE or Diversion Authority as to what type of mitigation or remediation would be necessary. • Several structures within the footprint of the Project would need to be demolished or moved. Structure material would be evaluated for potential environmental hazards.
<p>Fish Passage and Mortality (see Section 3.8)</p>	<p>NAA:</p> <ul style="list-style-type: none"> • May have slightly less fish passage impacts on Wolverton Creek and slightly more impacts on Wild Rice River. • By shifting project 1.5-3 miles north, NAA would have slightly less impact to aquatic habitat on Wolverton Creek. 	<ul style="list-style-type: none"> • Existing habitat for all streams in project area is rated as moderate to poor quality. • Impacts are dependent on Project operation, weather, final design of structures, and timing of operation with fish movement. • Fish Passage: NAA is located further away from the confluence of Wolverton Creek and Red River and closer to confluence of Wild Rice and Red Rivers, which could lower velocities on Red River and Wolverton during drawdown providing better fish passage. • Fish Stranding: This process naturally occurs during flood events. Dependent upon timing of receding water and drawdown velocity. • Aquatic Habitat: Impacts have potential to extend beyond the construction footprint through habitat and flow changes as a result of Project construction alterations or Project operation.

Summary of Major Differences Between Alternatives (continued)

Topic	Major Differences between Proposed Project and Northern Alignment Alternative	Context & Comments
Wildlife and Wildlife Habitat (see Section 3.9)	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> Sedimentation would likely occur incrementally over several decades, allowing vegetation communities to adapt in these conditions; however, could result in community and habitat changes or wetland type changes. For floodplain forests, sites that are likely to be successful for restoration would be historic floodplains along rivers that are currently utilized for intensive agriculture. Once construction and mitigation are completed, the proposed diversion channel is anticipated to have the potential to provide positive impacts by creating a potential new wildlife corridor and habitat in what is now used agriculturally. Federal, state, and/or local permits that may be required could include provisions such as date restrictions for when construction can occur for particular Project features or other requirements to help avoid or minimize effects on wildlife or wildlife habitat based on the factors involved. Adaptive management may need to be considered for those impacts that are unknown.
State Listed Species and Special Status Species (see Section 3.10)	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> Impacts to migration would depend on timing of migration (beginning, middle, and end), timing of project operation, and frequency of project operation. The Project and NAA would mostly impact land that is used for agricultural purposes which does not provide the critical habitat needs for these species so impacts to these species is not likely or is anticipated to be minimal. The Project is not anticipated to cause long-term decline in species population.
Invasive Species (see Section 3.11)	<ul style="list-style-type: none"> No Major Differences. 	<ul style="list-style-type: none"> Zebra mussels are present in the Red River. Since most natural plant communities are limited to riparian areas in the project area, noxious weed spread into these areas is of particular concern. A consequence of noxious weed spread could be increased herbicide use.
Cultural Resources (see Section 3.12)	<ul style="list-style-type: none"> Known impacts include: <ul style="list-style-type: none"> Under NAA, potential impacts to 33 additional NRHP-recommended eligible sites, and 7 additional sites listed as NRHP-undetermined eligibility. 2 less cemeteries impacted under NAA (1 added from Project-Benefited Area and 3 dropped from Project staging area.) 	<ul style="list-style-type: none"> Full comparison cannot be made due to incomplete information. There are several areas within the NAA area of potential effect that have not had cultural resource surveys completed and some within the Project area as well, so surveys would need to be conducted to fully compare NAA impacts. Site information current as of January 1, 2016.

Summary of Major Differences Between Alternatives (continued)

Topic	Major Differences between Proposed Project and Northern Alignment Alternative	Context & Comments
Infrastructure and Public Services (see Section 3.13)	NAA: <ul style="list-style-type: none"> • Cass Rural Water District Phase 1 Water Plant would be inundated and require mitigation . 	<ul style="list-style-type: none"> • The Project would result in the modification of traffic patterns for local residences and farmsteads that are close to the alignment, and would affect connectivity and accessibility to various locations and properties in the project area. Roadways requiring improvements to maintain connectivity include, but are not limited to, I-29, U.S. Highway 81, I-94, U.S. Highway 52, U.S. Highway 75, and County Road 10 (See subsection 3.13.2.1.1 for a complete listing). • Improvements and/or modifications to the rail lines were not evaluated in the Transportation Plans. Any improvements/ modifications would be coordinated with Burlington Northern Santa Fe and the Red River Valley & Western Railroad. • The proposed road configurations and bridge locations were determined to not affect emergency response times.
Land Use Plans and Regulations (see Section 3.14)	NAA: <ul style="list-style-type: none"> • Fewer environmental land use (floodplain) impacts. • Less developable land south of Fargo and Moorhead. • Fewer land use and regulation impacts to Richland and Wilkin Counties, but more impact to Cass and Clay Counties. 	<ul style="list-style-type: none"> • Under NAA, Comstock is not anticipated to have significant new inundation; therefore a ring levee may not be needed and is not included as a NAA Project component. • The 1.5 mile of floodplain between Project and NAA alignments would remain an active floodplain up to a 10-year flood under either alternative. For the NAA, this 1.5 mile stretch, during project operation, would not be a natural floodplain since it would experience additional depth/duration inundation from Project operation; however, it would still have floodplain benefits which wouldn't be realized under the Project. The 1.5 mile area between the NAA and Project alignments represent approximately 5% of the existing floodplain within the project area. • MPCA's Watershed Restoration and Protection Strategy (WRAPS) would be considered during Project review and permitting process. • Minnesota Drainage Law (103E) would be considered during Project review and permit application processes.
Minnesota Dam Safety Regulations and Permitting (see Section 3.15)	<ul style="list-style-type: none"> • No Major Differences. 	<ul style="list-style-type: none"> • Both the Project and NAA include a dam feature. This would require a MNDNR dam safety permit. • A dam safety and work in public waters permit application for the Project has been received from the Diversion Authority in February 2015 and is currently under review by the MNDNR.
Socioeconomics (see Section 3.16)	Project: <ul style="list-style-type: none"> • Construction cost \$81 million (4%) less. • 274 (214 non-residential and 60 residential; 33%) fewer structures impacted by flooding, 100-year event. • 75 (14%) fewer parcels impacted by 	<ul style="list-style-type: none"> • Cost alone is not sufficient cause to dismiss an alternative in State environmental review. • The Project and NAA are anticipated to provide flood insurance costs saving to numerous property owners. • Under the Project, the Comstock ring levee could allow for relocations of displaced residences, which could increase the tax base for the City and the school district. • Under NAA, it is not anticipated that Comstock would require a ring levee; therefore, residents

Summary of Major Differences Between Alternatives (continued)

Topic	Major Differences between Proposed Project and Northern Alignment Alternative	Context & Comments
	<p>flooding, 100-year event.</p> <ul style="list-style-type: none"> • \$71 million (35%) less business losses. <p>NAA:</p> <ul style="list-style-type: none"> • Higher cost of land acquisition and damages (approximately \$68 million; 25%). • Approximately \$1 million (13%) higher average annual relocation costs to ND. • 68 more structures require flood insurance. • Approximately 1,000 (42%) fewer acres of inundation to organic farms. • 2 less (50%) organic farms affected. • CR 16 impacted. 	<p>would not have as high of potential for stress, loss of economic vitality, or restricted future development.</p> <ul style="list-style-type: none"> • Comstock population has been on the decline since 1930. • If flooding occurs prior to the growing season it is anticipated that there would not be impacts to agricultural properties. • NDSU Initial Ag Impact Study indicates that there is an 85% chance that the Project would not operate in any given year (more research yet to be completed). • Fargo and Moorhead share economic vitality. • All 4 organic farms in the project area are located in Minnesota.

Summary of Major Differences Between Alternatives (continued)

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Proposed and Recommended Mitigation and Monitoring

The purpose of the environmental review process is to determine what potential environmental effects or impacts a proposed project could have on natural resources and the human environment. The MNDNR evaluated these potential impacts for the Project and its alternatives. Mitigation measures that could reasonably be applied to eliminate or minimize adverse environmental effects were identified in the EIS and were evaluated for their effectiveness of proposed mitigation (and monitoring, including adaptive management) to minimize or offset known and potential Project impacts. Additional recommendations for mitigation and/or monitoring are included in the EIS where applicable. Additionally, the Adaptive Management Plan concept presented in the FFREIS was further refined during this EIS process which resulted in a comprehensive Draft Adaptive Management and Monitoring Plan (Draft AMMP) that provides background information, proposed and recommended mitigation and monitoring measures, and outlines draft monitoring plan protocols. The Draft AMMP is provided as Appendix B to the EIS.

Two primary resources were used to develop the discussion on proposed and recommended mitigation and monitoring; Appendix B— Draft Adaptive Management and Monitoring Plan (Draft AMMP) and Appendix O—Takings, Flowage Easements, and Acquisition Processes (Appendix O). The Draft AMMP provides background information, proposed and recommended mitigation and monitoring measures, and outlines draft monitoring plan protocols. The Draft AMMP focuses on mitigation and monitoring for environmental impacts, whereas Appendix O provides a detailed legal discussion of proposed and recommended mitigation approaches specific to takings, flowage easements and acquisitions.

The MNDNR considered mitigation measures identified during the comment period on the draft scoping documents as well. These suggested mitigation measures were considered against the exclusionary criteria identified in Minnesota Rules, part 4410.2300, item G. Mitigation measures identified through public comments and carried forward in the EIS included:

- Monitoring diversion channel and flood water drawdown to reduce fish stranding in the diversion channel and inundation areas;
- incorporate invasive species monitoring and mitigation strategies into the Project operation plan;
- review existing Index of Biological Integrity (IBIs) for their potential to inform future monitoring of the aqueducts on the Maple River and Sheyenne River for freezing during low-flow and no-flow conditions; and
- assess the need for groundwater monitoring as part of the Draft Adaptive Management and Monitoring Plan.

Public comments received on the Draft EIS identified concerns pertaining to impacts, mitigation and monitoring on the following topics:

- Cemeteries
- Agricultural land
- Structures
- Roads, ditches and culverts
- Debris removal
- Takings process

Proposed and Recommended Mitigation and Monitoring (continued)

Many of the above concerns relate to takings, flowage easements and acquisitions. MNDNR determined that more information on those topics was needed. After further communication with USACE and the Diversion Authority, gaps were identified in the proposed mitigation. Therefore, in response, MNDNR developed Appendix O. Other concerns not directly related to takings, flowage easements or acquisitions are addressed in Appendix L—Responses to Public Comments Received on the Draft EIS.

The tables below summarize known or potential Project impacts with associated proposed mitigation; monitoring measures as detailed in previous environmental review documents or that were identified or updated during the development of this EIS; and recommendations for additional mitigation or monitoring as applicable. The table indicates if the mitigation or monitoring measure has been adopted as part of the Project or has been identified as a measure that could be implemented. Additional information related to mitigation for the Project is provided in the corresponding chapters of the EIS for each topic area.

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 2 Summary of Hydrology and Hydraulics Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Flood inundation beyond existing floodplain (an estimated 20,000 acres) resulting in impacts to various natural resource features and socioeconomics as covered within the EIS. 	<ul style="list-style-type: none"> Mitigation specific to Project hydrology was not proposed in the USACE environmental review documents. Hydrologic changes in the project area caused by the Project may impact a number of resources. Mitigation specific to identified or potential resource impacts are discussed under the appropriate resource categories. 	<ul style="list-style-type: none"> Red River hydrology and hydraulics should be monitored from USGS gages as part of the Geomorphology Monitoring Plan. Three new gages are proposed to be added at the three control structures; diversion channel inlet, Red River, and Wild Rice River. During critical flood events, field monitoring and measurements should be completed to validate gage information and used to compare existing hydraulic conditions to Project-predicted and Project-actual hydraulic conditions.

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 3 Summary of FEMA Regulations and the CLOMR Process Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP and Appendix O)
<ul style="list-style-type: none"> • 100-year flood inundation to residential and non-residential insurable structures. 	<ul style="list-style-type: none"> • More than two feet flood inundation within FEMA revision reach (residential and non-residential): Acquisition or relocation of homes in manner consistent with federal law and policy and applicable state eminent domain law. • Up to two feet flood inundation within FEMA revision reach: Would be evaluated for non-structural measures, such as ring levees, relocation, or elevating structures. Acquisition may be considered in areas where risk and safety analysis indicates that leaving in place would be inappropriate. 	<ul style="list-style-type: none"> • Out-costs for ring levees (i.e., operation, maintenance, recertification) should be included with mitigation. Accredited levees must have government (local, state, federal) ownership and/or responsibility for inspection and maintenance. All ring levees must meet FEMA accreditation requirements. • For portion of staging area in MN: Minnesota state law does not allow for the development of structures within the floodway. • Minnesota state law requires mitigation for structures located within the floodplain – this would include the newly defined floodplain or those that would experience an increase in flood damage potential on existing structures. • Mitigation would need to be completed prior to the LOMR being issued or flood insurance would be required. • Mitigation could include landscaping, structure relocation, flood-proofing, or elevating structures.
<ul style="list-style-type: none"> • Greater than 100-year flood inundation for residential and nonresidential structures. 	<ul style="list-style-type: none"> • The FEMA/USACE Coordination Plan does not address mitigation above the 100-year flood event. 	<ul style="list-style-type: none"> • Additional recommendations for structures not considered in the FEMA/USACE Coordination Plan can be found in ES Table 20.
<ul style="list-style-type: none"> • 100-year flood inundation to land including agricultural and organic farms. 	<ul style="list-style-type: none"> • The areal extent of flood inundation required by the Project for operation in the staging area would be mapped as floodway. Flowage easements are proposed to be obtained. • Inundated land outside of the staging area and within the FEMA revision reach would be mapped as FEMA floodplain. USACE has proposed to perform an analysis to determine if a taking has occurred, and flowage easements are proposed to be obtained only where impacts rise to the level of a taking. (See Appendix O). 	<ul style="list-style-type: none"> • Additional recommendations for properties not considered in the FEMA/USACE Coordination Plan can be found in Table 6.19.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP and Appendix O)
<ul style="list-style-type: none"> Greater than 100-year flood inundation to land including agricultural and organic farms. 	<ul style="list-style-type: none"> The FEMA/USACE Coordination Plan does not address mitigation above the 100-year flood event. 	<ul style="list-style-type: none"> Additional recommendations for land not considered in the FEMA/USACE Coordination Plan can be found in ES Table 20.

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 4 Summary of Stream Stability Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Modification and control of water flow from Project construction and Project operation (alteration of flood flow frequency and velocity; modification of existing floodway and floodplain; channel abandonment and aqueducts channel/substrate alteration effects). 	<ul style="list-style-type: none"> Monitoring and adaptive management to track before and after Project changes and adjust management of the Project through Geomorphology Assessments. Geomorphology Assessment – Monitoring - Includes: Pre- and post-construction geomorphic surveys once prior to Project construction and twice following construction. The pre-construction survey was completed in 2010 and 2011 (Geomorphology Report of Fargo, North Dakota and Moorhead Minnesota Flood risk Management Project, West 2012). Post-construction would potentially occur at five to ten years and 20 years following completion of Project construction. Additional surveys may occur if deemed necessary through the adaptive management process. Geomorphic Assessment Tasks: Analysis of hydrology, bank stability, sediment transport, and morphological classification. Final control structure designs should account for energy dissipation. Once design is finalized, shear stresses and velocities flowing out of the control structures should be verified to be lower than the threshold values for stiff clay. Adaptive management approach: Following Project operation, if bank failures or increasing bank instability is observed under the typical receding limb rate, the drawdown should be decreased systematically until a solution is reached by the AMMPT. The AMMPT would consider potential impacts that would result from decreasing the drawdown (e.g., agricultural impacts) in their approach. 	<ul style="list-style-type: none"> Adaptive management approach: Following Project operation, if bank failures or increasing bank instability is observed under the typical receding limb rate, the drawdown should be decreased systematically until a solution is reached by the AMMPT. The AMMPT would consider potential impacts that would result from decreasing the drawdown (e.g., agricultural impacts) in their approach. Monitoring (listed below) would be the basis for identifying the need for additional response/mitigation actions as described in detail in the Draft AMMP. Cross Sections: No less than three pre-construction surveys should occur prior to construction completion. Post-construction surveys every two years for three sampling cycles (assumes Project operation has not occurred). Following three sampling events, the Geomorphology Monitoring Team (GMT) would assess findings and determine whether more sampling is necessary and at what frequency. If Project is operated, sampling would occur as soon as possible following Project operation. Cross Sections: Additional and revised cross section survey locations (from those defined in the Geomorphology Report (West 2012) have been included in the Draft AMMP in an effort to provide a more complete assessment of potential Project impacts. Longitudinal Profile: To collect bed topography data and other data that may otherwise be missed when performing cross-sections. Pre- and post-construction surveys to follow the same schedule as Cross Sections. (This was not completed during 2010-2011 geomorphology survey). Cross Section and Geomorphic Assessments

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
		<p>Qualifications: For consistency and as supported by the MNDNR, the MNDNR highly recommends for quality assurance/quality control that these assessments should be completed by those trained in Rosgen III channel stability assessment certified by the MNDNR or other Rosgen course. Data management analysis should use one consistent data management tool; recommended data management tool is the RIVERMORPH data management software package associated with the Rosgen Stream assessments. If this data management tool is not utilized, then the software used should be in a format that is transferable to RIVERMORPH.</p> <ul style="list-style-type: none"> • Hydrology and Hydraulic Monitoring: USGS gages used in study area. Addition of three new gages is proposed at the three control structures; channel inlet, Red River, and Wild Rice River. • Bathymetry: Every 10-20 years in absence of large geomorphic change events. • Sediment Samples: Of both instream and bed and bank samples to determine sediment load and particles. Pre- and post-construction surveys to follow the same schedule as Cross Sections. • Bed Scour: Monitoring at the water control structures should be completed once the design and operating plan is finalized for these structures. • Communication with Local Agencies: Annual or more frequent communication should be established with representatives from local agencies regarding channel morphology. • Field Reconnaissance: A reconnaissance of the detailed study reaches should be conducted immediately prior to the completion of the Project and of the diversion channel immediately following its completion (to establish baseline as a conditions) and every five years thereafter for the first

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
		<p>ten years. If no significant changes are noted, reduce to every ten years.</p> <ul style="list-style-type: none"> • LiDAR: Should be completed to complement cross section data on the reaches in areas that are not surveyed. To occur once every three years focused in the river corridor. • Water Quality: Sample for water quality way to assess river response to Project. Sampling frequency would be dependent on data being gathered (some continuous and some parameters would follow sediment sampling frequency). • Aerial Photography: To capture trends in the land surface – use and observations of impacts (Project and other causes). Every one to two years for five years or immediately following Project operation. If no significant changes have occurred after five years, the frequency can be reduced to every four to five years. If no significant changes have occurred after 15 years, the frequency can be reduced to every ten years.

ES Table 5 Summary of Wetlands Proposed and Recommended Mitigation and Monitoring – Forested Wetlands

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> • 62 acres of direct impacts to floodplain forest. 	<p>Mitigation</p> <ul style="list-style-type: none"> • A two to one mitigation ratio would be applied for floodplain forest impacts. • Floodplain lands would be acquired that are currently in agriculture or pasture, and re-establish woodland on those tracts. Restore native floodplain forest and herbaceous vegetation. These areas would also provide wildlife habitat. • USACE would develop a site restoration plan, including tree 	<p>Mitigation</p> <ul style="list-style-type: none"> • Acquisition, monitoring, management, and easement acquisition should be the responsibility of the non-Federal sponsor. Monitoring Plan: • Monitoring through adaptive management (as detailed in the Draft AMMP) to evaluate whether the specific ratios proposed for wetland mitigation would replace lost function and temporal loss. The AMMPT would weigh in on

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
	<p>planting areas, and clearing, treatment and management schedule of the site(s). A combination of direct seeding and seedling trees would be used as needed. Site(s) would be managed for effective growing. Site(s) would be protected and managed into perpetuity by an agreement for management as a wildlife management area by the MNDNR or North Dakota Game and Fish Department (NDGF).</p> <p>Monitoring Plan:</p> <ul style="list-style-type: none"> • Sites would be monitored for tree survival annually for five years, then tree survival and composition at ten years. Tree survival and composition would be monitored every five years thereafter and following major wind storms. • Adaptive management would be used to monitor the mitigation sites. Monitoring would include measurement of specific performance standards and the implementation of corrective action measures if the standards were not being met. • The MNRAM wetland assessment method or other agreed upon methods would be used to assess the adequacy with which the mitigations replaced lost wetland function. 	<p>monitoring reports and decide whether additional response actions are needed. The monitoring plan should also include a post-event assessment. Particularly if the Project would go into operation prior to good root establishment. The rate and amount of sedimentation could impact these species. Mitigation sites should be monitored for sedimentation impacts and habitat function. Monitoring would evaluate impacts to wetland type and seed banks from various flood events. Wetland performance standards would include hydrology and vegetation observations over a period of several years. The Project consists of several monitored wetland types, each have different performance ranges for hydrology and vegetation.</p>

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 6 Summary of Wetlands Proposed and Recommended Mitigation and Monitoring -- Non-Forested Wetlands

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> 1,700 acres of non-forested wetland impact. 	<ul style="list-style-type: none"> Wetland replacement for diversion channel including side slopes and upland, at a 1.19 to 1 ratio and would be mitigated through revegetation/wetland creation at the bottom of the diversion channel and management of upland inside slopes. Adaptive management would be used to monitor the mitigation sites. Monitoring would include measurement of specific performance standards and the implementation of corrective action measures if the standards were not being met. The MNRAM wetland assessment method or other agreed upon methods would be used to assess the adequacy with which the mitigations replaced lost wetland function. 	<ul style="list-style-type: none"> North Dakota wetland mitigation plan proposed wetland replacement based on function, not by specific wetland type. This would require monitoring and reporting of habitat function. A range of performance measure standards are discussed in the USACE AMP mitigation and monitoring plan for wetlands. A project-specific wetland replacement plan for Minnesota is needed and should be developed under the direction of the WCA LGU(s) per WCA requirements. Wetland performance standards should include hydrology and vegetation observations over a period of several years. The Project consists of several monitored wetland types, each have different performance ranges for hydrology and vegetation.

ES Table 7 Summary of Wetlands Proposed and Recommended Mitigation and Monitoring – Oxbow/Hickson/Bakke Ring Levee Wetlands

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> 53 acres of direct impact. 	<ul style="list-style-type: none"> Mitigation sites include Forest River site (already constructed) and the Oxbow Country Club site. The remaining sites would be developed through Ducks Unlimited In-Lieu Fee Program. 	<ul style="list-style-type: none"> No additional recommendations or requirements at this time.

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 8 Summary of Wetlands Proposed and Recommended Mitigation and Monitoring -- Inundation Area Wetlands

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Potential impacts to wetland in the unprotected Project inundation area from sedimentation and subsequent function loss are unknown. 	<ul style="list-style-type: none"> Wetland mitigation is not specifically proposed for the staging area and inundation areas for potential indirect impacts resulting from sedimentation. 	<ul style="list-style-type: none"> Monitoring of the inundation areas should occur to assess potential indirect impacts to wetlands due to Project operation. Considerations for the wetland mitigation and monitoring plan should include sedimentation monitoring and habitat function monitoring. In the event that negative impacts are observed, additional replacement requirements that meet federal and state replacement requirements would also be necessary.

ES Table 9 Summary of Cold Weather Impacts on Aqueducts Function and Biotics Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Potential impacts to fish passage and biological connectivity as well as habitat. 	<ul style="list-style-type: none"> The mitigation and adaptive management proposed under Fish Passage and Biological Connectivity that includes monitoring fish, macroinvertebrates, and physical habitat would apply. Current engineering plans include heating components to reduce the potential for freezing or ice buildup. 	<ul style="list-style-type: none"> Monitoring of surface ice in the heated and unheated portions of the aqueduct compared to ice formation on the Maple and Sheyenne Rivers. Monitoring of backwater stage increase upstream of the proposed aqueducts compared to historic gage data.

ES Table 10 Summary of Cover Types Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Land, primarily cropland, would be acquired for construction of the diversion channel and other Project 	<ul style="list-style-type: none"> Cropland impacts would be mitigated by compensation to landowners for direct cropland impacts, such as land acquisition for Project construction. Owners of croplands that are 	<ul style="list-style-type: none"> No additional recommendations or requirements at this time.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
features. • Impacts would occur primarily to croplands and wetlands.	purchased for the Project would be compensated at fair market value.	
• Direct and indirect impacts to forested and non-forested wetlands.	• Refer to Wetlands discussion.	• Refer to Wetlands discussion.

ES Table 11 Summary of Potential Environmental Hazards Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
• Direct impacts to parcels from Project construction that may contain Recognized Environmental Conditions (RECs).	• Once Project designs are more refined and parcels have been identified for acquisition, the USACE would conduct additional Phase I Environmental Site Assessments (ESAs) and any necessary Phase II ESAs as recommended to determine if RECs are present and if remediation/mitigation is necessary. RECs could be mitigated through removal of REC, soil and groundwater remediation projects or other measures.	• Minnesota Rules, part 7035.0805 requires that a building survey be completed to identify potential asbestos containing materials, lead based paint, and any regulated/hazardous materials that require special handling or disposal prior to demolition or relocation of structures. Regulated materials would need to be mitigated/disposed of in accordance with local, state, and federal laws by a licensed hazardous waste contractor.
• Flood inundation to properties containing RECs.	• Mitigation for structures that would be impacted from inundation would be determined on a case-by-case basis as the level of impact (depth of flood impact) would be taken into consideration when determining a mitigation course of action. Refer to FEMA CLOMR and Socioeconomics discussions for more details.	• RECs should be considered during property evaluations and should be identified and properly mitigated for those properties that would be affected by inundation as a result of Project operation.

Proposed and Recommended Mitigation and Monitoring (continued)

ES Table 12 Summary of Fish Passage and Biological Connectivity Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> • Channel abandonment: <ul style="list-style-type: none"> ○ Lower Rush River: 2.7 miles ○ Rush River: 2.3 miles 	<ul style="list-style-type: none"> • A low flow channel would be constructed in a sinuous nature from the Maple River downstream to the outlet of the diversion channel into the Red River to mimic a more natural stream channel. 	<ul style="list-style-type: none"> • Monitoring would be the basis for identifying the need for additional response/mitigation actions. Ecological function of the proposed low-flow channel needs to be monitored post-construction and operation to determine its effectiveness. See Draft AMMP. • Construction Avoidance Periods: Proper timing of Project construction would need to be considered in order to minimize or avoid further potential impacts to the fish community.
<ul style="list-style-type: none"> • Red River connectivity - operation of control structure. 	<ul style="list-style-type: none"> • Construct Drayton Dam Fish Passage, including installation of a new rock-ramp spillway and removal of portions of the existing dam. 	<ul style="list-style-type: none"> • Consider additional ways to reduce frequency of operation by, for example, constructing more in-town levees (or other flood reduction project(s)) that would allow for flows through town to be greater than 17,000 cubic feet per section (cfs).
<ul style="list-style-type: none"> • Wild Rice River connectivity – operation of control structure. 	<ul style="list-style-type: none"> • Remove the Wild Rice River Dam. 	<ul style="list-style-type: none"> • No additional recommendations or requirements at this time.
<ul style="list-style-type: none"> • Impacts to connectivity in the project area. 	<ul style="list-style-type: none"> • Monitoring would occur following Project operation at predefined locations. Techniques for monitoring would be determined following Project construction but would generally include evaluation of hydraulic conditions and biological sampling. See Draft AMMP for more details. 	<ul style="list-style-type: none"> • Monitoring for fisheries impacts should be evaluated on a broader scale, as a fish connectivity barrier on the main stem can have impacts on upstream and downstream reproduction. Monitoring plan sampling techniques need to take into account large river species. See Draft AMMP – Considerations for benthic fishes on the Red River. • Final diversion channel and control structure designs should be reviewed by the AMMPT and the ABMT to ensure that they are designed to minimize the potential for impacts to fish passage.
<ul style="list-style-type: none"> • Impacts to aquatic biota and potential habitat in the project area. 	<ul style="list-style-type: none"> • Fisheries, physical habitat, and macroinvertebrate assessments would be completed pre- and post-Project operation to establish baseline and Project conditions. At least two fish monitoring events would be conducted prior to construction of the Project and that the survey locations would include areas 	<ul style="list-style-type: none"> • Fish community monitoring at sites identified within the Aquatic Biological Monitoring Plan (ABMP) in the Draft AMMP (currently 21 sites listed in the Draft AMMP but number may be adjusted by the ABM Team) should be conducted at least two times prior to Project construction

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
	near the footprint of the Project structures (i.e., control structures, aqueducts, rock-ramps, etc.), as well as sites above or below the features. As of 2015, one pre-construction fish survey has already been completed. <ul style="list-style-type: none"> • Adaptive management would be used by the AMMPT to determine if additional mitigation is necessary based on assessment results. 	and two additional times prior to Project operation. It is recommended that monitoring be conducted on a two or three-year return frequency for the pre-construction/operation surveys. After the Project construction is complete, additional monitoring events and assessments would be required to monitor future changes and assess impacts. The number of sites that are surveyed could vary depending on final Project design and due to the adaptive nature of this approach. Changes to survey sites would be recommended by the ABMT. See Draft AMMP. <ul style="list-style-type: none"> • Follow up surveys and assessments should follow the protocols and methodologies used in the initial assessment (URS, 2013), and if possible, should occur during the same time of the year. • Metrics where sites have scored well, such as taxa richness of fish-eating species or relative abundance, would be good to track across monitoring events, including pre-construction, post-construction and Project operation.
<ul style="list-style-type: none"> • Direct impacts to aquatic habitat from Project construction; <ul style="list-style-type: none"> ○ Maple River: 11 acres ○ Sheyenne River: 8 to 9 acres ○ Wild Rice River: 12 acres ○ Red River: 14 acres 	<ul style="list-style-type: none"> • Stream restoration would be completed that includes stream re-meandering, bank grading, riffles/grade control, riparian buffer strips and other actions. • The aquatic habitat within constructed channels would be measured (quantity and quality) and compared against pre-construction conditions to assess if additional aquatic habitat mitigation is necessary. 	<ul style="list-style-type: none"> • Possible stream restorations on a different river that is not impacted by the Project or that may be located outside of the project area. The stream reconstruction projects should be restricted to other streams within the Red River basin to ensure the impacts from the Project are offset within the overall watershed. Consider large restoration efforts basin-wide if monitoring shows significant impacts occurring. Large restoration efforts would require financial assurance. • Construction Avoidance Periods: Proper timing of Project construction would need to be considered in order to minimize or avoid further potential impacts to the fish community.
<ul style="list-style-type: none"> • Potential fish stranding after Project operation. 	<ul style="list-style-type: none"> • Visual Assessment to evaluate fish stranding after Project operation would be completed by non-Federal sponsors 	<ul style="list-style-type: none"> • Operation should ensure that fish would have the ability to follow the receding hydrograph, i.e., prevent stranding.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
	<ul style="list-style-type: none"> Design change to include diversion inlet structure gates to allow for more control over receding waters within diversion channel. 	

ES Table 13 Summary of Wildlife and Wildlife Habitat Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> 62 acres of direct impacts to floodplain forest. 	<ul style="list-style-type: none"> See descriptions under Wetlands as wildlife habitat replacement would be incidental to wetland replacement. 	<ul style="list-style-type: none"> See descriptions under Wetlands as wildlife habitat replacement would be incidental to wetland replacement.
<ul style="list-style-type: none"> Direct impacts to aquatic habitat from Project construction; <ul style="list-style-type: none"> Maple River: 11 acres Sheyenne River: 8 to 9 acres Wild Rice River: 12 acres Red River: 14 acres 	<ul style="list-style-type: none"> See descriptions for Fish Passage and Biological Connectivity. 	<ul style="list-style-type: none"> See descriptions for Fish Passage and Biological Connectivity.

ES Table 14 Summary of State-Listed Species and Special Status Species Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Interruption of bald eagle nesting. 	<ul style="list-style-type: none"> Bald eagles nests would be monitored during spring construction season. The project area would continue to be monitored during the upcoming years to ensure that no new nests would be impacted by Project construction. There would be raptor nest surveys completed in the spring of the year preceding construction within or near any affected wooded areas. 	<ul style="list-style-type: none"> No additional or requirements recommendations at this time.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Mortality of mussels from Project construction. 	<ul style="list-style-type: none"> Additional mussel surveys are being considered for Project footprint areas to verify whether impacts to mussel resources would be substantial. This would include determining presence of the black sandshell, mapleleaf and Wabash pigtoe mussels. 	<ul style="list-style-type: none"> Recommend that additional mussel surveys be completed for Project footprint areas.
<ul style="list-style-type: none"> Interruption of cardinal and whip-poor-will nesting. 	<ul style="list-style-type: none"> To the extent practicable, vegetation clearing activities would be done so as to avoid affecting nesting individuals. 	<ul style="list-style-type: none"> No additional recommendations or requirements at this time.
<ul style="list-style-type: none"> Interruption of bird nesting and rearing periods. 	<ul style="list-style-type: none"> Tree clearing on forested land would occur during the winter months in order to not impact listed bird species during their nesting and rearing periods. 	<ul style="list-style-type: none"> No additional recommendations or requirements at this time.
<ul style="list-style-type: none"> Interruption to migration and spawning for lake sturgeon during Project operation. 	<ul style="list-style-type: none"> Monitoring would occur following Project operation as predefined locations. Techniques for monitoring would be determined following Project construction but would generally include evaluation of hydraulic conditions and biological sampling. See Fish Passage and Biological Connectivity for more details. 	<ul style="list-style-type: none"> See descriptions for Fish Passage and Biological Connectivity.

ES Table 15 Summary of Invasive Species Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Invasive species establishment at disturbance sites (i.e., mitigation and construction sites). 	<ul style="list-style-type: none"> An invasive species management plan, including pre-construction monitoring data previously collected by the USACE and post-construction monitoring of biota and physical habitat for both construction sites and mitigation sites, would be prepared. The plan would outline the inspection procedures and occurrences to ensure compliance. BMPs would be followed to prevent the introduction and spread of aquatic or terrestrial invasive species during Project construction and monitoring. Wetland mitigation sites would be managed for invasive species. Invasive and/or non-native plant species would be 	<ul style="list-style-type: none"> Control of invasive species may be needed at specific mitigation sites for functional lift/enhancement if monitoring shows that functions being replaced are not adequate. Minnesota wetland replacement requirements usually have specific performance criteria that must be met (e.g., max. percent cover of invasive species). The construction of this project would involve work in zebra-mussel infested waters. The Corps should develop a plan for reducing the risk of spreading zebra mussels during construction, including: decontamination of construction equipment before it's used at another site,

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
	controlled for three full growing seasons at floodplain forest mitigation sites. Control would consist of mowing, burning, disking, mulching, biocontrol and/or herbicide treatments as needed. By the third growing season, any planted areas one-half acre in size or larger that have greater than 50 percent areal cover of invasive and/or non-native species would be treated (e.g., herbicide) and/or cleared (e.g., disked) and then replanted with appropriate non-invasive plants. <ul style="list-style-type: none"> • When construction activities are complete, disturbed areas would be seeded with native plant species or other plant species per Project plans and specifications. After native species have been planted, the seeded areas would be monitored per the Project plans and specifications. • The non-Federal sponsors would be responsible for noxious weed control on the whole Project perpetually as part of the Operations, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R). 	taking precautions with any water that is moved/transported/diverted from the site during the project, and proper disposal of any solid fill to reduce risk of spreading zebra mussels.
<ul style="list-style-type: none"> • Invasive species spread and establishment in inundation areas. 	<ul style="list-style-type: none"> • A monitoring plan would be prepared that would include procedures on survey for identifying invasive species, treatment plans, and follow-up surveys to confirm that treatments are effective. • Monitoring would be completed on an annual basis in accordance with the OMRR&R and adaptive management plan. 	<ul style="list-style-type: none"> • No additional recommendations or requirements at this time.

ES Table 16 Summary of Cultural Resources Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
<ul style="list-style-type: none"> • Flood impacts to eligible or listed NRHP properties and cemeteries. 	<ul style="list-style-type: none"> • USACE and Diversion Authority would comply with Section 106 through consultations and Programmatic Agreement with North Dakota and Minnesota State Historic Preservations 	<ul style="list-style-type: none"> • Adopt State Historic Preservation Office (SHPO) recommendations (per SHPO correspondence). • See Appendix O for potential mitigation measures.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
	<p>Officers. Programmatic Agreement for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project was signed in June and July 2011, and Amendment 1, signed in 2013.</p> <ul style="list-style-type: none"> • Programmatic Agreement defines the Project's Area of Potential Effects and contains stipulations for cultural resources avoidance, minimization, and mitigation measures. • The USACE completed a 2015 Draft Cemetery Mitigation Plan that includes potential mitigation measures but none of these measures have been proposed at this time. 	
<ul style="list-style-type: none"> • Flood impacts to cemeteries not eligible for NRHP. 	<ul style="list-style-type: none"> • Federal mitigation plan consists of requiring the non-Federal sponsor to acquire flowage easements within the staging area. 	<ul style="list-style-type: none"> • Adopt recommendations from the Draft Cemetery Mitigation Plan that go beyond flowage easements that fully consider potential impacts from Project operation specific to each cemetery. • See Appendix O for potential mitigation measures.
<ul style="list-style-type: none"> • Flood impacts to cemeteries outside the staging area. 	<ul style="list-style-type: none"> • The Draft Cemetery Mitigation Plan does not identify any proposed mitigation for these cemeteries. 	<ul style="list-style-type: none"> • See Appendix O for potential mitigation measures.

ES Table 17 Summary of Infrastructure and Public Services Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> • Diversion channel construction impacts on existing roads and bridges. 	<ul style="list-style-type: none"> • Construction of road and rail bridges over the diversion channel would be completed to mitigate transportation connectivity impacts 	<ul style="list-style-type: none"> • Construction of roads and bridges as well as changes to other infrastructure may cause impacts to resources, which should be evaluated accordingly during permitting. • Coordination with entities such as the US Postal Service is recommended so that road closures can be anticipated in advance and planned for.
<ul style="list-style-type: none"> • Flood inundation of existing roads, culverts and ditches. 	<ul style="list-style-type: none"> • I-29 and Highway 75 would be raised in the staging area to prevent inundation during Project operation. Small portions of Highways 81, 18, and 2 would be raised to maintain access to OHB and Comstock. All other roads in the staging area would be 	<ul style="list-style-type: none"> • The Diversion Authority should develop a process for Project-related clean-up and repair, including identifying responsibility, priorities, and local government coordination.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
	allowed to flood under Project operation. <ul style="list-style-type: none"> Debris would be removed from public land and would be captured in the forthcoming Operation and Maintenance Plan. 	
<ul style="list-style-type: none"> Change in traffic patterns to roads that were not designed for increased traffic. 	<ul style="list-style-type: none"> Road improvements to maintain mobility. 	<ul style="list-style-type: none"> No additional recommendations or requirements at this time.
<ul style="list-style-type: none"> Flood inundation of existing railroads. 	<ul style="list-style-type: none"> Railroads would be raised as needed through the inundation area. 	<ul style="list-style-type: none"> Additional studies are needed to evaluate potential impacts of railroad improvements or raises.
<ul style="list-style-type: none"> Project construction or flood inundation of existing utilities. 	<ul style="list-style-type: none"> Utilities that cannot withstand occasional flooding in the inundation area would be abandoned, modified, or relocated, depending on the situation in accordance with applicable regulations. 	<ul style="list-style-type: none"> Additional studies are needed to evaluate potential impacts of modifying or relocating utilities. For example, high voltage transmission lines would require coordination and possible approval from the MN Public Utilities Commission.

ES Table 18 Summary of Land Use Plans and Regulations Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Increased flooding of the inundation area, restricting development and/or use of areas <ul style="list-style-type: none"> Depending on inundation depth and location (within or outside of the staging area). 	<ul style="list-style-type: none"> The USACE has indicated regulations would be followed as required by federal law, and would continue to work with state and local entities for Project implementation. FEMA would require that the areal extent of flood inundation required by the Project for operation in the staging area be designated as floodway. Inundation outside of the staging area but within the FEMA revision reach would be designated as floodplain. Development restrictions would apply per FEMA regulations. See FEMA CLOMR for more details. 	<ul style="list-style-type: none"> Project construction may require permits and LGU approval. Conditional use permits (CUP) may be required. MNDNR may be involved with some of the local permit reviews, such as variances and CUPs that may include specific mitigation. Zoning amendments could be needed at the county, township, and municipal level once the Project is in operation and impacts can be monitored and quantified. Current floodplain ordinance and map revision: the impact of the Project on the existing floodplain may require LGU review of current floodplain ordinances and maps. Enhanced land use controls (e.g., “no build zones”) downstream of the dam in the benefited area (e.g., the hydrologic shadow of the dam, or areas impacted by flood

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
		<p>events greater than the 100-year).</p> <ul style="list-style-type: none"> Minnesota state law would not allow development to occur within the designated floodway (i.e., the inundated portions of the staging area on the MN side). Existing structures that would be within the newly designated floodplain would require flood insurance or would need to be mitigated. Restrictions for future development on parcels within the floodplain would apply per MN law.

ES Table 19 Summary of Minnesota Dam Safety and Work in Public Waters Regulations and Permitting Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS and Draft AMMP)
<ul style="list-style-type: none"> Dam construction on the Red River and Wild Rice River. 	<ul style="list-style-type: none"> No specific mitigation was described in the USACE environmental review documents. The Project would require a MNDNR Dam Permit, which has specific requirements for approval and possible mitigation. 	<ul style="list-style-type: none"> MNDNR dam safety and work in public waters permit would include necessary design, mitigation, and operation conditions for the Project. Application requires that specific studies be completed (by licensed engineers) and approved prior to permit approval. See Dam Safety Section 3.15 for further details on application process and permit approval criteria.

ES Table 20 Summary of Socioeconomics Proposed and Recommended Mitigation and Monitoring

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
<ul style="list-style-type: none"> Flood inundation to residential and nonresidential structures in the staging area. 	<ul style="list-style-type: none"> See ES Table 3 (FEMA) above. Flood insurance would be purchased for structures that are allowed to remain. 	<ul style="list-style-type: none"> See ES Table 3 (FEMA) above. Financial assurance for unforeseen impacts.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
<ul style="list-style-type: none"> Project operation flooding to land including agricultural. 	<ul style="list-style-type: none"> See ES Table 3 (FEMA) above. 	<ul style="list-style-type: none"> See ES Table 3 (FEMA) above. Provide supplemental crop insurance. Clean-up of debris following each Project operation. Appraisal for the flowage easement should consider future impacts of Project operation. Assess and compensate drainage ditch authorities for Project-related damage following each operation. Financial assurance for unforeseen impacts. Non-Federal sponsors purchase the impacted land.
<ul style="list-style-type: none"> Organic Farms 	<ul style="list-style-type: none"> Mitigation for organic farms is proposed to be the same as for agricultural land. 	<ul style="list-style-type: none"> Provide supplemental crop insurance. Approach organic farmers to discuss early buy-out options. Clean-up of debris following each Project operation. Potential impacts to certification should be determined prior to flowage easement issuance. Appraisal for the flowage easement should consider future impacts of Project operation. Flowage easements must consider “Going Concerns” for Minnesota businesses per Minnesota Constitution. Financial assurance for unforeseen impacts.
<ul style="list-style-type: none"> Century Farms 	<ul style="list-style-type: none"> Depending on structure eligibility, see ES Table 16 (Cultural) or ES Table 3 (FEMA) above. 	<ul style="list-style-type: none"> Depending on structure eligibility, see ES Table 16 (Cultural) or ES Table 3 (FEMA) above. See above rows for organic farms and agricultural land recommendations, as applicable.
<ul style="list-style-type: none"> Businesses in Unbenefited area 	<ul style="list-style-type: none"> Options include (impact-dependent): buy-outs, relocations, flowage easements, non-structural measures. Proposed mitigation would go to the landowner; no mitigation is currently proposed for the lessee. 	<ul style="list-style-type: none"> Flowage easements must consider “Going Concerns” for Minnesota businesses per Minnesota Constitution. Financial assurance for unforeseen impacts.
<ul style="list-style-type: none"> Infrastructure and Public Services and Utilities 	<ul style="list-style-type: none"> See ES Table 17 (Infrastructure) above. Development of a Utility Relocation Plan. Completed transportation plan. 	<ul style="list-style-type: none"> See ES Table 17 (Infrastructure) above. Financial assurance for unforeseen impacts.
<ul style="list-style-type: none"> Unbenefited Area Access to Health Care and Emergency Services 	<ul style="list-style-type: none"> OHB and Comstock ring levee residents would have at least one access road maintained during Project operation. Detour routes. 	<ul style="list-style-type: none"> Local Emergency Flood Plans (evacuation plans and routes) may need to be updated, particularly in areas with new inundation.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
<ul style="list-style-type: none"> • Social (e.g., effects of relocations, stress, community tie impacts) 	<ul style="list-style-type: none"> • There is no proposed mitigation for these impacts. 	<ul style="list-style-type: none"> • No additional recommendations or requirements at this time.
<ul style="list-style-type: none"> • Well, septic and groundwater impacts 	<ul style="list-style-type: none"> • Removal or abandonment within footprint or those that are associated with structures proposed to receive relocated/buy-outs. • Well monitoring near Project inundation area. Modifications may be made to prevent contamination to drinking water. 	<ul style="list-style-type: none"> • Regulations in accordance with Minnesota Rules, part 4725 must be followed. • Follow guidelines for the Minnesota Department of Health flood precautions for private water wells. • Include cost (as part of proposed mitigation) for floodproofing, abandonment or relocation of septic systems due to new inundation.
<ul style="list-style-type: none"> • Tenants (e.g., farmers, businesses, residents) 	<ul style="list-style-type: none"> • Proposed mitigation would go to the property owner; no mitigation is currently proposed for tenants. 	<ul style="list-style-type: none"> • Relocation assistance. • Advance notification of Project operation. • Provide supplemental crop insurance.
<ul style="list-style-type: none"> • Agricultural impacts (e.g., mobilization impacts, bisected properties, changes to soil chemistry, sedimentation/erosion, transportation of plant pathogens, invasive species and noxious weed spread, planting delays) 	<ul style="list-style-type: none"> • There is no proposed mitigation for these impacts. 	<ul style="list-style-type: none"> • Follow recommendations outlined in the NDSU Initial Ag Impact Study. • Mitigation for these types of impacts should consider the type of agriculture (traditional vs. organic) property. • Financial assurance for unforeseen impacts. • Provide supplemental crop insurance.
<ul style="list-style-type: none"> • Uninsurable farm structures, grain/livestock food spoilage 	<ul style="list-style-type: none"> • Uninsurable farm structures would be mitigated, but specific measures have not yet been determined. • Livestock operations would not be allowed in the staging area. • Relocations or other mitigation for grain food storage has not yet been determined. 	<ul style="list-style-type: none"> • Financial assurance for unforeseen impacts. • Flowage easements should account for damages to uninsurable structures.
<ul style="list-style-type: none"> • Cemeteries 	<ul style="list-style-type: none"> • See ES Table 16 (Cultural) above. 	<ul style="list-style-type: none"> • See ES Table 16 (Cultural) above. • Financial assurance for unforeseen impacts.
<ul style="list-style-type: none"> • Impacted land, primarily cropland, within the construction footprint 	<ul style="list-style-type: none"> • See ES Table 10 (Cover Types) above. 	<ul style="list-style-type: none"> • See ES Table 10 (Cover Types) above.
<ul style="list-style-type: none"> • Comstock and OHB ring levees. 	<ul style="list-style-type: none"> • Comstock ring levee would be designed in collaboration with local officials and would allow for future development. All residents within Comstock would be protected by the ring levee. • OHB ring levee would require the relocation of 42 homes to 	<ul style="list-style-type: none"> • No additional recommendations or requirements at this time.

Proposed and Recommended Mitigation and Monitoring (continued)

Known or Potential Impact Type (approx. acreage when applicable)	Proposed Mitigation and/or Monitoring Description (sources: FFREIS (AMP), Supplemental EA, Ag Impacts Mitigation Plan, Operating Plan, FEMA/USACE Coordination Plan, Draft AMMP)	EIS Recommended or Other Required Mitigation and Monitoring (sources: EIS, Draft AMMP, and Appendix O)
	different sites within the OHB levee. An additional 60 residential lots would be added within the ring levee for other displaced residents within the unprotected area. <ul style="list-style-type: none"> • The Diversion Authority proposes to compensate the City of Oxbow and the Kindred School District for loss of tax base for a period of up to four years caused by the temporary loss of the 42 homes. 	

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Areas of Controversy and Issues Yet to be Resolved

Areas of Controversy

Minnesota Rules part 4410.2300 identifies the minimum EIS content requirements. One of these content requirements is a summary that includes, among other items, areas of controversy and issues yet to be resolved. MNDNR has identified the following areas of controversy and issues based on public comments received in EIS Scoping and on the Draft EIS.

Flood Risk Transfer

The Project reduces flood risk within the Fargo-Moorhead urban area, but would increase flood risk upstream of the proposed dam. The justification for this flood risk transfer is that the Fargo-Moorhead urban area is a regional center with more structures and people. It is more feasible to remove or mitigate for flood risk in a confined area, less-developed area to the south. The extent of increased flood risk from the Project is such that some areas would have flood risk that previously had none. This brings up the criticism that those people who live in an area with flood risk are now transferring that risk to people who live in an area that did not have flood risk. Several commenters expressed concerns that this transfer of flood risk is unfair and unethical. The hydrology section (3.1) and the socioeconomic section (3.16) of the Final EIS describe how and to what extent this flood risk transfer would occur. For the 100-year flood, the Project benefits approximately 72,923.50 acres from flooding in the project area. This same flood event would flood approximate 20,461.30 acres of land upstream of the proposed dam that would not have been flooded without the Project.

Another aspect of flood risk transfer that has been a subject of controversy is associated with lands in Minnesota that would be flooded by the Project in comparison to how much benefit the project provides in Minnesota. Of the total benefits from the project approximately 10,229 acres, or about 14%, are within Minnesota. The total newly inundated acres in Minnesota are 12,317; an addition of 2,088 acres of inundation over existing conditions. This is largely due to higher ground in Minnesota and efforts of the City of Moorhead to manage flood risk. Minnesota ends up with more acres impacted than benefited. On the other hand, North Dakota would see 62,694 acres benefited, or about 86% of the Project benefits. The total newly inundated acres in North Dakota is 8,145; a reduction of 54,549.

Alternatives Analysis

The alternative analysis for the Project has been a source of concern and criticism since the early planning stages of the USACE's Feasibility Study. Federal alternative analysis conducted by the USACE relied heavily on cost-benefit ratios to determine suitability of various alternatives. USACE policy limits Federal participation in projects to only those projects that have a cost-benefit ratio greater than 1.0. Although the USACE found several different project alternatives that would have the required cost-benefit ratio, the proposed project was selected by the USACE because it was favored by the local sponsors (Diversion Authority). Another important aspect that led to selection of the Project was the ability to mitigate for increased inundation upstream of the Project.

Alternative screening conducted by USACE was not in compliance with alternative screening requirements in Minnesota Rules. To address this issue the MNDNR conducted alternative screening as part of EIS Scoping, the Draft EIS development and during development of the Final EIS. An alternative screening report and an EIS Appendix were provided for transparency and clarity around the alternative screening process so that the public could understand what was done and if needed, raise any issues during the Draft EIS review period. The biggest criticism of the alternative screening that was received from public comments was that the purpose and need for the Project was so narrow that it prevented a reasonable consideration of alternatives. To address this comment, the MNDNR rescreened all scoping alternatives

Areas of Controversy and Issues Yet to be Resolved (continued)

using a broader Project purpose (see Appendix M). This alternatives rescreen exercise did not change the results of previous alternative screening process. Commenters also provided many additional alternatives or variants of alternatives in an effort to identify a better solution. These were evaluated as part of the rescreening exercise; however screening of these alternatives and variants did not result in the identification any additional reasonable alternatives to the Project.

The level of interest in alternatives is a strong indicator of dissatisfaction with the impacts of the Project. Some factors that could be contributing to dissatisfaction and inability to identify reasonable alternatives are the physical attributes of the project area and the long standing flood risk within the Red River Basin. The land around Fargo is particularly flat and flood protection measures are complicated by flood risk from North Dakota tributaries. Catastrophic flood events that have occurred in the Basin create additional challenges to reducing flood risk. Finding that one project that can protect a community requires incorporating large or expensive components to deal with the large amounts of water that are associated with catastrophic events. Incremental measures will not address extreme conditions, although these incremental measures can help reduce the severity of extreme conditions. To that end, basin-wide flood risk reduction measures are very valuable and should be pursued wherever possible. However, these measures will not substitute for community-specific projects to address catastrophic flood events.

Floodplain Development

Commenters have identified floodplain development as an area of controversy by asserting the Project is not compliant with Executive Order 11988 (E.O. 11988) and that the real purpose of the Project is so that Fargo can develop the floodplain south of the city. The Final EIS provides some information (subsection 1.5.1.3) related to the E.O. 11988 and the considerations that federal agencies must make if their activities may have impacts on floodplains. The USACE has asserted that the executive order is directed at federal agencies and, as such, only federal agencies can officially determine how they comply with that order. The USACE had also asserted that they have complied with the executive order. It is understandable that commenters would question compliance with E.O. 11988 for a project such as this that removes significant acreage from the floodplain.

This concern is amplified by existing City of Fargo growth plans that envision future development in the area that is now undeveloped floodplain that is proposed to be protected by the Project. Some commenters have asserted that development of this area is the true purpose of the Project, and that purpose is not justified. The Final EIS addresses future development by the City of Fargo in Land Use Section 3.14.2. The EIS did identify under the No Action Alternatives that additional floodplain development would continue with the same flood risk current experienced. Local land use plans and regulations would be revised over time to reflect growth trends and future needs of each community, including regulation of floodplain development where required and appropriate. The EIS also attempts to address this by evaluating a different alignment of the dam under the NAA. The NAA reduces the amount of existing floodplain that is protected by the Project; however, shifting the alignment north would impact more structures than the Project.

Areas of Controversy and Issues Yet to be Resolved (continued)

Mitigation

The USACE and the Diversion Authority have proposed a series of mitigation measures to address various potential Project impacts, such as physical impacts to water resources, loss of connectivity, construction impacts and increased inundation. The controversy associated with mitigation is whether or not the proposed mitigation is sufficient to address the potential impacts of the Project. In some cases there is a disagreement about whether an impact would actually occur or the degree that the Project contributes to the impact. For example the MNDNR believes that the Project would change the hydrology in the project area such that stream impacts could occur. The USACE believes this potential is small and should not require mitigation.

In other cases there is disagreement about the sufficiency of the mitigation. An agricultural impact due to increased inundation is just one of many potential examples where commenters felt the mitigation was insufficient. The USACE believes that it is not likely that Project operation would have an impact on agricultural production because Project operation would likely occur during early spring, prior to when planting occurs. In addition, it is believed that if Project operation would overlap with the planting schedule that the storing of additional water on agricultural land would not result in major impacts to planting delays, crop yields, and etc. Another area of potential disagreement is associated with storing additional water on land would have been flooded under existing conditions. For example, a specific parcel may currently be flooded with 18 inches of water during a 100-year flood event, but under Project operation that same parcel could be flooded with up to 3 feet of water during the a 100-year flood event. This raises questions about if the additional 18 inches of water makes any difference to that parcel, and if so, what mitigation is warranted.

There is disagreement between the MNDNR and the USACE and Diversion Authority about what level of mitigation is needed to compensate for Project impacts. Chapter 6.0 of the Final EIS identifies those impacts where MNDNR believes additional mitigation is needed. This same chapter also identifies potential additional mitigation measures that could be implemented to address these deficiencies.

Examples of unmitigated impacts include:

- Sufficiency of takings process
- Increased inundation less than 6 inches.
- Increased inundation for flood between the 100-year and 500-year events
- Impacts to agricultural land including organic farms
- Impacts to cemeteries
- Geomorphology impacts
- Wetland impacts in the inundation area

Section 3.15 of the Final EIS identifies the permit requirements that MNDNR must consider when evaluating the application for a dam safety and work in public waters permit for the Project. One of these criteria is the sufficiency of mitigation. If during consideration of the application for the Project MNDNR determines that proposed mitigation is insufficient, the application must be denied.

Alternatively, the USACE and Diversion Authority could develop additional mitigation measures that would become conditions of the permit to address this potential deficiency.

Areas of Controversy and Issues Yet to be Resolved (continued)

Issues Yet to be Resolved

In order to begin construction in Minnesota (including the Red River), the Project needs approval from the MNDNR for work in public waters and dam safety. Minnesota Statute and Rule contain requirements that must be met in order for MNDNR to issue a permit. The EIS does provide information relating to these topics; however there still are unresolved issues that would need to be addressed as part of a permit decision. Some examples of these potential unresolved issues include:

- Alternatives. As part of permit application review, there will need to be an evaluation of whether the Proposed Project represents a minimum impact solution to a specific need with respect to all other reasonable alternatives. For example, a different alternative could be deemed more reasonable or the Project could be deemed un-permittable.
- Plan compatibility. The MNDNR must make a finding that the Project is compatible with local land use and water management plans. The land use section of the Final EIS identifies the outstanding questions associated with plan compatibility.
- Mitigation. The MNDNR must determine if the proposed mitigation is sufficient. For additional information on proposed, recommended, and potential gaps in mitigation and monitoring, see Chapter 6 and Appendix O.

Permits, Approvals, and Federal Regulatory Programs and Laws

What permits, approvals or Federal Regulatory Programs and Laws would be required or would need to be complied with prior to construction and operation of the Project?

ES Table 21 provides a list of the possible permits, approvals, Federal Regulatory Programs and Laws that have been identified for the Proposed Project. Additional details are included in Chapter 1 of the EIS.

ES Table 21 Permit, Approvals, and Federal Regulatory Programs and Laws Related to the Project

Permit/Approval	Governing Agency	Responsibility
Federal Agencies		
Clean Water Act – Section 404	United States Army Corps of Engineers (USACE)	Non-Federal Sponsor if constructed by Non-Federal Sponsor ¹
Section 7 of the Endangered Species Act Coordination	United States Fish and Wildlife Service (USFWS)	USACE
Executive Order 11988: Floodplain Management	USACE	USACE
Rivers and Harbors Act of 1899 – Sections 9 and 10	USACE	Non-Federal Sponsor if constructed by Non-Federal Sponsors
Conditional Letter of Map Revision (CLOMR)	Federal Emergency Management Agency (FEMA)	Non-Federal Sponsors
Letter of Map Revision (LOMR)	FEMA	Non-Federal Sponsors
Prime and Unique Farmlands	Natural Resources Conservation Service	USACE
State Agencies: North Dakota		
Clean Water Act – Section 401 Certification, Water Quality - ND	North Dakota Department of Health (NDDH)	USACE
Dewatering Permit	NDDH	Contractor
NPDES Stormwater Permit	NDDH	Contractor/Owner
Aquatic Nuisance Species Rule	North Dakota Game and Fish Dept.	Contractor
Memorandum of Understanding	North Dakota Department of Transportation (NDDOT)	Non-Federal Sponsors
Section 106 Consultation	Archaeology and Historic Preservation Division, State Historical Society of North Dakota	USACE
Waters Drain Permit	North Dakota State Water Commission (ND State Water Commission)	Non-Federal Sponsors
Construction Permit	ND State Water Commission	Non-Federal Sponsors
Sovereign Lands Permit	Office of the State Engineer	Non-Federal Sponsors
State Agencies: Minnesota		

Permits, Approvals, and Federal Regulatory Programs and Laws (continued)

Permit/Approval	Governing Agency	Responsibility
Dam Safety Permit	Minnesota Department of Natural Resources (MNDNR)	Non-Federal Sponsors
Water Appropriations Permit	MNDNR	Non-Federal Sponsors
Public Waters Work Permit	MNDNR	Non-Federal Sponsors
Burning Permit	MNDNR	Non-Federal Sponsors
Infested Waters Permit	MNDNR	Non-Federal Sponsors
Prohibited Invasive Species Permit	MNDNR	Non-Federal Sponsors
Cooperative Construction Agreement	Minnesota Department of Transportation (MNDOT)	Non-Federal Sponsors
Clean Water Act (CWA) – Section 401 Certification, Water Quality – MN	Minnesota Pollution Control Agency (MPCA)	USACE
NPDES Stormwater Construction Permit	MPCA	Contractor/Owner
Section 106 Consultation	Minnesota State Historic Preservation Office (MN SHPO)	USACE
Counties: Minnesota		
Floodplain	Clay County, Minnesota	Non-Federal Sponsors
MN Wetland Conservation Act	Clay Soil and Water Conservation District	Non-Federal Sponsors
MN Wetland Conservation Act	Wilkin County, Minnesota	Non-Federal Sponsors
Townships: North Dakota		
Building Permit	Harwood Township, North Dakota	Non-Federal Sponsors
Floodplain Permit	Harwood Township, North Dakota	Non-Federal Sponsors
Conditional Use Permit -Site Approval for General Ground Excavation	Mapleton Township, North Dakota	Non-Federal Sponsors
Conditional Use Permit -Site Approval for General Ground Excavation	Pleasant Township, North Dakota	Non-Federal Sponsors
Conditional Use Permit -Site Approval for General Ground Excavation	Warren Township, North Dakota	Non-Federal Sponsors
Townships: Minnesota		
Interim Zoning Ordinance	Holy Cross, Minnesota	Non-Federal Sponsors
Municipalities: North Dakota		
Floodplain Permit	City of Fargo, North Dakota	Non-Federal Sponsors
Stormwater Permit	City of Fargo, North Dakota	Non-Federal Sponsors
Conditional Use Permit -Site Approval for General Ground Excavation	City of Horace, North Dakota	Non-Federal Sponsors
Conditional Use Permit	City of West Fargo, North Dakota	Non-Federal Sponsors
Conditional Use Permit -Site Approval for General Ground Excavation	City of Argusville, North Dakota	Non-Federal Sponsors

Permits, Approvals, and Federal Regulatory Programs and Laws (continued)

Permit/Approval	Governing Agency	Responsibility
Municipalities: Minnesota		
Floodplain Permit	City of Moorhead, Minnesota	Non-Federal Sponsors
Stormwater Permit	City of Moorhead, Minnesota	Non-Federal Sponsors
Other Jurisdictions		
Application to Drain	Cass County Joint Water Resource District, North Dakota (Cass County Joint WRD)	Non-Federal Sponsors
Construction/Floodplain Approval	Buffalo-Red River Watershed District, Minnesota (BRRWD)	Non-Federal Sponsors
Two Rivers Watershed District (WD) Application	Two Rivers WD, Minnesota	Non-Federal Sponsors

¹A section 404 permit would be required for construction of the Project if construction is completed by an entity 879 other than the USACE as they are the governing agency. However, the USACE is required to adhere to Section 404 880 requirements for construction.

Organization and Content of the Environmental Impact Statement

This EIS analyzes potential impacts from the Project for various topics as identified in the FSDD. Organization of the EIS generally follows the standard format as set forth in Minnesota Rules, part 4410.2300. The EIS is organized by the following components:

- **Chapter 1 – Introduction** provides a Project overview, describes the purpose and need for the Project, and the government approvals that would be needed for construction and operation of the Project, including the various permits and agencies that would review the Project prior to construction and operation.
- **Chapter 2 – Proposed Project and Project Alternatives** provides detailed information on the Project and the alternatives evaluated in the EIS, including the Base No Action Alternative, No Action (with Emergency Measures), and the NAA. This chapter also provides an alternative evaluation with information on alternatives considered, but not carried forward for further evaluation in this EIS.
- **Chapter 3 – Affected Environment and Environmental Consequences** describes the potentially affected environment in which the Base No Action Alternative, Proposed Project, No Action (with Emergency Measures), and the NAA would occur. Environmental consequences of the Project and alternatives are analyzed, and a discussion of potential impacts is presented for each topic area, which considers short-term, long-term, beneficial, and adverse effects, and the significance of each of those potential effects.
- **Chapter 4 – Cumulative Effects** presents the results of the analysis that identified the potential for cumulative effects within a local and regional context.
- **Chapter 5 – Comparison of Alternatives** provides a summary of each of the alternatives relevant to the Project purpose and potential impacts.
- **Chapter 6 – Mitigation and Monitoring Measures** describes mitigation measures that could reasonably eliminate or minimize adverse environmental, economic, or sociological effects of the Project. Identifying these measures is required per Minnesota Rules, part 4410.2300. To meet this requirement, the EIS evaluates and discusses mitigation measures to address adverse effects identified as a result of analyses proposed in Chapter 3 of the EIS.
- **Chapter 7 – Consultation and Coordination** describes how the MNDNR and Project Proposer developed the FEIS in coordination with other state and federal agencies, tribal entities, and the public. This chapter also includes a description of the public involvement completed and planned.
- **Chapter 8 – List of Preparers** provides a list of preparers and document reviewers, their qualifications, and areas of responsibility.
- **Chapter 9 – References** provides a list of references that were used during the evaluation and analysis for the EIS and are cited in the EIS text.
- **Figures and Appendices** are also included in the EIS, and the reader is directed to these sources of information as needed throughout the EIS.