



**US Army Corps
of Engineers®**

St. Paul District

Draft Supplemental Environmental Assessment #2

Modifications to the Fargo Moorhead Metropolitan Area Flood Risk Management Project



U.S. Army Corps of Engineers

St. Paul District

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- Attachment I: Draft Clean Water Act Section 404(b)(1) Evaluation Supplement #2
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- Appendix A – Fargo-Moorhead Area Flood Diversion Task Force Final Report
- Appendix B – Post-Task Force Technical Advisory Group (TAG) Summary for Policy (Leadership) Group - March 8, 2018
- Appendix C – Alternative C Hydraulic Modeling Summary
- Appendix D – Hydrology and Hydraulics
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1 SUMMARY

The Red River basin in eastern North Dakota and western Minnesota has a long history of flooding due to the unique hydrology and topography of the area. The US Army Corps of Engineers (USACE) completed the Final Feasibility Report and Environmental Impact Statement (FEIS) for the Fargo-Moorhead Metropolitan Area Flood Risk Management Project (Project) in July 2011. The Project was later authorized by Congress in the Water Resources Reform and Development Act of 2014.

Detailed engineering and design studies conducted since the completion of the FEIS resulted in several proposed modifications to the Project (described in Section 2.1). An initial round of modifications was addressed in a Supplemental Environmental Assessment (SEA), dated September 2013. Additional modifications are analyzed within this document—the second SEA—which also addresses any changes in affected environment and impacts from what was described in the 2013 SEA. Information presented in the FEIS and the 2013 SEA is incorporated by reference.

This document focuses primarily on the modifications to the alignment of the Southern Embankment and the passage of more flow through town during project operation. The Project with all proposed modifications is referred to as “Plan B”. The construction and operation of Plan B would result in several changes in impacts to the human environment from what was presented in the 2013 SEA. An environmental review indicates that while the proposed modifications of Plan B would result in some changes in the location, timing, and magnitude of effects on some resources, there would not be an appreciable change in the overall types and scope of impacts from what was described in the 2013 SEA.

2 PURPOSE AND NEED FOR ACTION

2.1 Introduction and Background

The Fargo-Moorhead Metropolitan Area is a flood prone area located in Cass County, North Dakota and Clay County, Minnesota. The FEIS for the Project was completed in July 2011 to investigate flood issues, identify flood risk management measures, and recommend implementation of a federal project, if appropriate. The Locally Preferred Plan (LPP) from the FEIS consisted of a diversion channel system including, but not limited to: excavated channels; a diversion inlet structure; tieback embankments; gated structures on the Red and Wild Rice (ND) Rivers; an upstream staging area; hydraulic structures on tributaries; community ring levees; non-structural features (such as fee acquisitions, relocations, or raising individual structures); recreational features (such as multipurpose trails and pedestrian bridges); and environmental mitigation projects located inside and outside the project area. The LPP became the Federally Recommended Plan (FRP) after the analysis of alternatives in the FEIS, and was authorized by Congress in the Water Resources Reform and Development Act of 2014.

Detailed engineering and design studies conducted after the completion of the FEIS resulted in several modifications to the Project. These modifications were analyzed in the first Supplemental Environmental Assessment (2013 SEA), which was completed in September 2013. Project modifications addressed in the 2013 SEA included: alignment shifts; diversion channel cross-section modifications; the addition of gates to the Diversion Inlet Structure; the addition of levees and floodwalls in downtown Fargo to accommodate a river stage (RS) of 35' during the 1% annual chance exceedance (ACE) event (100-year flood); and a ring levee around the communities of Oxbow, Hickson, and Bakke, ND.

The Metro Flood Diversion Authority (Diversion Authority), one of the non-federal sponsors for the Project along with the cities of Fargo, North Dakota and Moorhead, Minnesota, applied for a dam safety and public waters work permit from the Minnesota Department of Natural Resources (MnDNR) in February 2016. In October 2016 the MnDNR denied the permit.

The Richland/Wilkin Joint Powers Authority (RWJPA) had previously filed a federal lawsuit in the District of Minnesota (Richland/Wilkin Joint Powers Authority et al. v. USACE et al., Civil No. 13-2262), alleging that Minnesota permits are required prior to construction, and that lawsuit was joined by the MnDNR following the permit denial. On September 7, 2017 the court issued a preliminary injunction stopping all construction work and advised, "The Court strongly encourages all parties to work to agree on a flood protection project that can serve the interests of both states and the affected communities. It is time for all parties to work together to find common ground."

In October 2017, North Dakota Governor Doug Burgum and Minnesota Governor Mark Dayton created a joint task force (Task Force) to propose a framework for flood risk management for the Fargo-Moorhead region. The Governors served as the Task Force Co-Chairs. Each Governor appointed eight members seeking to represent the range of perspectives in the region. Over a series of five meetings between October 23 and December 11, 2017, the Task Force discussed options for flood risk reduction and made recommendations with the understanding that these recommendations would be available for

consideration by the Diversion Authority for a future permit application for a flood risk management project. The charter for the Task Force included finding a solution that is permissible by the State of Minnesota, maintains the federal authorization for the Project, and provides 1% ACE event FEMA accredited flood protection.

The Technical Advisory Group (TAG) was created as an advisory group to the Task Force and was composed of three MnDNR staff members, the Moorhead City Engineer, the Fargo Diversion Engineer, and a Diversion Authority Engineer. The primary responsibilities of the TAG were to assess project components and alternatives and provide technical guidance to the Task Force. The work of the Task Force and the TAG analysis was summarized in a report titled “Fargo-Moorhead Area Flood Diversion Task Force: Final Report”, dated January 18, 2018, included in Appendix A.

A number of recommended changes to the Project came out of the Task Force and TAG meetings. These mainly relate to hydrology, allowable flow through the Fargo-Moorhead urban area, the location of tieback embankments in North Dakota and Minnesota, and modifications to the alignment of the Southern Embankment. The Southern Embankment collectively includes an earthen embankment with three gated structures: the Red River Structure, the Wild Rice River Structure, and the Diversion Inlet Structure (Figure 1). Key findings on components developed and changes recommended by the Task Force/TAG include:

- The Task Force directed the TAG to use the full period of record hydrology for its analysis. Based on this direction, and with data available through 2009, the analysis established the 1% ACE discharge of 33,000 cubic feet per second (cfs) at the USGS Fargo stream gage.
- The TAG recommended using the Western Tieback alignment, which shifts the Limited Service Spillway for the Southern Embankment to the west along an existing natural ridge that runs south and west from Horace.
- The TAG recommended using an Eastern Tieback alignment that turns the Southern Embankment south in Section 2 of Holy Cross Township, Clay County and extends south for approximately 5.5 miles and ties into existing high ground in Section 36 of Holy Cross Township near Clay County Highway 50.
- The TAG recommended using a flow through the Fargo-Moorhead urban area that results in RS37' at the USGS Fargo stream gage during the 1% ACE flood event.
- The TAG developed and evaluated three alignment options for the Southern Embankment. The alignments generally shifted the Southern Embankment north and shifted the staging area impacts into North Dakota.
- The TAG evaluated the use of northern storage in the downstream areas of the Project. It would reduce the staging area pool elevation by 0.03'.

- The TAG recommended that increases in downstream water levels be considered in the Project's operating plan.

The Fargo-Moorhead Area Flood Diversion Task Force: Final Report dated January 18, 2018 with Technical Advisory Group appendices is included as Appendix A.

Subsequent to the conclusion of the Task Force meetings, the TAG membership was expanded to include an engineer from the RWJPA and representation from USACE, and a Leadership Group (also referred to as a Policy Group) was formed to include two executive-level representatives from each of the following entities: the MnDNR, the Diversion Authority, the USACE, and the RWJPA. The TAG continued to meet to refine, explore, and study alternatives, including alignments not identified by the Task Force. The TAG reported its findings to the Leadership Group, which met a total of four times between January 29, 2018 and March 8, 2018. In evaluating alignments, the TAG focused on criteria that were identified in the Task Force meetings, mainly:

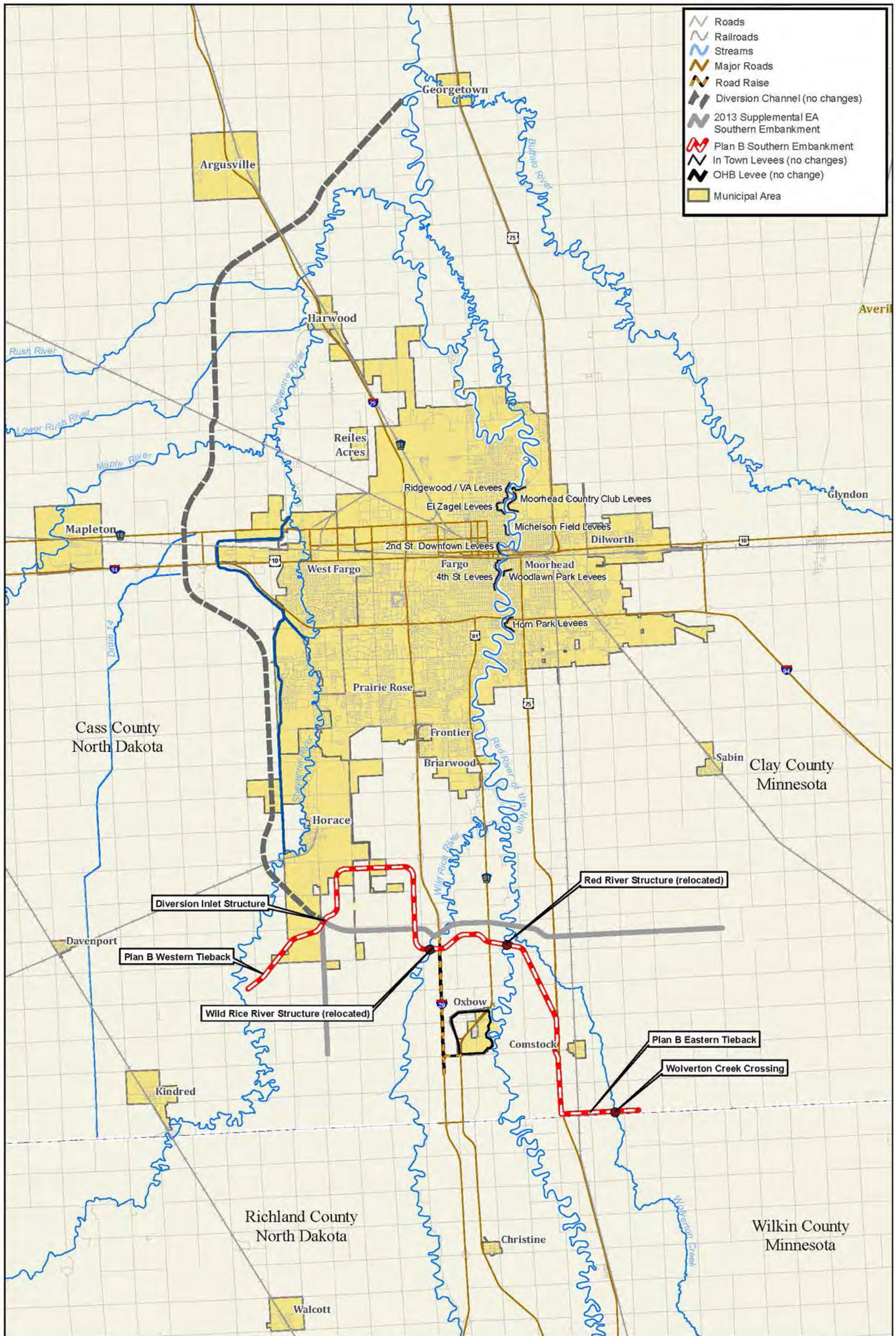
- Strive for equity of impacts and benefits between North Dakota and Minnesota
- Minimize acres removed from the floodplain
- Minimize newly impacted acreage and structures
- Minimize impacts in Wilkin County, MN and Richland County, ND, with a goal of reducing the newly impacted acreage to 640 acres or fewer in each county
- Consider economics – cost increases and reductions

In an effort to satisfactorily balance these criteria, a new alignment for the Southern Embankment in Minnesota was identified. This revised alignment would keep the Southern Embankment between Wolverton Creek and the Red River west of U.S. Highway 75. The alignment would also eliminate the need for a ring levee around the City of Comstock and for grade raises for the BNSF Moorhead Subdivision rail line and U.S. Highway 75. The alignment would also reduce the acres of impacted floodplain and impacted residential structures in Minnesota. The TAG Summary provided to the Leadership Group for their last meeting held March 8, 2018 is included as Appendix B. This summary presents comparative data for the Pre-Task Force project, four different southern alignment alternatives for the embankment between the Diversion Inlet Structure and the Red River, including the RWJPA Southern Alignment, and also the RWJPA-NW diversion channel alignment alternative.

The revised alignment in Minnesota west of Highway 75, as described in the previous paragraph, was combined with the alignment considered to be the most practicable option for the rest of the Southern Embankment. Combined, this new alternative is referred to as Option 7A/10D or Plan B. In its capacity as a non-Federal sponsor for the Project, the Diversion Authority submitted a MnDNR dam safety and public waters work permit application for Plan B, on March 16, 2018.

After further analysis, slight modifications to Plan B were made after the March 16, 2018 permit application. These micrositing adjustments were made to avoid unnecessary impact to residences, businesses, and various resources. Further reference to Plan B in this document includes the microsited features.

This SEA will focus on the differences between Plan B and the project that was proposed in the 2013 SEA (Figure 1). Major changes include: modifications to the alignment of the Southern Embankment, including the location of the Red River and Wild Rice River Structures and the addition of culverts where the Southern Embankment crosses Wolverton Creek, as well as allowing RS37' through Fargo and Moorhead during the 1% ACE flood event. Reference to the 2013 SEA and the FEIS are used frequently and are intended to increase the brevity and readability of this document.



Project Change Map - June 2018
 Fargo Moorhead Metro Area Flood Risk Management

Figure 1. Proposed modifications to the Project since the 2013 Supplemental Environmental Assessment.
 Draft Supplemental Environmental Assessment #2
 Fargo-Moorhead Flood Risk Management Project

2.2 Purpose for Action

A Task Force was created by the governors of North Dakota and Minnesota to propose a framework for flood risk management for the Fargo-Moorhead area. Recommendations made by the Task Force, along with further analysis by the Technical Advisory Group and Leadership Team, resulted in the formulation of Plan B. The proposed modifications are intended to meet the criteria in the Task Force charter and the Federal Court recommendation that the parties work together to find common ground that serves the interests of both states and the affected communities. In addition the Wild Rice River Structure was relocated to avoid impacts and improve constructability. This SEA evaluates the impacts of the proposed modifications to the Project with Plan B.

3 ALTERNATIVES CONSIDERED

Alternatives for achieving flood risk management in the Fargo-Moorhead Metro Area were evaluated in chapter 3 of the FEIS and in the 2013 SEA. This SEA addresses proposed modifications as part of Plan B. In addition, several other alternatives were evaluated by the Task Force and the TAG. As this SEA is intended to be a concise document, generally the alternatives that were considered and ruled out are described in Appendices A, B, C and E and as follows.

The Plan B Southern Embankment (also referred to as Option 7A/10D in TAG documents) was selected as the preferred alternative for the following reasons:

- Plan B would result in a balance of impacts (staging area total acres) and benefits (protected acres) between the states of Minnesota (~20%) and North Dakota (~80%). The other alternatives would further shift impacts into North Dakota beyond those necessary to equitably balance the impacts and benefits between the states. Plan B also reduces new impacts in each of Richland and Wilkin Counties to below 1 sq. mi (640 ac.).
- The other southern alignment alternatives (Option 7A/C Hybrid/10D, Option 7A'/10D, JPA Southern Alignment Revised (Alternative C)) generally extended farther north and east and would have greater impacts to residential and non-residential structures, utilities, transportation, and public services, at greater cost. Most alternatives would also place the St. Benedict area, with historic church and cemetery, into the area inundated upstream of the Southern Embankment unless a ring levee is added.
- The other southern alignment alternatives, with the exception of 7A/C Hybrid/10D, have longer dam lengths. There is greater risk associated with longer dam lengths located closer to the population at risk.
- The other southern alignment alternatives likely would result in greater impacts to the environment, including increased potential impacts to wetlands and cultural resources due to longer project footprint and increased forested wetland impacts due to more northern crossings of the Wild Rice River. Option 7A/C Hybrid/10D and JPA Southern Alignment Revised would impact three additional sites eligible for listing on the National Register of Historic Places (NRHP).

In addition, the RWJPA-NW Diversion Channel alignment was ruled out for several reasons, as detailed in Appendix E and summarized below:

- Increased number of structures left unprotected, including the city of Harwood, ND and other rural subdivisions.
- Increased number of structures impacted by the footprint of the alignment.
- Increased likelihood of environmental, stream stability, cultural resource, and maintenance impacts associated with the at-grade crossing of the Sheyenne River.
- Greater additional cost for land and construction.

The FEIS was written as a programmatic document from which subsequent NEPA documents could be tiered. This format uses the description and impacts analysis from the most recent NEPA document to discuss proposed modifications to the Project and changes in impacts to the environment. As such, the No Action Alternative for this SEA is the proposed alternative from the most recent supplement, the 2013 SEA. Information presented in the FEIS and the 2013 SEA is incorporated by reference.

In addition to the No Action Alternative, the existing conditions are also used in the Environmental Effects Section (Section 5) to compare the level of impacts expected to result from Plan B. The existing conditions are based on those described in the FEIS, and therefore do not include construction of any flood risk management measures that have resulted from the Project (portions of the Oxbow-Hickson-Bakke ring levee and several levees in downtown Fargo-Moorhead) or emergency measures (temporary structures providing flood risk management).

3.1 Plan B Alternative

3.1.1 Southern Embankment

The Southern Embankment would consist of an earthen embankment with three gated structures and one open culvert structure. The gated structures include the Diversion Inlet Structure, the Wild Rice River Structure, and the Red River Structure. The location of the open culvert structure on Wolverton Creek is referred to as the Wolverton Creek Crossing. The Southern Embankment would be approximately 20 miles long and in general would have a top width of 15 feet and side slopes of 4H to 1V.

As shown in Figure 1, starting from the west, the Southern Embankment begins approximately 4.5 miles south of the city of Horace, adjacent to the eastern banks of the Sheyenne River. The embankment runs northeast from this point for approximately three miles to the location of the Diversion Inlet Structure. The location of the Diversion Inlet Structure would be the same as described in the 2013 SEA. This section of the Southern Embankment is referred to as the Western Tieback. A portion of the Western Tieback will be designed to be overtopped in the event of a significant gate failure at one of the gated structures.

From the Diversion Inlet Structure, the Southern Embankment runs north two miles before heading east for another two miles and then back south for 2.5 miles. The Southern Embankment then turns east as it approaches the location of the Wild Rice River Structure. From the Wild Rice River Structure, the Plan B alignment continues east for just over two miles before arriving at the location of the Red River Structure.

East of the Red River Structure the Southern Embankment turns to the southeast along Wolverton Creek for 2.5 miles before turning south for another three miles parallel to Highway 75. Approximately 500 feet north of the Cass/Wilkin County line the alignment crosses Highway 75 and runs east 2.3 miles, crossing Wolverton Creek. This entire section of the Southern Embankment that runs east/west approximately 500 feet north of the county line and crosses Wolverton Creek is referred to as the Eastern Tieback. At the location of the Eastern Tieback, the effect of the Project on flooding would be minimal, but an embankment would be needed to prevent additional downstream flooding during extreme flood events. The Eastern Tieback would be designed to overtop, but overtopping flows would be limited such that downstream areas, including Comstock, would not receive stage increases up through the probable

maximum flood (PMF) event and stage impacts are less than 0.5 foot upstream of the Clay/Wilkin County line. An open hydraulic structure at the Wolverton Creek Crossing would be embedded within the Eastern Tieback.

3.1.1.1 Wild Rice River Structure

Plan B incorporated the recommendations of a micrositing study completed in 2014 to relocate the site of the Wild Rice River Structure to increase resiliency, avoid property impacts, optimize cost, reduce impacts to transportation facilities and to the traveling public, and limit environmental impacts (Final Technical Memorandum FM Diversion Post-Feasibility Alternatives Assessment: Wild Rice Hydraulic Structure and I-29/CH16 Interchange Micrositing, Appendix F). The location of the Wild Rice River Structure would change from what was described in the 2013 SEA, but the design would be similar. The Wild Rice River Structure would be placed west of I-29 rather than east of I-29, as had been indicated in the 2013 SEA (No Action Alternative). The location of the structure would also be shifted south by approximately 0.9 mile from the location in the 2013 SEA. Similar to what was described in the 2013 SEA, the structure is expected to consist of two 40-foot wide gates and would be built adjacent to the existing channel to keep the site dry during construction. Once built, the Wild Rice River would be rerouted through the gated structure. The gates would be fully open unless a flood event large enough to warrant operation of the gates occurs. When operated during flood events, the gates on the Wild Rice River Structure (along with the Red River Structure) would limit flood waters from flowing downstream into the urban core and would cause flood waters to accumulate upstream of the Southern Embankment.

3.1.1.2 Red River Structure

The location of the Red River Structure would change from what was described in the 2013 SEA, but the design would be similar. The Red River Structure would be constructed adjacent to the Red River in Cass County, North Dakota, approximately 0.6 mile south of the location described in the 2013 SEA. Similar to the Wild Rice River Structure, the Red River Structure would be built adjacent to the existing river channel in order to keep the site dry during construction. The Red River Structure is expected to consist of three 50-foot wide gates. Once built, the Red River would be rerouted through the gated structure. The gates would be fully open unless a flood event large enough to warrant operation of the gates occurs. When operated during flood events, the gates on the Red River Structure (along with the Wild Rice River Structure) would limit flood waters from flowing downstream into the urban core and would cause flood waters to accumulate upstream of the Southern Embankment.

3.1.1.3 Wolverton Creek Crossing

A gated structure on Wolverton Creek had been proposed in the FEIS but was removed when the Project was modified in the 2013 SEA. Modifications to the Southern Embankment with Plan B would again require the crossing of Wolverton Creek; however the crossing is anticipated to be an open culvert design with no gates. A temporary bypass channel would likely be used to divert flows during the construction of the Wolverton Creek Crossing. Sheetpile would be driven into the creek bottom and an approximately 550 foot long bypass channel would be excavated to allow construction of the Wolverton Creek Crossing. The sheetpile would be removed and channel restored following construction of the feature. The Eastern Tieback embankment elevation and the Wolverton Creek Crossing would be sized to ensure Comstock

would not receive stage increases up through the probable maximum flood (PMF) event and stage impacts are less than 0.5 foot upstream of the Clay/Wilkin County line.

3.1.2 Flow through Town (Project Operation)

A major modification to project operation would be the increased target of RS37' at the Fargo gage, as opposed to RS35' with the No Action Alternative. A general description of project operation is provided in the following paragraph. A more detailed description of project operation is provided in Section 4.1 of the Hydrology and Hydraulics Appendix (Appendix D).

During normal flows the Red River and Wild Rice River Structures would be fully open and the Diversion Inlet Structure would be closed. These structures would remain in their resting positions until a combined flow of 21,000 cfs (the 5% ACE event; 20-year flood) was recorded on the Red and the Wild Rice Rivers. USGS gages upstream of the project area, near Enloe and Abercrombie, North Dakota, would be used to determine the combined flow. Once the sum of flows exceed 21,000 cfs all gates at the Red River and Wild Rice River Structures would partially close and water would begin to pool upstream of the Southern Embankment. The amount of water allowed to pass through the gated structures would be based on a combination of observed flows and water surface elevations. The procedure would consider flows at six rivers in the vicinity of the Project (Red River, Wild Rice River, Sheyenne River, Maple River, Rush River, and Wolverton Creek). RS37' would be maintained up through the 1% ACE event. For events larger than the 1% ACE the target river stage at the Fargo gage would increase, with RS40' being the target for the 0.2% ACE event (500-year flood). Following a flood event gates would be opened at a rate that ensures stage fall does not exceed what has occurred under natural conditions so the potential for bank instability and fish stranding are minimized.

3.1.3 Inundation Upstream of the Southern Embankment

Once gate operations start, the area upstream of the dam would begin to store water by increasing the extent and depth of inundation. The extent and depth of water would vary depending on the severity of flooding (additional information provided in Section 5.3.2 as well as Sections 4.2 and 4.3 of Appendix D). The maximum pool elevation would be no greater than 924.0 feet, measured at the Western Tieback. For the 1% ACE event the approximate area of inundation upstream of the Plan B Southern Embankment would be 29,000 acres; this is approximately 12,000 acres greater than the area flooded during a 1% ACE event with existing conditions.

The Southern Embankment severs existing drainage paths and therefore additional ditching and grading would be needed to provide interior drainage (See Figure 5 & 6 in Appendix D). With Plan B, conveying large flows to the Diversion Inlet Structure would be accomplished by excavation upstream of the structure instead of the previously proposed connecting channel. A borrow ditch along the south side of the Southern Embankment would serve as the path for local drainage when the Project is not in operation and would aid with pool drawdown.

3.2 No Action Alternative

The No Action Alternative for this SEA is the proposed alternative from the 2013 SEA. Both this SEA and the 2013 SEA are written as tiered NEPA documents. Tiered NEPA documents utilize the discussion and analysis presented in previously prepared NEPA documents to avoid duplication and to focus on changes from what had previously been discussed. Therefore, the proposed alternative from the 2013 SEA is used as the No Action Alternative in this document and is compared against the environmental effects of Plan B.

3.2.1 Southern Embankment

The No Action Alternative for the Southern Embankment is the alignment proposed in the 2013 SEA. That alignment includes a 12 mile long embankment that runs easterly from the Diversion Inlet Structure, as well as a four mile long overflow embankment that extends south from the Diversion Inlet Structure to 52nd Street SE, for a total length of 16 miles. The alignment from the 2013 SEA is displayed along with Plan B in Figure 1.

3.2.1.1 Wild Rice River Structure

The No Action Alternative is the Wild Rice Structure as described in the 2013 SEA. The Wild Rice River Structure would require complete reconstruction of the I-29/CR-16 interchange north of its existing location, and would be located 0.9 mile north of the location proposed with Plan B.

3.2.1.2 Red River Structure

The No Action Alternative is the Red River Structure as described in the 2013 SEA. The structure would be located in Clay County, Minnesota, 0.6 mile north of the location proposed with Plan B.

3.2.1.3 Wolverton Creek Crossing

The No Action Alternative has an alignment that would not cross Wolverton Creek, as described in the 2013 SEA, thus the No Action Alternative does not include this structure.

3.2.2 Flow through Town (Project Operation)

The No Action Alternative is the proposed alternative as described in the 2013 SEA. In general, this would involve the operation of structure gates, starting at the 10% ACE event (10-year event), so that RS35' is not exceeded at the USGS gage in Fargo up to the 1% ACE event. A maximum RS35' would be maintained at the Fargo gage until an elevation of 922.2 NAVD 88 (1% ACE) was reached upstream of the Southern Embankment. Once the stage upstream of the Southern Embankment reached 922.2, the Red and Wild Rice River structures would be opened as necessary to maintain an elevation of 922.2 while not exceeding RS40' at the Fargo gage (0.2% ACE). The Fargo-Moorhead Metro Area would rely on a combination of permanent flood protection measures (levees and floodwalls) and emergency measures to reduce flood risk when the stage exceeds RS35' at the Fargo gage.

3.2.3 Inundation Upstream of the Southern Embankment

Water would be stored and the extent and depth of inundation would increase once flows reach 17,000 cfs and the Project goes into operation. The Southern Embankment severs existing drainage paths and therefore additional channel construction and grading would be needed. With the No Action Alternative a six mile long connecting channel would provide the geometry necessary to convey large flows to the Diversion Inlet Structure for extreme flood events, aid with pool drawdown, and serve as the path for local drainage.

4 AFFECTED ENVIRONMENT

The affected environment is described in detail in chapter 4 of the FEIS and section 4 of the 2013 SEA. This section will provide any additional information that has become available and describe any differences in the affected environment due to project modifications since the 2013 SEA.

4.1 Social

There have been 74 residential structures and seven commercial properties purchased by the Diversion Authority as part of the Project to date. Several other properties have been purchased through other efforts to support local flood risk management projects and/or to assist in the emergency flood fighting efforts. Residents living in homes removed as part of the Oxbow-Hickson-Bakke (OHB) ring levee project had the opportunity to re-locate within a newly developed part of the City of Oxbow.

4.2 Economic

No change from what is described in the FEIS and the 2013 SEA.

4.3 Natural Resources

4.3.1 Climate: No change from what is described in the FEIS and the 2013 SEA.

4.3.2 Geomorphology: No change from what is described in the FEIS and the 2013 SEA.

4.3.3 Air Quality: No change from what is described in the FEIS the 2013 SEA.

4.3.4 Water Quality: No change from what is described in the FEIS and the 2013 SEA.

4.3.5 Water Quantity: No change from what is described in the FEIS and the 2013 SEA.

4.3.6 Shallow Groundwater: No change from what is described in the FEIS and the 2013 SEA.

4.3.7 Aquifers: No change from what is described in the FEIS and the 2013 SEA.

4.3.8 Aquatic Habitat: General aquatic habitat conditions in the project area were discussed in the FEIS and the 2013 SEA. This included data observations from 2010, 2011 and 2012. Since the 2013 SEA, additional observations on aquatic habitat quality, including fish and macroinvertebrate communities, were made in the project area in 2017. Collectively from these recent observations, habitat quality for the Red River and tributaries within the project area generally ranges from “fair” to “poor”. This is based on qualitative habitat observations and available Index of Biotic Integrity (IBI) tools that characterize river health based on the biological community. Further details on assessments of habitat quality for the Red River and tributaries are included in Appendix G.

4.3.9 Fish Passage and Biological Connectivity: No change from what is described in the FEIS and the 2013 SEA.

4.3.10 Riparian Habitat: The proposed alignment shifts would change the location of some of the affected riparian habitat, but overall there is no appreciable change in the type or quality of riparian habitat from what is described in the FEIS and the 2013 SEA.

4.3.11 Wetlands: Wetland delineations were completed for the entire area directly impacted by Plan B. The off-site methodology used was the same as described in the July 13, 2011 wetland determination report in Appendix F of the FEIS. The general approach described by the Natural Resources Conservation Service (NRCS) "Mapping Conventions" to identify wetlands on agricultural fields was followed, with modifications based on the use of LiDAR and professional judgment.

4.3.12 Upland Habitat: The proposed alignment shifts would change the location of some of the affected upland habitat, but overall there is no appreciable change in the type or quality of upland habitat from what is described in the FEIS and the 2013 SEA. The upland areas in the project vicinity continue to be primarily composed of agricultural lands and urban development. While the majority of areas have not changed appreciably, slight changes have occurred. Forested windrows and fence lines have been removed in some locations to increase the number of tillable acreage and accommodate larger farm machinery. In addition, development in the project vicinity continues to occur. Overall, these changes are small but may reduce the amount of upland habitat, such as forested areas, affected by the Project.

4.3.13 Terrestrial Wildlife: The proposed alignment shifts would change the location of some of the affected habitat, but no new types of wildlife would be impacted as a result of these modifications.

4.3.14 Threatened and Endangered Species: On August 13, 2018 the U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) tool was used to determine species protected by the Endangered Species Act that are known to or are believed to occur in the counties affected by the Project (Cass and Richland Counties in North Dakota and Clay and Wilkin Counties in Minnesota). As stated in the 2013 SEA, IPaC indicated that the western prairie fringed orchid (*Platanthera praeclara*) and dakota skipper (*Hesperia dacotae*) are threatened species and that the gray wolf (*Canis lupus*), whooping crane (*Grus americana*), and Poweshiek skipperling (*Oarisma poweshiek*) are endangered species that may occur in these counties. Additional information on these species can be found in the FEIS and the 2013 SEA. A complete list of federally listed species in the project area can be found in Table 1.

The northern long-eared bat (*Myotis septentrionalis*, NLEB) was also listed as a threatened species in the project vicinity. It is the only species to have changed federal status in the project area since the 2013 SEA. The NLEB was newly listed as a threatened species in May 2015. The NLEB roosts underneath the bark or in cavities of trees during the summer months and hibernates in caves and mines during the winter. A fungal disease known as white-nose syndrome is the predominant threat to the NLEB. White-nose syndrome has decreased NLEB populations by up to 99 percent in the Northeast United States and continues to spread westward. No roost trees or hibernacula are known to occur in the project area.

Table 1. Federally-listed threatened and endangered species that are known or believed to occur in the project area.

Species	Status	Counties Believed to or Known to Occur
Whooping Crane	Endangered	Cass
Gray Wolf	Endangered	Cass, Richland
Northern Long-Eared Bat	Threatened	Cass, Clay, Richland, Wilkin
Western Prairie Fringed Orchid	Threatened	Clay, Richland
Dakota Skipper	Threatened	Clay, Richland
Poweshiek Skipperling	Endangered	Richland

4.3.15 State Listed Species:

North Dakota

The North Dakota State Wildlife Action Plan (2015 NDGF; SWAP) is the principle document for safeguarding rare and declining fish and wildlife species in North Dakota. SWAP identifies key species of conservation priority (SCP) for the State of North Dakota. SCP are periodically updated by the North Dakota Game and Fish Department. An updated list produced in 2015 resulted in the identification of several additional SCP species that may be present in the project area that were not previously identified. Additional species include 11 fish species, five mammal species, four mussel species, and three bird species (Table 2).

Table 2. Additional North Dakota Key Species of Conservation Priority that May be Present in the Project Area.

Fish Species		Mammal Species	Mussel Species	Bird Species
Chestnut Lamprey	Logperch	River Otter	Threeridge	Black-billed Cuckoo
Largescale Stoneroller	Northern Pearl Dace	Northern Long-eared Bat	Creek Heelsplitter	Red-headed Woodpecker
Silver Lamprey	Burbot	Little Brown Bat	Pink Heelsplitter	Bald Eagle
Hornyhead Chub	Pugnose Shiner	Big Brown Bat	Creeper	
Finescale Dace	Blacknose Shiner	Gray Fox		
Carmine Shiner				

Minnesota

The Minnesota Natural Heritage Information System (NHIS) was queried to determine if any additional rare species or other significant natural features are known to occur in the vicinity of the Project. One species (the rusty patched bumble bee), one site of moderate biodiversity significance, and one rare plant community (Northern Terrace Forest) were identified. It is important to note that the rusty patched bumble bee is a federally-listed endangered species; however, its presence has not been recognized by the USFWS in the four county project area.

4.3.16 Eagles: Raptor nest surveys have been conducted annually along various project alignments that have been considered since 2012. Four eagle nesting locations have been discovered in close proximity to the alignments during this time. One of these nests is located within several hundred feet of the Plan B Southern Embankment. This nest has been occupied by a pair of eagles every year since the surveys began. Surveys will continue each spring until construction of the Project is complete.

4.3.17 Prime and Unique Farmland: The proposed alignment shifts would change the location of some of the affected Prime and Unique Farmland, but overall there is no appreciable change in the type or quality of Prime and Unique Farmland from what is described in the FEIS and the 2013 SEA. The majority of the farmland in the region is categorized as “Prime and Unique Farmland” per the NRCS.

4.3.18 Hazardous, Toxic and Radioactive Waste (HTRW): Information on the 2010 comprehensive Phase 1 Environmental Site Assessment (ESA) and a 2012 supplemental investigation was provided in the FEIS and the 2013 SEA. An additional supplemental Phase 1 ESA was completed in 2015 to identify HTRW concerns along subtle alignment modifications being considered. The vast majority of this area has been in agricultural production since settlement. No HTRW concerns of major significance were revealed in the investigation. The majority of the area within the Plan B alignment has not been surveyed for HTRW sites. A complete Phase 1 ESA will ultimately be necessary along this alignment.

4.4 Cultural Resources

This section addresses cultural resources within the Area of Potential Effect (APE) and includes discussion of project features not limited to the Plan B alignment. The purpose of this overview is to provide updated information that was not available at the time of the 2013 SEA. Access to property for the purpose of cultural resources surveys has played a role in determining when historic properties information becomes available, and several of the reports that were works in progress in 2013 have been received and reviewed by USACE and State Historic Preservation Offices (SHPO).

Phase I and Phase II cultural resources surveys were conducted for the different project alignments between 2009 and 2017. Nearly 33,400 acres have been the subject of Phase I survey to date. Figure 2 shows the various survey tracts. Phase II surveys have been used to confirm the presence of subsurface cultural material, and intact features. In accordance with the terms of the Project’s cultural resources Programmatic Agreement (PA), Memoranda of Agreement (MOAs) have been executed for Phase III data recovery at two archaeological sites (32CS201 and 32CS5127) within the direct APE in the diversion channel. These locations have not yet been excavated. Four residential structures, adversely impacted by construction of in-town levees, were mitigated under a third MOA and were subsequently removed or relocated.

As of May 2018, the recorded information for all previously surveyed areas includes a total of 457 sites comprising archaeological and architectural sites, artifact scatters, isolated finds, and site leads. Of that total, 327 sites are located in North Dakota, of which all but 3 are in Cass County. The Cass County sites included 230 historic sites, 28 of which were artifact/debris scatters, and another 11 were isolated finds. There were 84 prehistoric sites, 21 of which were artifact/debris scatters, and 49 were isolated finds.

Another ten unverified or unaffiliated sites or site leads were primarily documented through literature or informant accounts. All the 130 sites recorded in Minnesota to date are discussed in the 2013 SEA.

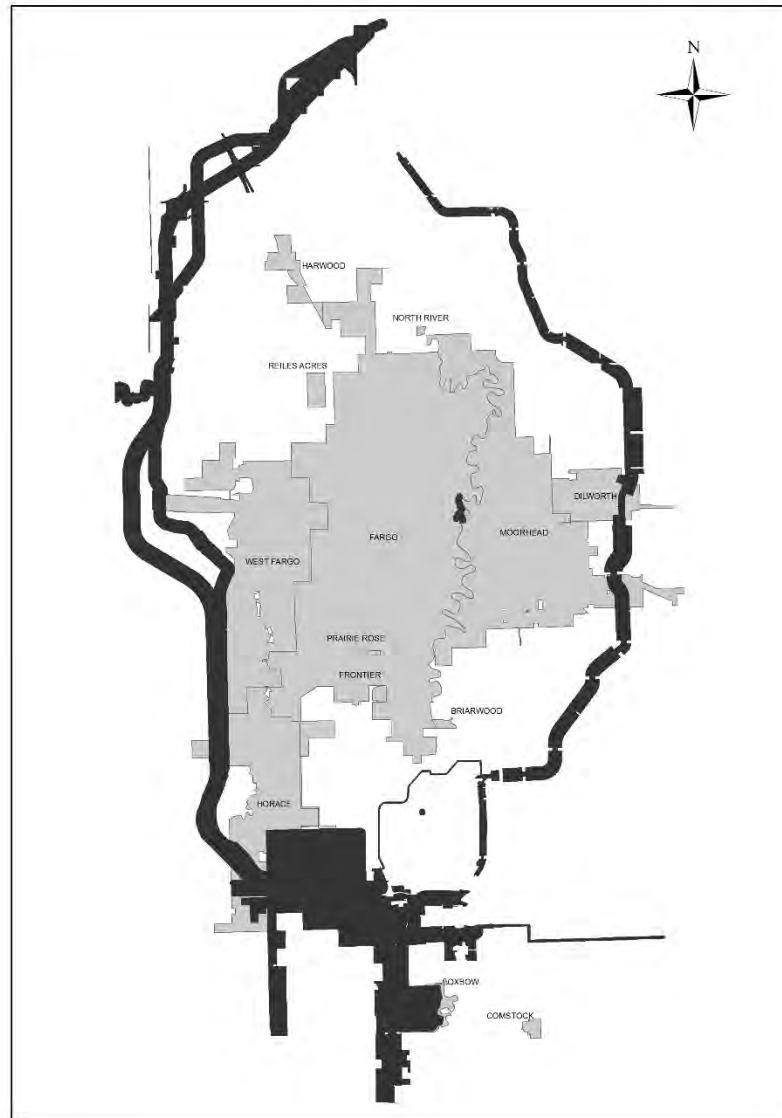


Figure 2. Tracts surveyed for cultural resources, indicated in black, equal 33,385 acres.

In-town Levees

Forty-three sites were identified as part of the downtown surveys for various levee and floodwall features. Four of these sites were historic debris scatters, isolated finds, or unverified site leads. Of the remaining 39 sites, 25 were built environment sites in the indirect APE of the 2nd Street efforts, eight were located at the El Zagal levee site, and the remaining six were part of the Oak Grove neighborhood. An MOA was executed in 2015 to mitigate the adverse effect of removing four of the Oak Grove historic properties, and a permanent historical marker was installed.

In 2013, a Phase I cultural resources survey commenced for the footprint (direct effect) of the floodwall located at 2nd Street North and along the proposed levee and floodwall at 2nd Street South in Fargo (McCarthy et al. 2014). A visual effects (indirect effect) analysis was also undertaken for the viewshed of the 2nd Street levee and floodwalls. Thirteen of the 25 visually impacted sites were listed in the National Register. Visual effects were ranked from major, to moderate, to minor, to no effect. Where adverse effects could not be avoided, they were minimized.

Further, an indirect APE survey was conducted for the El Zagal Levee approximately one-half mile northeast of downtown Fargo where, following evaluation, eight properties were determined not eligible/non-contributing and no further work was necessary (McCarthy 2015b).

An additional six residences contributing to the Fargo Oak Grove Residential Neighborhood National Register District were documented for the Mickelson Field levee extension (McCarthy 2015a). Subsequent Level II Historic American Buildings Survey (HABS) equivalent recordation of three properties was completed for 32CS4296, 32CS4298, 32CS4300 prior to demolition (McCarthy and Killam 2016). A fourth property, 32CS4278, was relocated to another lot in the same neighborhood (ibid.). Archaeological monitoring was conducted at the site of the property removals in Oak Grove during the construction of the levee extension (Domine 2016). Monitoring showed no signs of buried paleosols and the few historic artifacts appeared in undifferentiated modern fill.

Diversion Channel

Eligible sites located in the diversion channel alignment consist of two prehistoric archaeological sites that would be mitigated: 32CS201 near the diversion channel outlet, and 32CS5127 on the south bank of the Maple River. A third prehistoric archaeological site 32CS5135, along Drain 14—also south of the Maple River, still requires Phase II testing to determine its eligibility. Sites and isolated find locations north of the Maple River and within the work zone were the subject of Phase II testing (Jones et al. 2014). The work zone was subsequently modified to avoid prehistoric sites 32CS5139 and 32CS5146, also on the north side of the Maple River. No other sites inside the work zone were eligible. In all, 29 sites, including 18 that were characterized by either thin debris scatters or isolated finds, were located in the Maple River crossing area making it the locale with the greatest site density.

Located between the Sheyenne River and the diversion inlet structure at County Road 17, the National Register eligible historic farmstead site 32CS5153 requires the development of a mitigation plan and MOA. An unsubstantiated burial site (site lead 32CSX362) was investigated and found to be a field edge where repeated plowing aggregated material including modern debris (Jones and Shillinglaw 2013). A report providing an historic context for drains, ditches, and channelized river segments was prepared to assist with the evaluation of the many linear drain and ditch segments throughout the diversion channel (Gnabasik et al. 2014). To date none of these agricultural features have been determined eligible for National Register listing. Information needed for a viewshed analysis of impacts to the built environment along the diversion channel was assembled in 2017. A final report, containing the analysis and

recommendations for this work is pending. Mitigation measures for viewshed and for other impacts to the built environment by the Project's diversion channel and hydraulic structures have yet to be defined.

Plan B, End of Western Tieback to Diversion Inlet Structure

Phase I survey of approximately 800 additional acres in Cass County North Dakota is required along the Western Tieback section of Plan B. Archaeological and built environment resources investigations including viewshed analyses have not been undertaken throughout this part of the Project and are required.

Plan B, Diversion Inlet Structure to Wild Rice River Structure

Survey of the direct APE for the section between the Diversion Inlet Structure and the Wild Rice River Structure was largely completed in 2010 and is discussed in the FEIS. Three National Register eligible farmstead sites 32CS5158, 32CS5168, and 32CS5169, require mitigation plans and MOAs. Site 32CS5158 is a property that has been in the family for more than a century and contains an early 20th century barn eligible under criteria A and possibly C. Site 32CS5168, eligible under criterion A, was homesteaded in 1870 and has been in the family since that time. Site 32CS5169, eligible under criteria A and C includes an historic residential building with Queen Anne style elements circa 1900. Additionally, eligible site 32CS114, St. Benedict's Catholic Church and Cemetery, is located just inside the benefited area within the viewshed of Plan B (McCarthy 2015c) (Figure 3). Mitigation measures for viewshed impacts to the built environment by the Southern Embankment and hydraulic structures have yet to be defined. Structures located south of site 32CS5168 are addressed below as part of the staging area.

Plan B, Wild Rice River Structure to Red River Structure

Survey of approximately 50 percent of the direct APE for the section between the Wild Rice River Structure and the Red River Structure was completed in 2014 and 2015 as part of earlier investigations for the I-29 road raise (Bender et al. 2017). The approximately 350 acres that comprise the eastern half of Reach B, south of site 32CS2653, require Phase I survey for cultural resources. Three eligible sites are located within the benefitted area's half-mile viewshed, as defined by the amendment to the PA (2013). The Lower Wild Rice and Red River Cemetery (32CS2653) would be avoided by the Plan B alignment including the road raise of County Road 81, but lies within the viewshed buffer (Bender et al. 2015d) (Figure 3). The 1953 pre-stressed concrete bridge (32CS4678) at 124th Avenue SE and Cass County Road 16 over the Wild Rice River and the southernmost extent of the Freeman Farmstead site 32CS5267 also are situated within the viewshed buffer. The farmstead is a multi-structured early 1880s farmstead, originally belonging to Ole Olson who was part of the early Norwegian settlement in the area, eligible under criterion A. Mitigation measures for viewshed impacts to the built environment by the Project's Southern Embankment have yet to be defined.

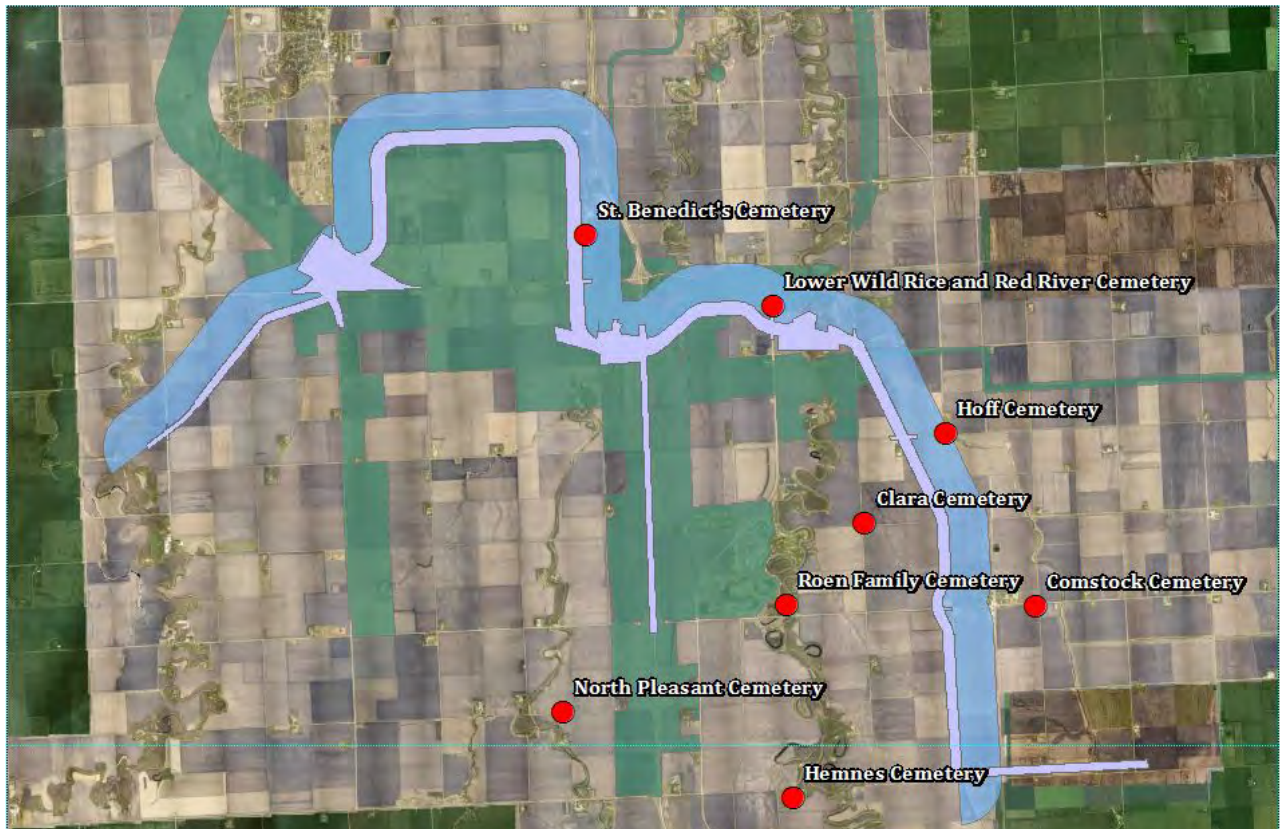


Figure 3. Plan B Southern Embankment with locations of previously surveyed cemeteries. Viewshed buffer provided in blue, previously surveyed areas in green, and work zone in purple.

Plan B, Red River Structure to end of Eastern Tieback

Phase I survey of approximately 1,550 acres is required in Minnesota along the Eastern Tieback section of Plan B, including the area crossing Wolverton Creek. Archaeological and built environment resources investigations, including viewshed analyses, have not been undertaken throughout this part of the project area and are required.

Staging Area

Cultural resources survey of portions of the staging area began in 2010 (Tucker 2012). The earlier connecting channel alignment was surveyed between 2010 and 2012 and covered areas between County Road 17 and I-29 (Tucker et al. 2012, Meier et al. 2013). The former overflow embankment along County Road 17 was surveyed in 2012 (Meier et al. 2013). Phase I and geoarchaeological deep testing investigations for Oxbow-Hickson-Bakke were completed in 2013 (Meier et al. 2014). Additional surveys were conducted in 2014 and 2015 for the revised southern alignment and I-29 road raise (Bender 2017). Six cemeteries previously located in the staging area were surveyed in 2014: three in North Dakota and three in Minnesota (Bedingfield et al. 2015a, 2015b, Bender and Bedingfield 2015a, Bender et al. 2015b, 2015c, Postiglione et al. 2015). A seventh cemetery, also surveyed in 2014 and located at Comstock (CY-HCR-008), lies east of and outside the staging area (Bender et al. 2015e).

Within these previously surveyed areas are a number of historic properties. Two of the cemeteries, Clara (CY-HCR-007), in Minnesota, and Hemnes (32RI1877), in North Dakota, are National Register eligible (Figure 3). The Clara cemetery is eligible under criterion A for its association with the themes of rural settlement and religion. The Hemnes cemetery is eligible under criteria A for its association with the themes of rural settlement and religion, B for its relationships with local historically significant individuals, and D for its potential to yield data important to the understanding of local and regional history. A cemetery mitigation plan was prepared in 2014. The remaining cemeteries shown on Figure 3 are ineligible for listing in the National Register.

The Oxbow-Hickson-Bakke ring levee survey located 31 sites of which all but one were historic (Meier et al. 2014). Two of the sites are National Register eligible. The Hickson Lutheran Church (32CS113) lies within the ring levee, and the Hickson Dam/Fargo Dam #3 (32CS5096), modified over time through improvement projects, continues to function as it is intended. There is no further action needed for Oxbow-Hickson-Bakke cultural resources.

Within the previously surveyed areas described above, there are two farmstead properties along the Wild Rice River that require mitigation plans or further investigation. The Ramstad farmstead (32CS5109) has a number of structures that illustrate, under criterion A, the connection to local agricultural practices. Site 32CS5098, also located on property associated with the Ramstad farmstead, is reported as the location of a former log cabin structure, and requires additional field verification.

Built environment surveys and visual effects surveys are required for the staging area. A limited shoreline survey would be conducted within the channels of the Wild Rice River, Red River, and sections of Wolverton Creek to ascertain whether cultural resources sites are exposed by bank line erosion. These surveys would be performed following delineation of the floodway and acquisition of right-of-entry for the relevant parcels.

5 ENVIRONMENTAL EFFECTS

The proposed alternative described in the 2013 SEA is the No Action Alternative for purposes of this SEA. The environmental effects from the No Action Alternative are fully discussed in Chapter 5 of the 2013 SEA. This section only describes the changes in effects associated with the proposed modifications to the alignment of the Southern Embankment and the increase of operational flows through town to RS37'. If no change in effects is discussed, the proposed modifications do not alter the environmental effects for that category of impact.

Flood impacts for any particular area varies in intensity depending on the size of the flood. Flood events in this document are referenced as annual chance exceedance (ACE) events, which is estimated based on the period of hydrologic record. The period of record used to describe events in the FEIS and the 2013 SEA was based on more recent hydrologic trends, as selected by an expert opinion elicitation (EOE) panel. However, based on recommendations by the Task Force/TAG, the hydrology used for this SEA will be the complete period of record (POR), through 2009. Due to differences in EOE and POR hydrology, impacts for a particular flood event are not directly comparable.

5.1 Social Effects

5.1.1 Noise: The location of noise impacts would change due to modification of the Southern Embankment alignment. Impacts from noise would be dependent on proximity to the Project. Areas affected by the alignment shifts would experience more or less noise impact, depending on the location. These impacts would be minor and temporary in nature. No increase in noise is expected during project operation.

5.1.2 Aesthetics: The location of aesthetic impacts of the Project would change due to modification of the Southern Embankment alignment. Areas affected by the alignment shifts would experience more or less aesthetic impact, depending on the location. Homes and businesses that are near the alignment may be subject to a view of the embankment rather than the existing viewshed. The severity of visual effects are dependent on proximity to project features and the degree to which those areas are currently blocked by present obstructions. Analyzing viewshed impacts on historic properties is addressed in the Project's PA (2011) and its amendment (2013).

5.1.3 Transportation:

Transportation Modifications Upstream of Southern Embankment

Similar to the No Action Alternative, Plan B would require several modifications to roads in the vicinity and upstream of the Southern Embankment (Figure 4). The location of the transportation impacts would change due to modification of the Southern Embankment alignment. The majority of modifications are road raises to allow passage up and over the Southern Embankment. Modifications to transportation between Plan B and the No Action Alternative are summarized below. Additional details can be found in the transportation plan, which can be found in Appendix H.

For both the No Action Alternative and Plan B, Interstate 29 would be raised slightly above the 1% ACE event. Similar to the No Action Alternative, Plan B would also require two bridge structures to be constructed for Interstate 29. Both bridges would allow passage over a ditch needed to provide local drainage between the Wild Rice and Red Rivers. With the No Action Alternative all of Country Road (CR) 16 would be on the benefited side of the Southern Embankment; however, sections of CR 16 and CR 17 near the diversion inlet would be realigned and combined to create a bridge crossing over the diversion channel. With Plan B the combined section of CR 16/CR 17 would be similar, but additional road raises would be required. A portion of CR 16 would lie in the staging area with Plan B and road raises would be needed to cross the Southern Embankment near the diversion inlet and near 173rd Ave SE. Plan B would also use a road raise to allow CR 81 to cross the embankment; for the No Action Alternative, a road raise and bridge or culverts would be required for CR 81. Plan B would eliminate the need for grade raises for the BNSF Moorhead Subdivision rail line and U.S. Highway 75. Both the No Action Alternative and Plan B would include road cut offs; with Plan B, nine roads would be permanently cut off by the Southern Embankment. Table 3 summarizes modifications to impacted roadways.

As with the No Action Alternative, the construction period for each road modification would vary. Interstate 29 would likely remain open along its current corridor during construction, but temporary lane closures may be necessary. Other smaller roads would be temporarily closed during construction and alternate routes would need to be identified. The impacts to transportation during construction would be minor.

Table 3. Summary of transportation modifications upstream of the Southern Embankment for Plan B.

Road	County	Modification
168 th Avenue SE	Cass, ND	0.2 mile of road raise
County Road 16 near 173 rd Avenue SE	Cass, ND	0.3 mile of road raise and realignment
County Road 16/ County Road 17	Cass, ND	3.0 miles of road raise, realignment, and construction of a bridge
Interstate 29	Cass, ND	3.6 miles of road raise along two lanes and construction of two bridges
County Road 81	Cass, ND	0.3 mile of road raise; no longer requires bridge
169 th Avenue SE	Cass, ND	Cut off by Southern Embankment
112 th Avenue S	Cass, ND	Cut off by Southern Embankment
57 th Street S	Cass, ND	Cut off by Southern Embankment
172 nd Avenue SE	Cass, ND	Cut off by Southern Embankment
173 rd Avenue SE	Cass, ND	Cut off by Southern Embankment
174 th Avenue SE	Cass, ND	Cut off by Southern Embankment
3 rd Street S	Clay, MN	0.3 mile of road raise
140 th Avenue S	Clay, MN	0.3 mile of road raise
160 th Avenue S	Clay, MN	0.2 mile of road raise
U.S. Hwy 75	Clay, MN	Road raise no longer required
BNSF Moorhead Subdivision rail line	Clay, MN	Grade raise no longer required
130 th Avenue S	Clay, MN	Cut off by Southern Embankment

150 th Avenue S	Clay, MN	Cut off by Southern Embankment
170 th Avenue S	Clay, MN	Cut off by Southern Embankment
Pfiffer Drive	Clay, MN	Removed for construction of the Red River Structure
Unnamed road adjacent to the Red River Structure	Clay, MN	Removed for construction of the Southern Embankment
County Highway 7	Clay, MN	No Southern Embankment crossing required with Plan B
Country Highway 61	Clay, MN	No Southern Embankment crossing required with Plan B

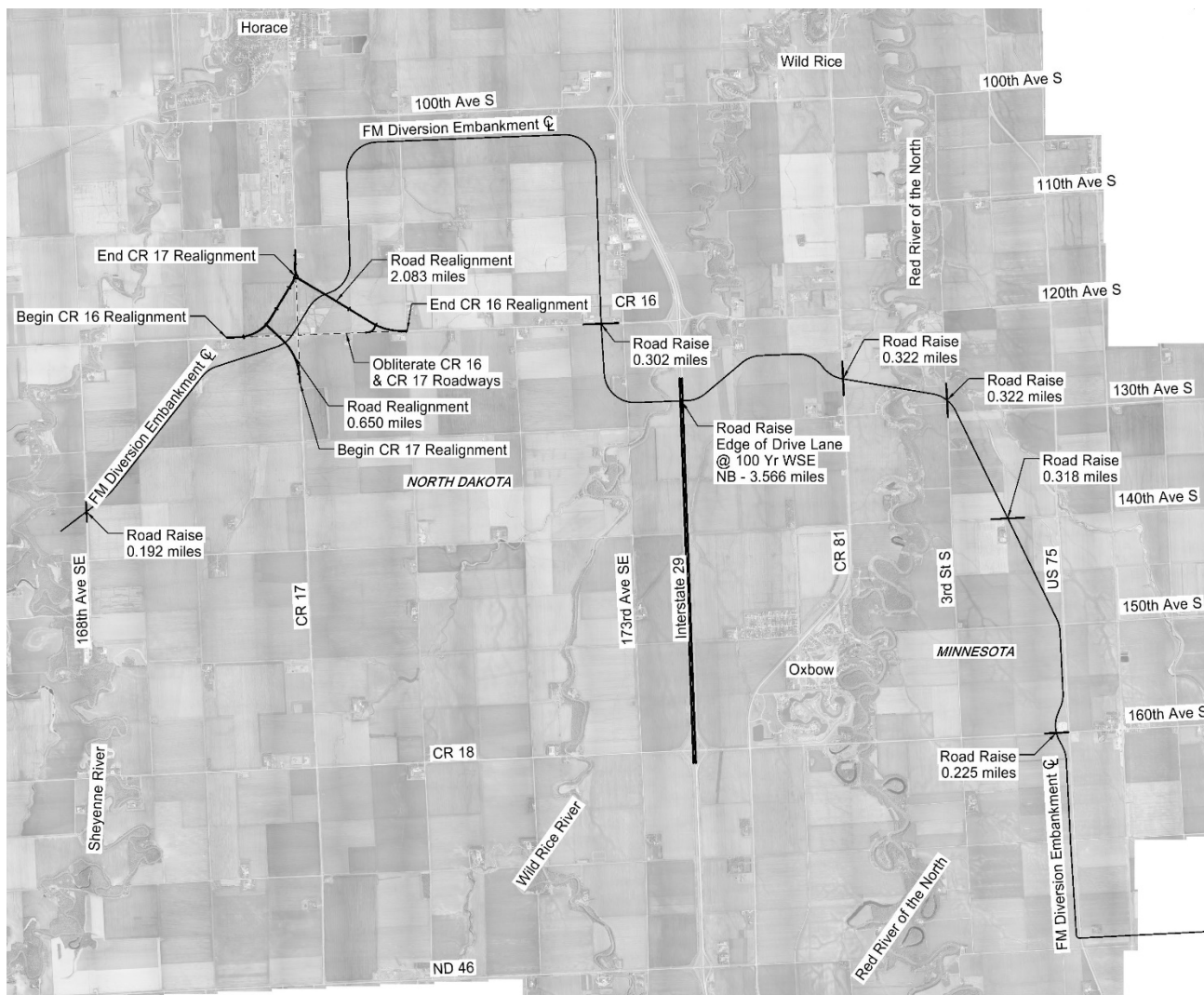


Figure 4. Map of Plan B transportation modifications.

Transportation Modifications through Town

Increasing the flow through town from RS35' to RS37' would cause additional inundation of the transportation system downstream of the Southern Embankment. Roads where water would inundate the driving lane (12' from the centerline of roadway) during the 1% ACE event were identified as areas requiring road raises. The vast majority of roads impacted were located in the downstream portion of the

benefitted area (Figure 5). Road raises for RS37' totaled 8.4 miles. Approximately 4.4 miles of roadway were identified for improvement in North Dakota at RS37', with a maximum grade raise height of 1.5'. In Minnesota, approximately 4.0 miles of roadway were identified to be impacted at RS37', with a maximum grade raise height of approximately 4'. A list of roads impacted downstream of the Southern Embankment for RS37' are provided in Table 4. Additional information on the impacts of RS37' downstream of the Southern Embankment can be found in Appendix I.

Table 4. Roads Inundated in the Benefitted Area with a River Stage of 37'

ND I-29 SB Exit Ramp (CR 16)
ND County Road 22
ND County Road 31, South Segment
ND County Road 31, South Center
ND County Road 31, North Center Segment
ND County Road 31, North Segment
MN Broadway
MN 10th St N
MN 100th Ave N
MN 110th Ave N
MN 120th Ave N
MN 130th Ave N
MN 140th Ave N
MN 15th St N, South Segment
MN 15th St N, Middle Segment
MN 15th St N, North Segment

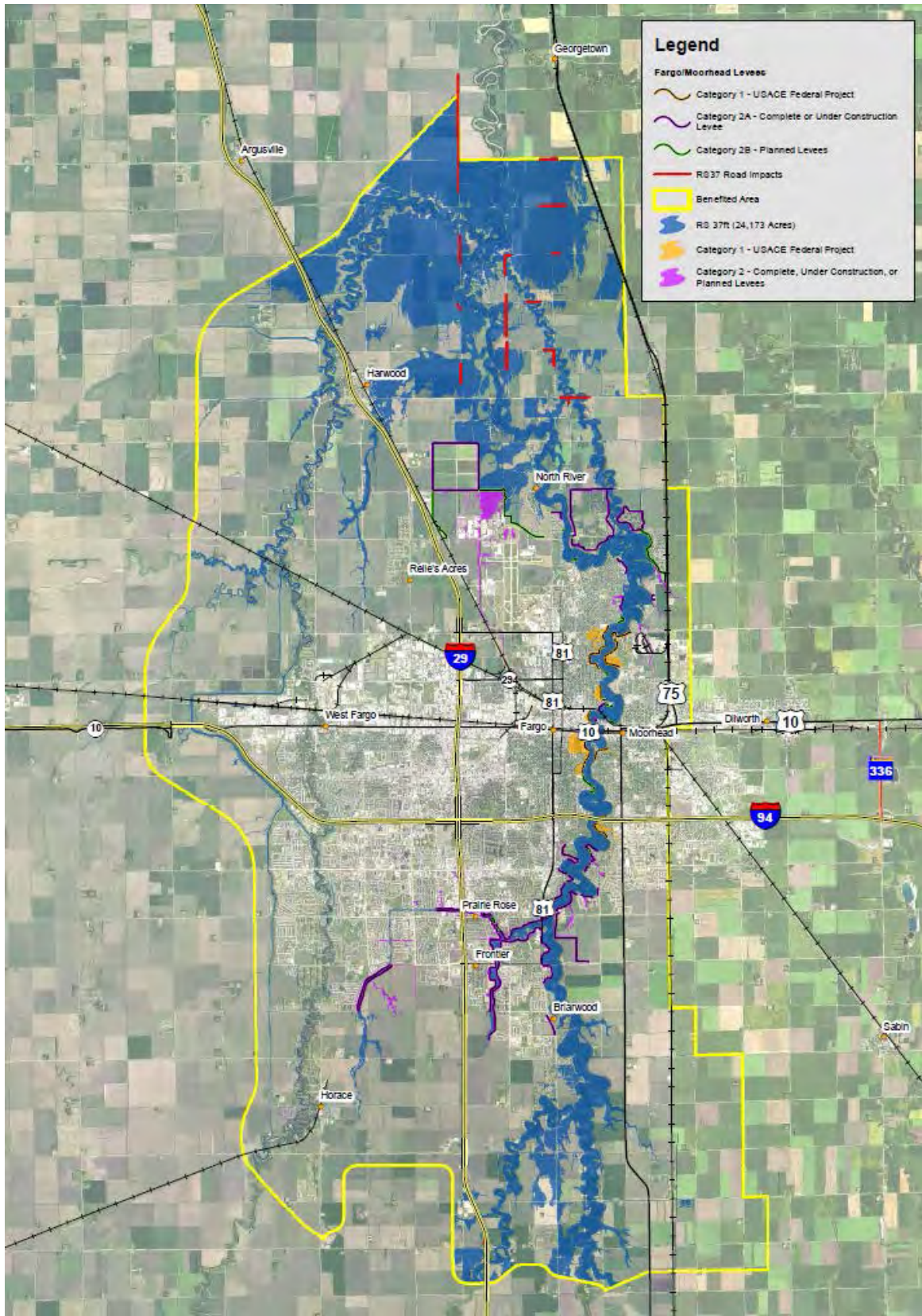


Figure 5. Road Impacts Downstream of the Southern Embankment for a River Stage of 37'

5.1.4 Community Cohesion (Sense of Unity): The areas benefited and adversely impacted near and upstream of the Southern Embankment would change with Plan B. Community cohesion in areas where modifications in the project alignment are proposed may change as a result. Changes in community cohesion are expected to be localized.

5.1.5 Business and Home Relocations:

Upstream of Southern Embankment

A number of structures currently lie within the area flooded during a 1% ACE event under existing conditions. However, the area inundated for a 1% ACE flood event would change with both Plan B and the No Action Alternative. In order to characterize the number of additional structures that would be flooded, hydraulic model results for the 2013 SEA alignment and the Plan B alignment were compared to the existing conditions model results. Structures impacted beyond existing conditions are classified as newly impacted structures and were classified into two categories for each of the four counties impacted by the Project: “residential” and “non-residential”. Table 5 describes the results of this analysis for the 1% ACE event. Three of the four counties (Clay, Richland, and Wilkin Counties) showed fewer residential and non-residential structures affected when comparing Plan B to existing conditions than when comparing the 2013 SEA alignment to existing conditions; however, Cass County showed an increase in the number of newly impacted residential and non-residential structures with Plan B. Overall, the number of additional residential structures impacted with Plan B would be reduced from 57 to 55 and the number of additional non-residential structures impacted would be reduced from 355 to 291. Table 11 in the Hydrology and Hydraulics Appendix (Appendix D) presents a summary of newly impacted structures with Plan B during other flood events.

Table 5. Newly impacted structures upstream of the Southern Embankment relative to existing conditions for the 1% ACE event.

State	County	2013 SEA Alignment		Plan B Alignment	
		Residential Structures	Non-Residential Structures	Residential Structures	Non-Residential Structures
North Dakota	Cass	32	128	42	173
	Richland	3	29	3	18
Minnesota	Clay	19	182	9	90
	Wilkin	3	16	1	10
Total		57	355	55	291

Flow through Town

Both Plan B and the No Action Alternative would provide reduced flood risk to the benefitted area when compared to existing conditions. For the 1% ACE event both Plan B and the No Action Alternative would reduce impacts to over 24,000 structures (including over 15,000 residential structures) in the benefitted

area (Table 6). However, differences in the operation of Plan B and the No Action Alternative would result in different inundation patterns in the benefitted area.

The No Action Alternative would begin operation when the total flow upstream of Fargo is measured to be 17,000 cfs (10% ACE event). Closure structures on the Red River and the Wild Rice River would then operate to allow a maximum RS35' to pass through town. A RS35' through town would be maintained for events up to the 1% ACE event. For floods greater than the 1% ACE event the closure structures would operate to target RS35' through town, with the target being RS40' for the 0.2% ACE event.

Plan B would begin operation when the total flow upstream of Fargo is measured to be 21,000 cfs (5% ACE event) and would maintain a RS37' through town up through the 1% ACE event. Similar to the No Action Alternative, Plan B would target RS35' through town, with the target being RS40' for the 0.2% ACE event.

For flood events between the 10% and 1% ACE events, Plan B would allow more flow through town than the No Action Alternative; therefore, there would be more properties and structures impacted with Plan B for those flood events. In the benefitted area it is estimated that for a 1% ACE flood event approximately 223 structures (including 27 residential) would be flooded with Plan B and 102 structures (including 10 residential) would be flooded with the No Action Alternative (Table 6 and Figure 6). Events greater than the 1% ACE event would result in similar impacts for Plan B and the No Action Alternative since the target stage would be similar. Additional information on flooding differences in the benefitted area between Plan B and the No Action Alternative can be found in the FM Diversion Plan B – River Stage 37' Impacts memorandum (Appendix I).

Table 6. Structures in the benefitted area impacted by a 1% ACE event.

	Residential Structures	Non-Residential Structures	Total
Existing Condition	16,000	9,000	25,000
No Action Alternative (RS35')	10	92	102
Plan B (RS37')	27	196	223

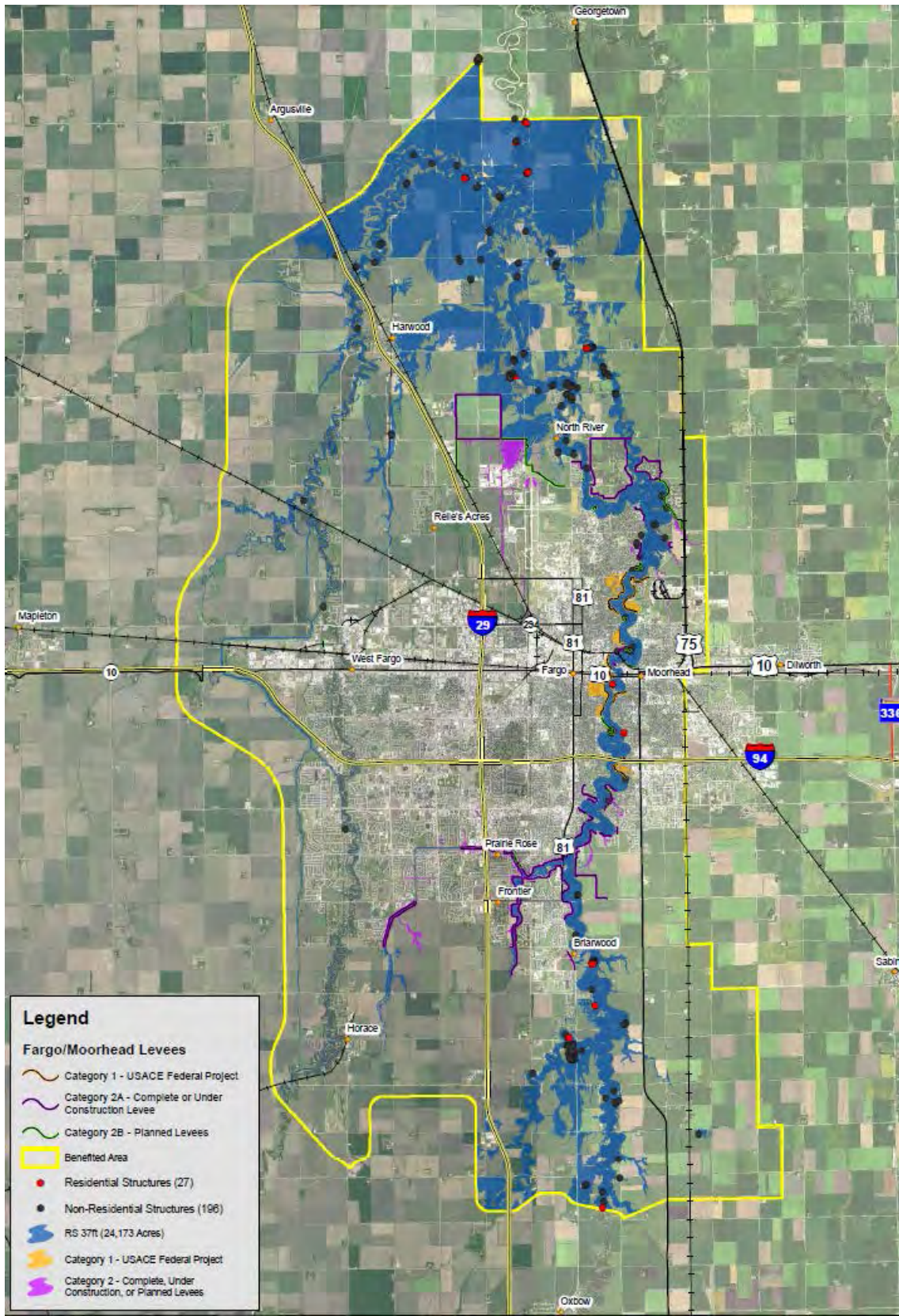


Figure 6. Inundation within the benefitted area for the 1% ACE Event.

5.1.6 Public Health and Safety: Both Plan B and the No Action Alternative would provide many benefits to public health and safety as generally discussed in the FEIS. However, compared to the No Action Alternative, Plan B does present additional risk associated with a longer dam located closer to the urban core and increasing the flood stage through town during project operation.

5.2 Economic Effects

5.2.1 Mitigation of Land and Structures Upstream of the Southern Embankment

Similar to the No Action Alternative, Plan B would have a beneficial impact on flooding effects in the metro area. The Water Quantity section (Section 5.3.2) discusses the impacts on flood depth and extent. This section describes the plan for mitigation of land and structures upstream of the Southern Embankment. Mitigation plans for land and structures are discussed separately in sections below. Specific mitigation needs depend on hydraulic model results, which are provided in the Hydrology and Hydraulics Appendix (Appendix D).

Mitigation for Land

USACE would impose use and development limitations on lands, utilizing a two-zone approach. Zone 1 is a more restrictive inner area while Zone 2 covers a less restrictive outer area. Zone 1 and Zone 2 together define the Project's staging area. The specific requirements to be imposed on Zone 1 and Zone 2 are as follows:

- **Zone 1**
 - Most restrictive zone.
 - Defines the operating pool or floodwater storage volume required to ensure the planned operation of the Project, which includes minimizing downstream impacts.
 - Provides sufficient volume to operate the Project as planned up to the 0.2% ACE event.
 - Differences in stage between Plan B and Existing conditions would be used to delineate the boundary of Zone 1. Zone 1 would generally encompass lands extending to the outermost limits of the 1 foot stage increase boundary for the 1% ACE event (see Figure 39 of Appendix D) as well as lands extending to the 1 foot stage increase boundary for the 0.2% ACE event (see Figure 40 of Appendix D). It should be noted that the 1 foot stage increase boundary for 1% ACE event is not always downstream of the 1 foot stage increase boundary for the 0.2% ACE event. Zone 1 would be limited to Cass and Clay Counties as much as possible except for corridors along the Red River and Wild Rice River in Richland County and Wilkin County.
 - Development would not be allowed within the footprint of Zone 1.
 - Placement of fill would not be allowed in Zone 1 (e.g. roads/driveways cannot be raised, unless raised as part of the Project).
 - Flowage Easements would be acquired.

- **Zone 2**

- Less restrictive zone.
- Includes additional areas of potential inundation beyond what is necessary for operation of the Project. Would encompass areas outside Zone 1 where the Project produces more than 1 foot of stage increase for either the 1% ACE event or the 0.2% ACE event (see Figures 39 and 40 of Appendix D).
- Limited placement of fill would be allowed in Zone 2, within the terms and conditions of the flowage easement.
- Development would be allowed, but structures must be constructed at least 1-foot higher than the elevation of the maximum pool elevation (which would be no greater than 924.0 feet) or above the 0.2% ACE water surface elevation, whichever is higher. It should be noted that the non-Federal sponsors are using 923.5 at this time for planning purposes.
- Flowage Easements would be acquired.

In addition to the restrictions imposed by USACE, the non-Federal sponsors' Property Rights Acquisition and Mitigation Plan provides additional mitigation. Specifically, the sponsors have defined a "Revision Reach Area" and a "Property Rights Area" that define areas of mitigation upstream of the southern embankment. These areas are generally defined as follows:

- **Revision Reach Area:** The Revision Reach Area is defined as part of the Conditional Letter of Map Revision (CLOMR) that will be developed in accordance with the USACE/FEMA Coordination Plan, revised June 26, 2018. In general, the Revision Reach is where the 1% ACE floodplain will be revised as a result of the Project. The Revision Reach is developed in coordination with FEMA. The extent of the Revision Reach is defined by an effective tie-in at the upstream and downstream limits for each flooding source. An effective tie-in is obtained when the revised base flood elevations from the post-project conditions model are within 0.5 foot of the pre-project conditions model at both the upstream and downstream limits. The downstream end of the Revision Reach is at the outlet of the diversion channel, and the upstream end of the Revision Reach will be near Red River model station 2673969, which is approximately 2 miles east and 1.5 miles south of Christine, ND. A portion of Christine, ND is within the Revision Reach. The upstream end of the Revision Reach on the Wild Rice River coincides with model station 103632 and is located approximately 0.5 mile north of the northern boundary of Richland County, ND. Zones 1 and 2 are located within the Revision Reach. Currently, the Revision Reach is defined using existing property boundaries. When obtaining the actual flowage easements, the actual easement would be defined by describing by survey the actual inundation on the parcel.
- **Property Rights Area:** The Property Rights Area is defined by using the maximum elevation of the spillway, which is expected to be 923.5 feet (NAV88). Currently, the boundary of the Property Rights Area is extended beyond the 923.5-foot contour to the existing parcel boundaries. In addition, the Property Rights Area boundary matches the Revision Reach Area boundary in locations where the Revision Reach extends beyond the 923.5-foot contour. The Property Rights Area will be finalized based on the final design of the Project, and the final boundary could be defined by describing by survey the actual contour on the parcel.

The Project's staging area (Zone 1 and Zone 2), the Revision Reach Area, and the Property Rights Area are shown in Figure 7.

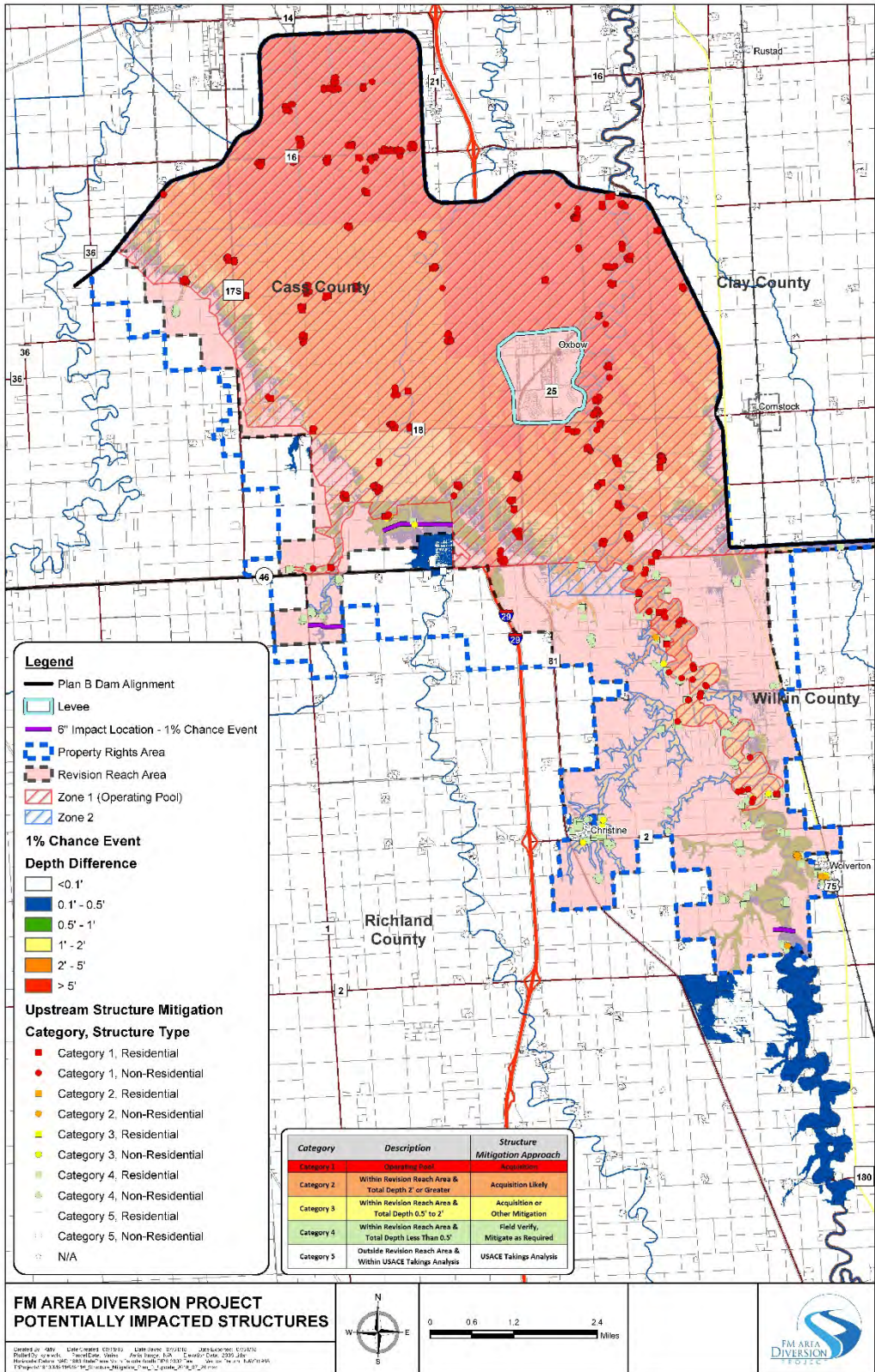


Figure 7: Mitigation Upstream of the Southern Embankment

Mitigation for Existing Structures

Mitigation for existing structures depends on the the land classification described above and the total depth of water at the structure for the 1% ACE event (see Figure 41 of Appendix D). The categories for structure mitigation are as follows:

- **Category 1:** Structures located within Zone 1 would be acquired and removed.
- **Category 2:** If the flood water depth at the structure is greater than or equal to two feet, the structure will be acquired and removed.
- **Category 3:** If the flood water depth at the structure is between 0.5 foot and two feet, and if the structure is outside Zone 1 and within the Revision Reach, non-structural measures would be utilized. Non-structural measures for residential structures may include elevation, ring levees, relocation, or acquisition. Non-structural measures for non-residential structures may include dry flood proofing, wet flood proofing, elevation, ring levees, relocation, and acquisition. Wells and septic systems serving residences that remain would be modified to prevent impacts from flooding. Each of these structures would be considered on a case-by-case basis, in coordination with the property owner. Acquisition may be considered in areas where risk and safety analysis indicates that leaving the structure in place would be inappropriate.
- **Category 4:** If the flood water depth at the structure is less than 0.5 foot, and if the structure is outside Zone 1 and within the Revision Reach, a topographical survey would be conducted to confirm the impacts. The field verification would result in the production of a FEMA Elevation Certificate. If the field verification confirms that the structure is impacted (for the purposes of structure mitigation, an impact is defined as any total depth greater than 0.01 foot during a 1% ACE event), non-structural measures would be utilized. Non-structural measures for residential structures may include elevation, ring levees, relocation, or acquisition. Non-structural measures for non-residential structures may include dry flood proofing, wet flood proofing, elevation, ring levees, relocation, and acquisition. Wells and septic systems serving residences that would remain would be modified to prevent impacts from flooding. Each of these structures would be considered on a case-by-case basis, in coordination with the property owner. Acquisition may be considered in areas where risk and safety analyses indicate that leaving the structure in place would be inappropriate.

Other Considerations

A legal analysis would be conducted for land and structures for which the impacts are not mitigated as described above in order to determine if the impacts rise to the level of a “taking” under the Fifth Amendment of the U.S. Constitution. All real property acquisitions conducted as part of the Project would comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

The non-Federal sponsors have developed a draft Property Rights Acquisition and Mitigation Plan for the Project that includes areas upstream of the Southern Embankment. This plan in some cases exceeds

Federal requirements, as described in part above. The plan is a living document and can be found at www.fmdiversion.com.

5.2.2 Floodplain (Executive Order 11988): Executive Order 11988 requires federal agencies to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, and then to minimize impacts to the floodplain. The acreage and location of the floodplain impacted would differ between the No Action Alternative and Plan B due to differences in the alignment of the Southern Embankment and from operational differences of flow through town.

The 1% ACE event was modeled for existing conditions, Plan B, and the No Action Alternative. Plan B and the No Action Alternative were compared spatially to existing conditions to identify areas that would be removed from the 1% ACE floodplain. Plan B would remove approximately 6,000 fewer acres from the 1% ACE floodplain than the No Action Alternative; it is estimated that Plan B would remove 56,000 acres and the No Action Alternative would remove 62,000 acres. The primary difference in acreage can be attributed to the area shifted north between the Diversion Inlet Structure and the Wild Rice River Structure with Plan B. In addition, the operational plan for Plan B would also allow more water to flow through town, allowing for a greater area of inundation downstream of the Southern Embankment.

5.3 Natural Resource Effects

5.3.1 Geomorphology: Plan B would allow the Project to operate less frequently than what was outlined in the 2013 SEA. With Plan B the Project would operate for floods with peaks in excess of 21,000 cfs (5% ACE). This would mean less frequent project operation and less risk for geomorphic effects. In addition, project operation would likely be limited to periods when riparian tree cover remains dormant. Historically, floods of this magnitude (e.g., peaks of 21,000 cfs or greater) have only occurred during the late winter or spring. Project operation would typically occur during periods prior to leaf-on. This helps minimize stress to riparian trees that may be caused by increased water elevations upstream of the Southern Embankment. Plan B could help to minimize tree stress and mortality, reducing any loss of root structures that are important for bank stability. The Red River and Wild Rice River Structures have been moved upstream with Plan B from the previously identified locations in the 2013 SEA. This would not be expected to cause any significant changes in effects, but the geomorphic monitoring stations in the area would be adjusted to allow for proper monitoring up and downstream of the structures. The Plan B orientation of the Western Tieback would allow more flows to maintain their existing flow paths thereby resulting in less geomorphic effects. Geomorphic sampling will continue in the future and will be supported with analyses to monitor if there are project impacts to the already dynamic river systems.

5.3.2 Water Quantity: As with the No Action Alternative, Plan B would increase flood depths and extents upstream of the Southern Embankment and decrease depths and extents downstream for the full range of hydrologic events during which the Project would be operated.

The area of inundation during a 1% ACE flood event was calculated for existing conditions, Plan B, and the No Action Alternative (Table 7). For Plan B and the No Action Alternative the flooded areas were also divided into two categories: 1) Upstream of the Southern Embankment and 2) Benefitted Area. Total acreage for the existing condition 1% ACE event was approximately 101,000 acres. The area flooded with

Plan B and with the No Action Alternative for the 1% ACE event were both approximately 57,000 acres; however, acreages upstream of the Southern Embankment and within the benefitted area differ (Table 7). Figure 8 displays the differences in flood extent between existing conditions and Plan B for the 1% ACE event. Section 4.2 of the Hydrology and Hydraulics Appendix (Appendix D) presents a discussion of flood extent changes due to the Plan B for the 10%, 5%, 2%, 1%, and 0.2% ACE events. For the 1% ACE event with Plan B, newly impacted land in Richland County and Wilkin County would total less than 1 square mile, with 616 and 372 acres of impact in the counties, respectively; with the No Action Alternative, newly impacted land totaled approximately 1,071 acres in Richland County and 995 acres in Wilkin County.

Table 7. Flood extent of the 1% ACE event for existing conditions, the No Action Alternative, and Plan B.

	Area Upstream of Southern Embankment	Benefitted Area	Total Area
Existing Conditions	-	-	101,000
No Action Alternative	35,000	22,000	57,000
Plan B	29,000	28,000	57,000

Section 4.3 of Appendix D presents the flood stage differences between existing conditions and Plan B for the 10%, 5%, 2%, 1%, and 0.2% ACE events. The results show that for the 1% ACE event with Plan B, Red River stages in Fargo are reduced approximately 4 feet, while stages upstream of the Southern Embankment are increased by up to 7 feet near the Western Tieback.

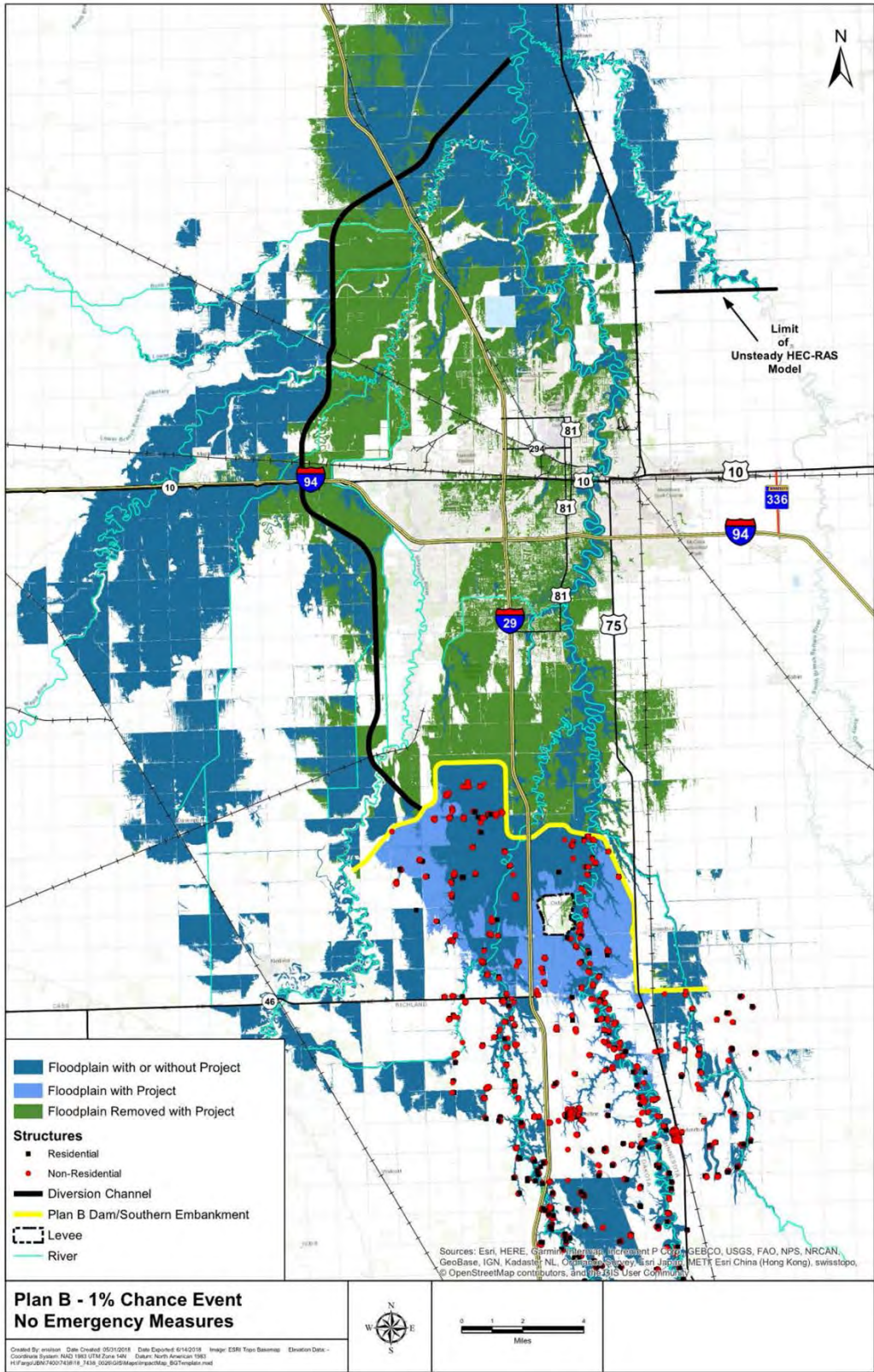


Figure 8. Areas inundated for the 1% ACE event.

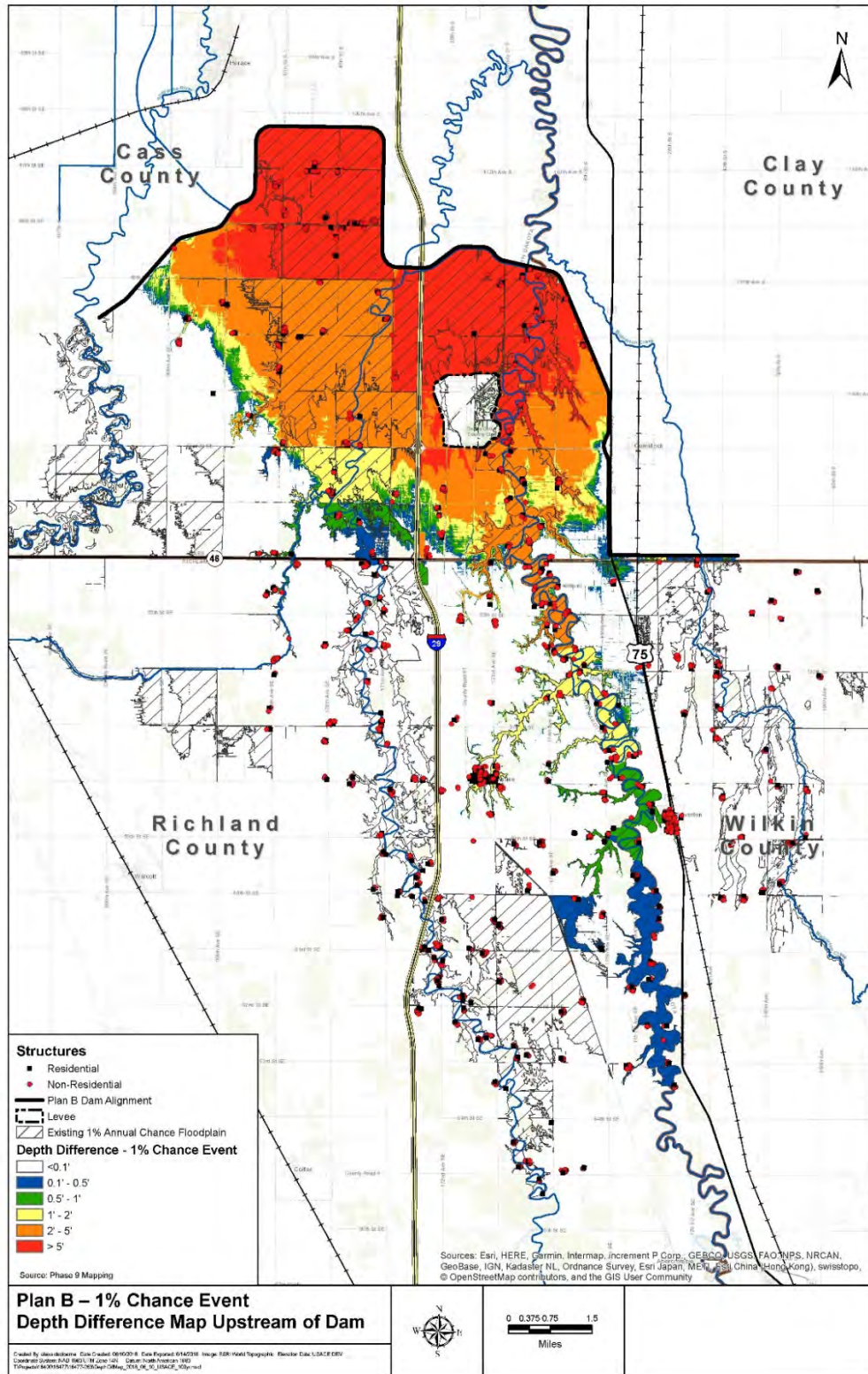


Figure 9. Depth differences (Existing Conditions vs. Plan B) upstream of the Plan B Southern Embankment for the 1% ACE event.

5.3.3 Wetlands: Wetlands within the temporary easement, permanent easement, and fee title areas required for construction of the Project are identified as impacted wetlands; however, this is a conservative estimate, as portions of this area may not be impacted by the Project, especially those within the temporary construction easement. Compared to the No Action Alternative (2013 SEA alignment), the Plan B alignment would reduce the acres of wetlands impacted for the entire Project from 1,703 to 1,655. Impacted acres along the Southern Embankment would decrease by 36 acres, from 280 acres to 244 acres. Impacts to specific wetland types are provided in Table 8 below. Wetland impacts for the diversion channel would be offset by the creation of wetlands within the diversion channel bottom. Impacts to wetlands along the Southern Embankment would be compensated for through mitigation actions such as the purchase of wetland credits, the restoration of degraded wetlands, and the creation of wetland areas. Additional description of wetland mitigation is provided in Section 3.3 of the Adaptive Management & Mitigation Plan (Appendix G).

Table 8. Wetland impacts

Wetland Type	Total Project Wetland Impacts (Including diversion channel)		Southern Embankment Wetland Impacts	
	As Proposed in 2013 SEA (ac)	Plan B Alignment (ac)	As Proposed in 2013 SEA (ac)	Plan B Alignment (ac)
Open Water	1	<1	<1	0
Farmed Seasonally Flooded Basin	1,475*	1,426	205	156
Shallow Marsh	106	84	39	17
Shrub-Carr	1	0	1	0
Wet Meadow	120	155	35	71
Total Acres	1,703*	1,665	280	244

*Numbers vary slightly from what was reported in 2013 SEA due to change in the mapping coordinate system. Numbers above were calculated in NAD 1983, State Plane North Dakota South, FIPS 3302, Feet.

5.3.4 Aquatic Habitat: Construction of Plan B would result in approximately 22 acres of impact to riverine habitat; a reduction of three acres from the 25 acres of impact described in the 2013 SEA. The alignment shift would place the Red River Structure 0.6 mile and Wild Rice River Structure 0.9 mile south of the locations identified in the 2013 SEA (Figure 10).

Construction of the Red River Structure for Plan B would result in direct and indirect impacts to approximately 13 acres of aquatic (riverine) habitat; a decrease of one acre from the No Action Alternative. Direct impacts from filling and excavation would total approximately four acres, and indirect impacts from channel abandonment would total approximately nine acres.

Construction of the Wild Rice River Structure for Plan B would result in direct and indirect impacts to approximately eight acres of aquatic (riverine) habitat; a decrease of four acres from the No Action Alternative. Direct impacts from filling and excavation would total approximately 2.5 acres and indirect impacts from channel abandonment would total approximately 5.5 acres.

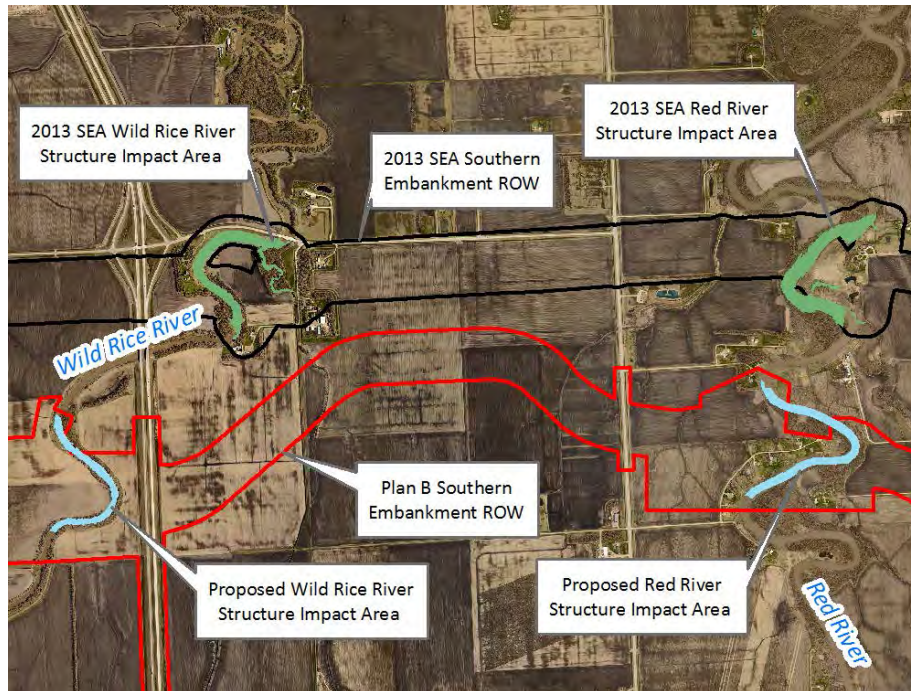


Figure 10. Proposed impact location changes for the Red River and Wild Rice River Structures.

Plan B also includes a tieback embankment with a series of culverts that would be constructed within Wolverton Creek. The area that would be impacted below the ordinary high water mark (OHWM) for construction of the Wolverton Creek Crossing would total approximately 1.3 acres; this includes 0.5 acres of excavation to construct a temporary bypass channel used during construction of the feature. All footprint impacts to Wolverton Creek would be greater than those for the No Action Alternative, as there were previously no footprint impacts in Wolverton Creek.



Figure 11. Location of the Wolverton Creek Crossing within the Eastern Tieback of the Southern Embankment.

Mitigation for aquatic impacts would be achieved through construction of the new river channel and other offsite mitigation. The new channels created at the Red River and Wild Rice River sites would provide some habitat to offset impacts. Several options for additional mitigation have been identified. See Appendix G for details on potential mitigation actions that have been identified to compensate for aquatic impacts.

5.3.5 Fish Passage: With Plan B, impacts associated with aquatic connectivity on the Red and Wild Rice rivers would be further reduced from the impacts to connectivity described in the 2013 SEA and FEIS. This is because Plan B would operate less frequently than previous designs. With Plan B, the Project would operate at floods above approximately a 5% ACE event. The No Action Alternative would operate at approximately a 10% ACE event. While the Project is operating, fish would not be able to pass through the Red River and Wild Rice River Structures. The duration of this blockage would typically be 10-14 days.

Fish passage on the Red and Wild Rice rivers would generally not be interrupted when the Project is not in operation. Hydraulic modeling for the Red River Structure suggests that at a 5% ACE event (prior to the Project going into operation), depth-averaged velocities through the structure would be approximately two feet per second (Figure 12). Velocities for more frequent flooding events (e.g. 10% ACE) would be even lower. These velocities generally would not be problematic for fish movement.

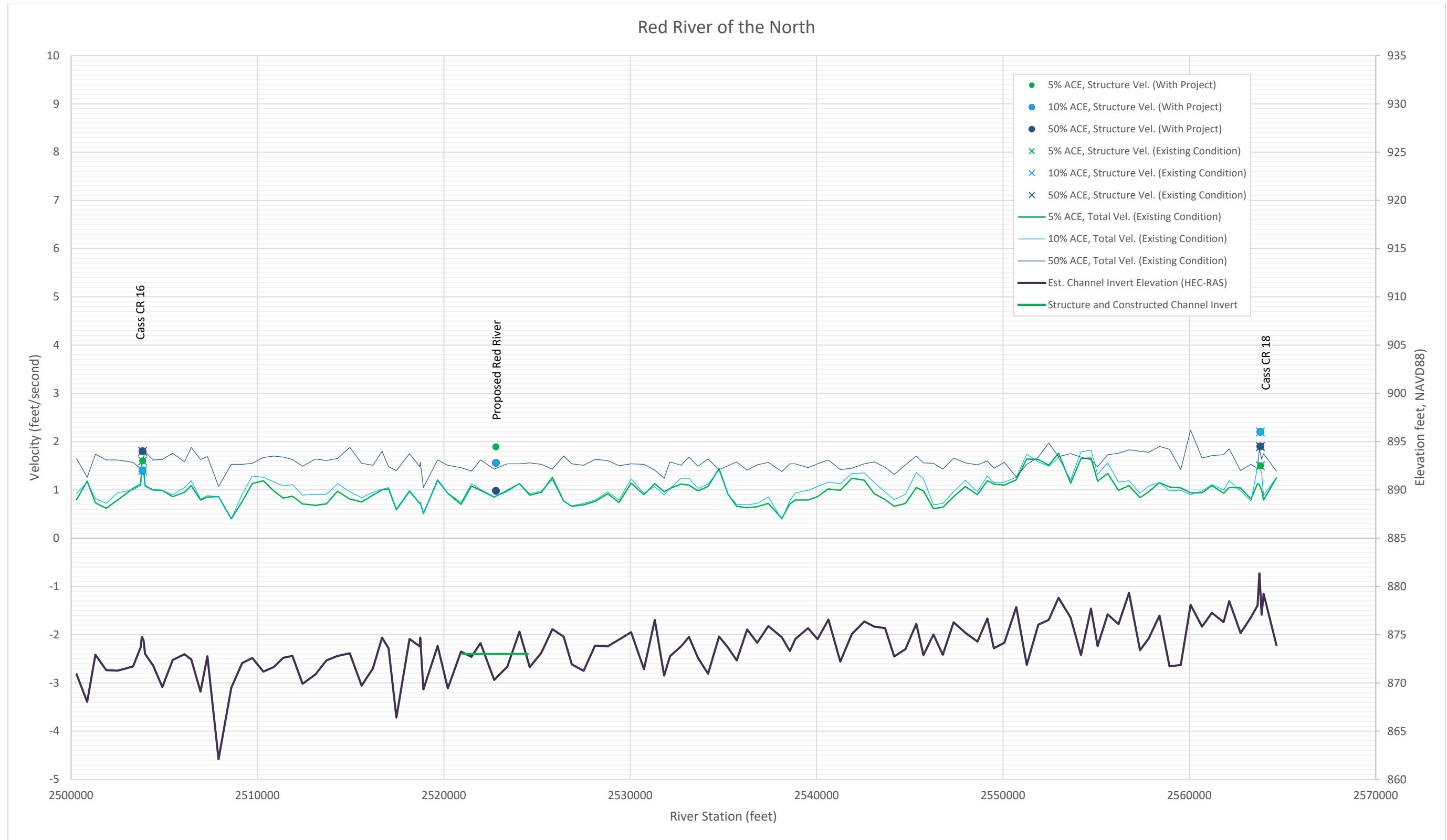


Figure 12. Modeled flow velocities and elevations through the Red River Structure and nearby bridges at Cass County Road 16 and Cass County Road 18 for discharge of a 50%, 10%, and 5% ACE event.

With hydraulic modeling it is estimated that the existing condition velocities at the Wild Rice River Structure are approximately 2.5 feet per second and three feet per second for the 10% and 5% ACE events, respectively. Modeling for the Wild Rice River Structure suggests that depth-averaged velocities at a 10% ACE event would be three feet per second, and slightly above four feet per second at a 5% ACE event (Figure 13 and Figure 14). Depth-averaged velocities as high as four feet per second would occur across an area of approximately 106 feet in length, which could be problematic for fish passage. However, during typical floods, flows would not remain at a constant level for a long period, passing relatively quickly through the ascending or descending limbs of the flood hydrograph. The structure on the Wild Rice River could add an extra day or two of fish passage disruption on the ascending and descending limbs of the hydrograph for flood events of a 5% ACE magnitude, or greater.

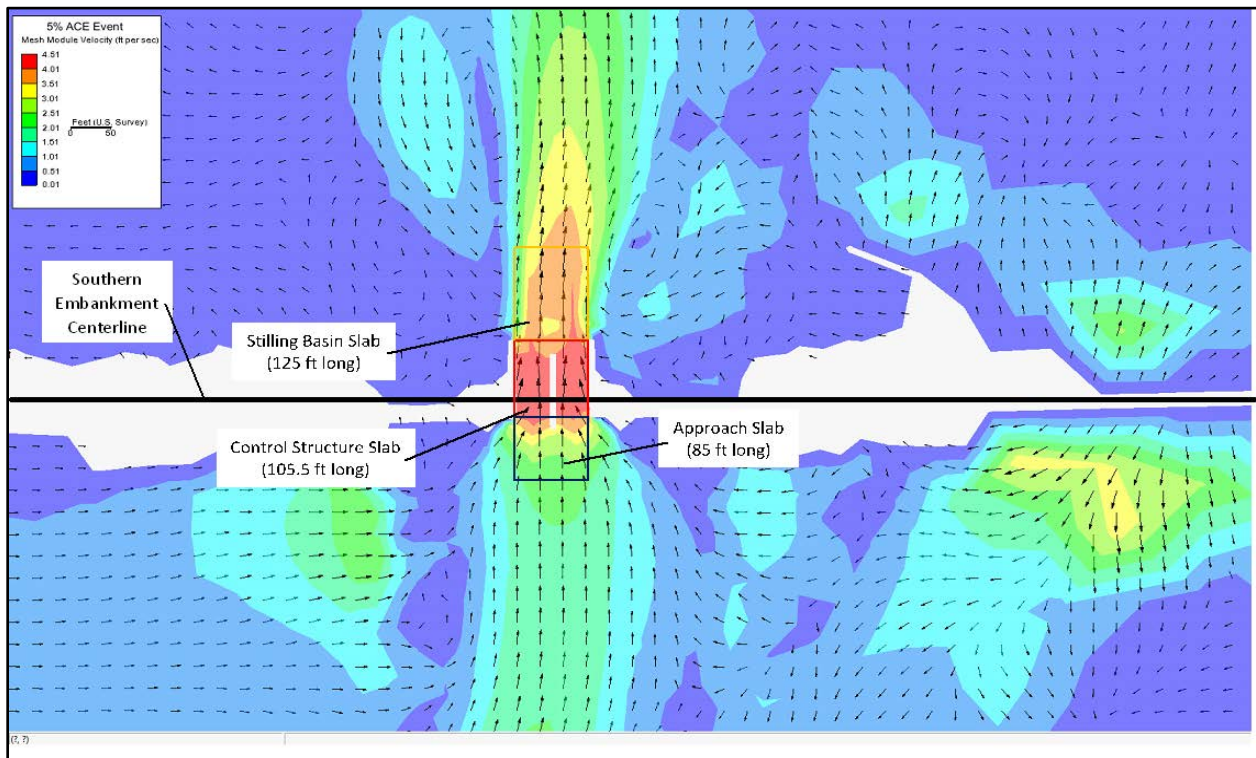


Figure 13. Modeled flow velocities through the Wild Rice River Structure for discharge of a 5% ACE event, prior to the Project going into operation.

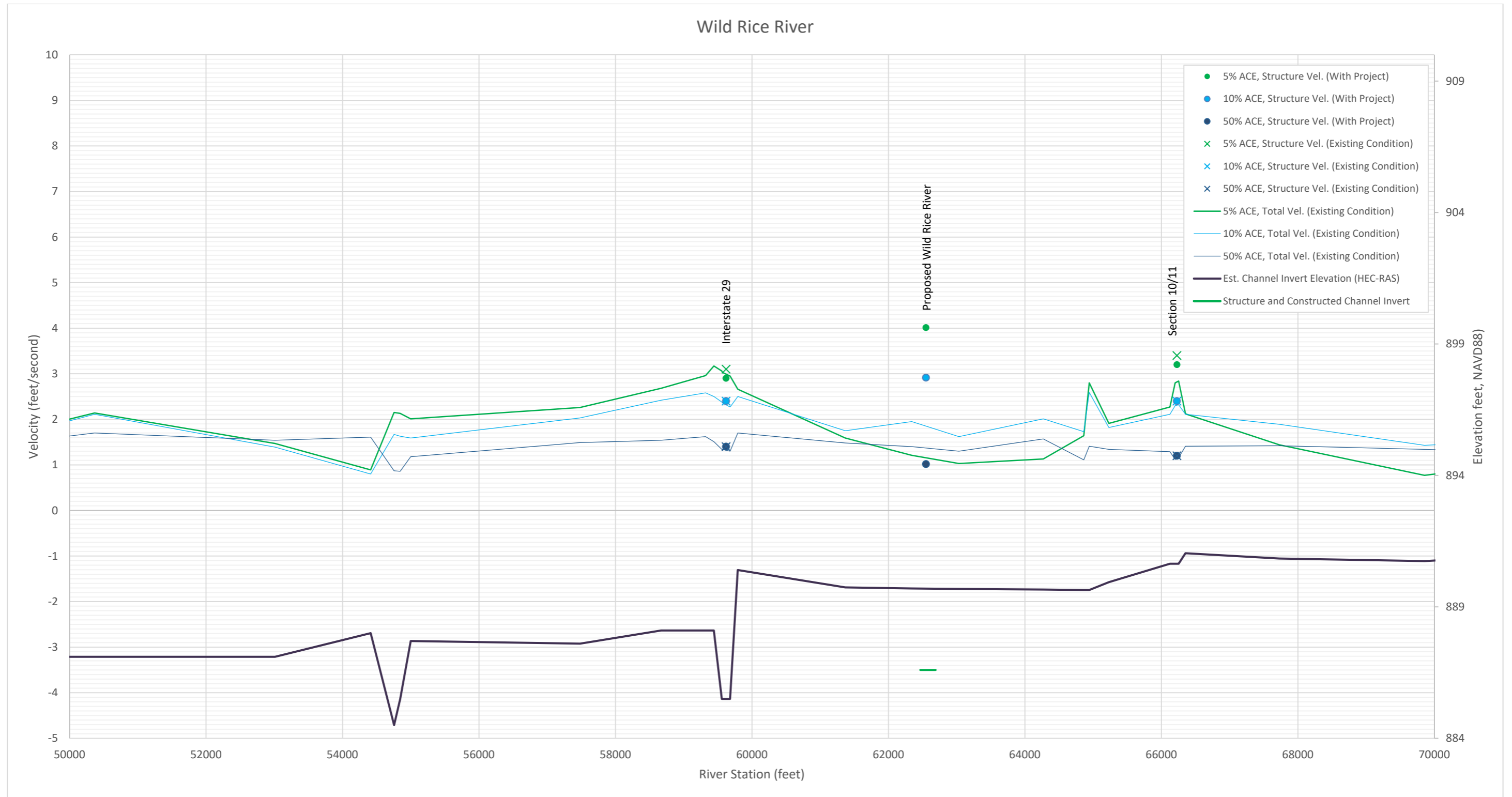


Figure 14. Modeled flow velocities and elevations through the Wild Rice River Structure and nearby bridges at Interstate 29 and Section 10/11 for discharge of a 50%, 10%, and 5% ACE event.

Previously, USACE has recommended mitigation for connectivity impacts associated with the Red River and Wild Rice River Structures. Although impacts to connectivity were small under operational conditions with the No Action Alternative, mitigation was still recommended given the uncertainty of impacts and natural resource agency concerns. Resource agency coordination on Plan B identified that even with the further reduction in operational frequency, concern still existed regarding impacts to connectivity. While uncertainty and concern may still exist, Plan B modifications would result in very infrequent disruptions to connectivity. A review of flow data for the Red River dating back to the early 1900s shows that the Project with the Plan B modifications would have only operated for five flood events in over 100 years of recorded history (Table 9). One of these floods (2010) had peak flows of about 21,000 cfs for two days, and the Project may not have operated under such conditions. All five of these floods (where flows were at or above 21,000 cfs) occurred during March and April, and it is likely that only the 1997 flood would have seen project operation extend appreciably into May. These historical floods have occurred early in the season, generally prior to the main migration periods of key fish species such as lake sturgeon and channel catfish (Figure 15). While disruptions to connectivity would still occur with Plan B modifications, it is most likely that these disruptions would be infrequent enough, short enough in duration, and early enough in the season that broad, measurable, long-term impacts to Red River fish communities would not be expected. As such, USACE is no longer recommending Wild Rice Dam Removal and Drayton Dam Fish Passage be implemented for impacts to aquatic habitat connectivity.

Table 9. Flood occurrence, duration, and timing from historical gage data, indicating floods which would have been of magnitude to operate the Project at 21,000 cfs (Plan B) and 17,000 cfs (No Action Alternative).

Event (Year)	Days flow at Fargo ≥ 21,000 cfs	Month*	Last date flows above 21,000 cfs**
1969	4	April	4/16/1969
1997	12	April	4/25/1997
2009	6	March	3/31/2009
2010	2	March	3/21/2010
2011	6	April	4/13/2011
Total	30	-	-
Event (Year)	Days flow at Fargo ≥ 17,000 cfs	Month*	Last date flows above 17,000 cfs**
1969	6	April	4/18/1969
1978	1	April	4/3/1978
1979	1	April	4/19/1979
1989	3	April	4/10/1989
1997	20	April	4/28/1997
2001	6	April	4/17/2001
2006	5	April	4/7/2006
2009	10	March/April	4/3/2009
2010	6	March	3/24/2010
2011	10	April	4/16/2011
Total	68	-	-

Number of 21,000+ cfs Flood Events	5
Avg. days \geq 21,000 cfs	6
21,000 cfs Events \leq 7 Days	4

Number of Flood 17,000+ cfs Events	10
Avg. days \geq 17,000 cfs	6.8
17,000 cfs Events \leq 7 Days	7

*Denotes the month where flows were above 21,000 and 17,000 cfs at Fargo.

**Note that under these historical conditions the Project would likely have operated longer than the last date of the flood due to the need to drain water upstream of the Southern Embankment (typical duration of operation is likely 10-14 days). It is uncertain if the Project would have operated in 2010 given that peak flows only reached about 21,000 cfs for a period of two days. Also note that it is uncertain if the Project would have operated in 1978 and 1979 given that peak flows only reached about 17,000 cfs for a period of one day.

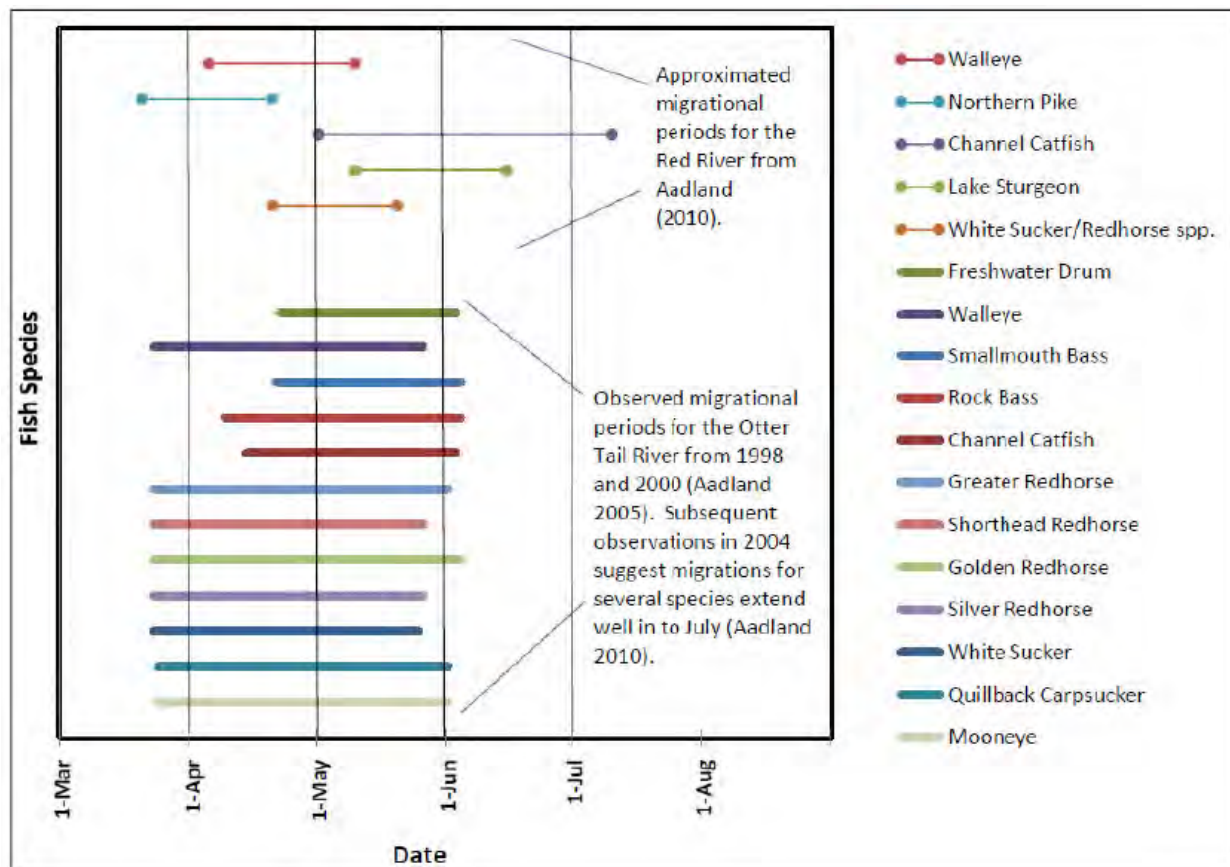


Figure 15. Migration periods for several fish of the Otter Tail and Red Rivers, MN.

The alternative recommended in 2011 FEIS included a gated structure with two 10' by 10' gated box culverts on Wolverton Creek. This culvert would have been closed during project operation, resulting in disturbance to connectivity. The No Action Alternative no longer included a box culvert or any structure across Wolverton Creek since the alignment of the Southern Embankment had shifted north of the confluence of Wolverton Creek and the Red River. Therefore, concerns to aquatic connectivity on Wolverton Creek were minimized. With Plan B, Wolverton Creek would again have a structure built within

its banks, an open culvert structure. The structure would not include any gates or other closure system. The Eastern Tieback embankment elevation and the Wolverton Creek culvert sizes would be selected to ensure Comstock does not receive stage increases up through the probable maximum flood (PMF) event and stage impacts are less than 0.5 foot upstream of the Clay/Wilkin County line. Design of the culverts would be made to minimize adverse effects to connectivity. Any limitations to connectivity would most likely be due to velocities through these culverts during high discharge.

The velocity information provided in Figure 16 includes best estimates of the average velocity through a structure at the Wolverton Creek Crossing, constructed such that natural materials exist in the bottom of the culvert openings (the culverts are set low enough such that natural material can be used to establish the natural grade of the river through the culverts). Velocities through culverts at the Wolverton Creek Crossing generally would not be problematic for fish movement until water elevations reach approximately a 5% annual chance exceedance (ACE) event discharge. This also corresponds to when the Project with Plan B would operate. Figure 16 provides existing and Plan B velocities across a range of flood events, ranging from a 50% ACE event to a 0.2% ACE event, for the location of the proposed culverts, as well as three adjacent bridge crossings. As noted in Figure 16, existing condition velocities for the bridges at 170th Ave S and the culverts at 180th Ave S and T-171 are the same or somewhat higher than those displayed for Plan B velocities. The culverts proposed for the Wolverton Creek Crossing with Plan B are similar to other existing culverts at nearby road crossings. These existing culverts provide a similar barrier to fish movement compared to the proposed structure, and therefore the culverts with Plan B would have only a minor incremental effect of fish passage. As outlined in Figure 16, the adjacent culverts on Wolverton Creek have notably higher velocities at the 50%, 10%, and 5% ACE event discharges than what would occur with the Plan B culverts in place. Connectivity through these culverts is worse for relatively frequent flood events than what would occur with the proposed culverts for Plan B.

Figure 16 demonstrates velocities through three bridges that would be adjacent to the proposed culverts on Wolverton Creek with Plan B. Based on review of aerial photos, there appears to be about twenty bridge crossings along Wolverton Creek with culverts that could have varying levels of effects on aquatic connectivity. It is also possible that future bridge replacements could include alternative designs to improve fish passage through individual bridges. That said, the level of aquatic connectivity through Wolverton Creek has limitations during high flow events under existing conditions. The additional disruption to connectivity on Wolverton Creek associated with Plan B would not be expected to substantially influence long term fish community trends.

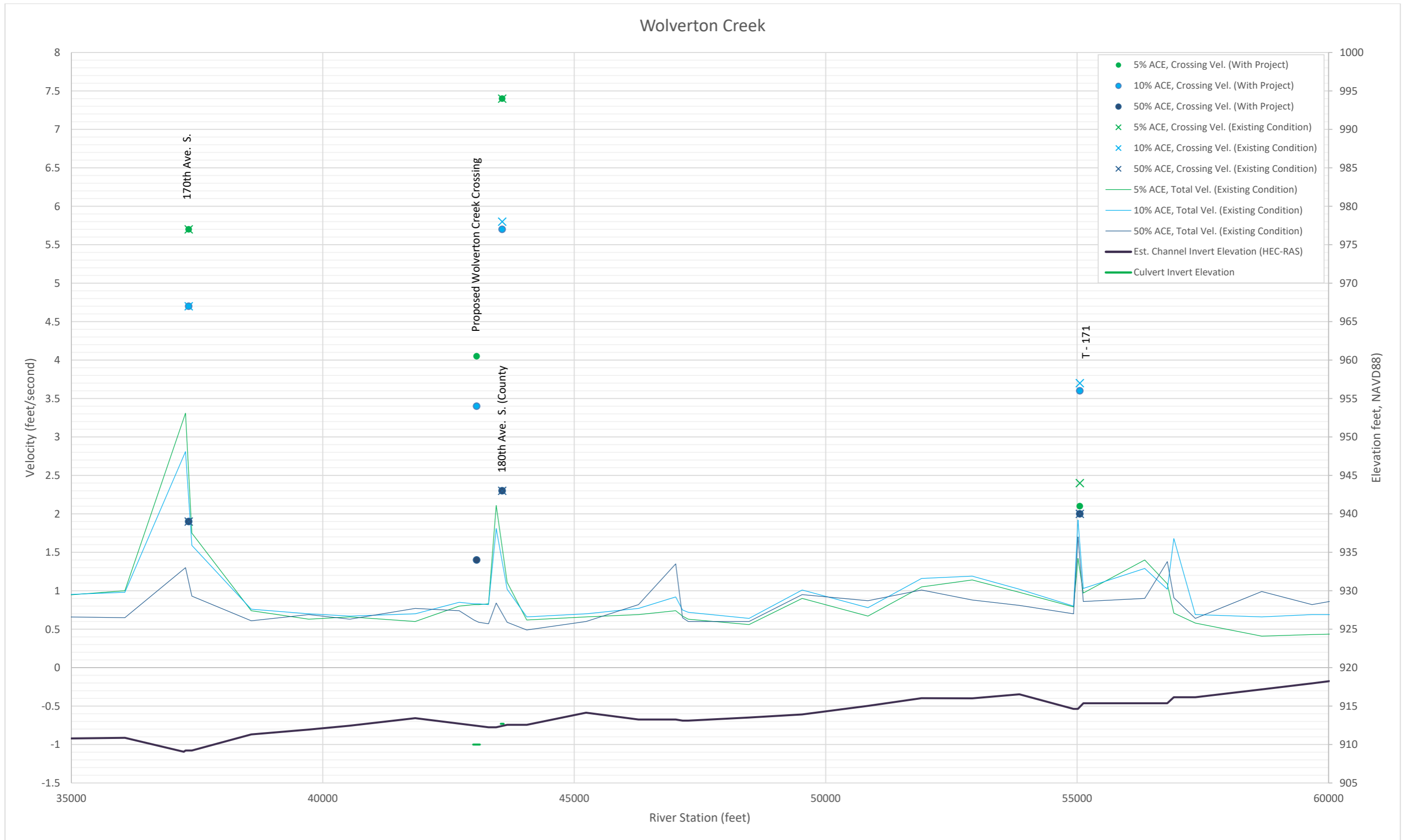


Figure 16. Modeled flow velocities through the proposed culverts on Wolverton Creek, as well as adjacent bridge crossings at 170th Ave S. and T-171.

5.3.6 Upland Habitat/Riparian Habitat: For impacts to upland and riparian habitat, temporary easement, permanent easement, and fee title construction areas were included in the calculation of impacted area; however, this is a conservative estimate, as portions of this area may not be impacted by the Project, especially those within the temporary construction easement.

The total acreage that would be impacted by the Southern Embankment for Plan B is nearly 2,500 acres; approximately 850 more acres than what would be impacted by the Southern Embankment of the No Action Alternative. The majority of this area would be composed of agricultural fields with limited value as wildlife habitat.

Some forested areas would require clearing for construction of Plan B. Upland and riparian forests within the permanent easement, temporary easement, and fee title construction areas total 124 acres for the entire Project with Plan B. Plan B Southern Embankment forest impacts total 49.5 acres, compared to 56.3 acres for the No Action Alternative. The loss of wooded acres would be mitigated by converting farmed wetland along the rivers into floodplain forest at a ratio determined to compensate for the lost habitat.

5.3.7 Endangered and Threatened Species: No changes in impacts to federally listed species would be expected with Plan B. The NLEB is the only federally listed species that has changed status in the project area since the 2013 SEA. Tree clearing would be required for the construction of both the No Action Alternative and Plan B alignment; therefore, either alternative may affect the NLEB, but it is unlikely either would adversely affect the NLEB. The construction of the Plan B alignment would require less tree clearing than the No Action Alternative, and therefore, would have less potential to affect the NLEB. Actions to avoid and minimize impacts to the species include minimizing tree cutting during the roosting season (April 1 to September 30) and complete avoidance of cutting during the NLEB pupping season (June 1 through July 31). Coordination with the USFWS is ongoing.

5.3.8 State Listed Species: Species and resources added to the Minnesota Natural Heritage Information System and species added to North Dakota Key Species of Conservation Priority would be impacted similarly with either Plan B or the No Action Alternative. A list of these species and resources can be found in Section 4.3.15. All fish species, mammal species, bird species, and insects listed are highly mobile and would likely avoid work areas during construction. Tree clearing would take place during winter months to minimize impacts to bird and bat species during their nesting and rearing periods. Low densities of pink heelsplitter (*Potamilus alatus*) and creeper (*Strophitus undulatus*) were found during mussel surveys in 2011. The other mussel species listed in Table 2 were not found during the surveys but may be present in the area. Minor take of mussel species in the vicinity of the structures at the Red River, Wild Rice River, and Wolverton Creek may occur; the take at the Red River and Wild Rice River structures would be similar for both Plan B and the No Action Alternative, with minor additional take at the Wolverton Creek Crossing for Plan B.

5.3.9 Bald Eagles: One of the eagle nests in the project area is located within 100 feet of the temporary construction easement area for the Plan B Southern Embankment, east of the proposed location for the Wild Rice River Structure. Construction activities within this proximity of an eagle nest may disturb eagles

to a degree that substantially interferes with breeding, feeding, or sheltering behavior which can be considered “take” of the bird which would be prohibited under the Bald and Golden Eagle Act; therefore, a permit for the non-purposeful take of an eagle would be required from the USFWS.

Construction in the vicinity of the nest during the nesting season would be avoided to the extent possible. Monitoring of the nest would continue to be performed in the late winter or early spring to evaluate the occupancy status of the nest. Additional monitoring would be completed during any construction activity in the immediate vicinity of the nest. Coordination with the USFWS on the nest and an application for a non-purposeful eagle take permit are ongoing.

5.3.10 Prime and Unique Farmland: Construction of the Southern Embankment for Plan B would directly impact approximately 2,100 acres of prime and unique farmland, compared to 1,500 acres for the No Action Alternative. The increase in acreage can be attributed to a larger footprint for the Plan B alignment. This impact is considered to be less than significant based on the large quantity of farmland in the study area. Over 90% of all farmland is considered prime and unique in this region.

5.3.11 Hazardous, Toxic and Radioactive Waste (HTRW): The majority of the area within the Plan B alignment has not been surveyed for HTRW sites; however, the land use is not appreciably different from that of the No Action Alternative. Therefore, it is reasonable to assume that the risk of uncovering any significant HTRW hazards along the Plan B alignment is minimal. An additional Phase 1 ESA will ultimately be necessary to supplement areas along this new alignment not covered in prior ESAs.

5.4 Cultural Resources Effects

When compared to the No Action Alternative, three additional National Register eligible farmsteads would be impacted upstream of the Plan B Southern Embankment.

There are four National Register eligible cemeteries that would be impacted by either Plan B or the No Action Alternative with a 1% ACE event: Clara, Lower Wild Rice & Red River, Hemnes, and St. Benedict. The No Action Alternative would result in increased inundation for three of the cemeteries (Clara, Wild Rice & Red River, and Hemnes) and no impact for the fourth cemetery (St. Benedict). Plan B would result in one cemetery with increased inundation (Clara), two cemeteries with viewshed impacts (Wild Rice & Red River, and St. Benedict), and one cemetery with no impact (Hemnes). Impacted National Register eligible cemeteries would require mitigation under Section 106 of the National Historic Preservation Act.

In addition to the cemeteries that are National Register eligible, both alternatives would impact four cemeteries that are not eligible for listing in the National Register. The Roen Family Cemetery and North Pleasant Cemetery would be impacted with either alternative. Hoff Cemetery and Comstock Cemetery would be impacted with the No Action Alternative, but are outside of the staging area with Plan B. Eagle Valley Evangelical Cemetery and Wolverton Cemetery would not be impacted with the No Action Alternative, but would be impacted with Plan B.

Additional Phase I survey efforts are required for Plan B, including the Western and Eastern Tieback, the relocation of the Red River and Wild Rice River Structures, the passage of additional flow through town,

and transportation changes. All surveys would be conducted in accordance with the PA. Within the staging area, additional built environment surveys and any visual effects surveys would be required following acquisition of rights-of-entry for the relevant parcels. A shoreline survey would be required within the channels of the Wild Rice River, Red River of the North, and sections of Wolverton Creek to ascertain whether any cultural resources sites are exposed by bank line erosion and to provide a baseline for a comparison with project effects.

5.5 Cumulative Impacts

Cumulative impacts would be similar to the No Action Alternative. In addition, currently there is a discontinuous line of protection for RS37' through town. The non-Federal sponsors intend to construct several flood risk management features (levees) separate from the Federal project (Figure 6), with state and local funding. When combined with Plan B these features would reduce the amount of emergency measures required in the benefitted area.

5.6 Controversy

Project features and alignments have been evaluated and altered numerous times throughout the planning and design of the Project. As designs change, the areas benefiting from or being adversely impacted by the Project also change. Individuals living and working within the areas benefited or adversely impacted by various designs generally show strong support or opposition.

Extensive analysis and consideration were given to a number of alternatives which led to the selection of the Federally Recommended Plan. This plan was optimized for functionality, constructability, safety, and reduced environmental impacts resulting in the modifications proposed in the 2013 SEA (the No Action Alternative in this SEA). However, a permit for the No Action Alternative was not issued by the MnDNR.

A lawsuit was filed by the RWJPA and was later joined by the MnDNR which resulted in a court injunction stopping all construction work. The Task Force was created by the governors of North Dakota and Minnesota to propose a framework for flood risk management for the Fargo-Moorhead area. Recommendations made by the Task Force, along with further analysis by the Technical Advisory Group and Leadership Team, resulted in the formulation of Plan B.

6 COORDINATION

Resource Agency Meetings: The resource agency team that was developed during the FEIS process has continued to meet in order to effectively discuss the Project. Over 50 resource agency meetings have occurred since the start of the project planning in 2008. The resource agencies identified in the FEIS have continued to work diligently on this Project. Since the completion of the 2013 SEA, 19 resource agency team meetings have occurred, with the last being held on May 10, 2018.

In addition to the resource agency team meetings, several other meetings and conversations have occurred between individual resource agencies and their personnel.

Meetings with Local Government Units: The Diversion Authority has held over 20 meetings with local government units (LGUs) following the submission of a permit application to the MnDNR on March 16, 2018. Table 10 provides a list of jurisdictional areas where meetings were held as well as the date of the meeting.

Table 10. Meetings with LGUs held by the Diversion Authority on Plan B

Entity	Date of Meeting
City of Fargo	Monday, March 12
City of Moorhead	Monday, March 12
Clay County	Tuesday, March 13
Stanley Township	Tuesday, March 13
Diversion Authority	Friday, March 16
Clay County Twp Officers	Monday, March 19
Cass County	Monday, March 19
City of West Fargo	Monday, March 19
City of Horace	Monday, March 19
Wilkin County	Tuesday, March 20
Pleasant Township	Tuesday, March 20
Raymond Township	Tuesday, March 20
Reed Township	Tuesday, March 20
City of Oxbow	Wednesday, March 21
Cass County Joint Water Resource District	Thursday, March 22
Buffalo Red Watershed District	Monday, March 26
City of Harwood	Monday, April 2
Richland County	Tuesday, April 3
Cass County Township Association	Thursday, April 5
City of Dilworth	Monday, April 9
City of Comstock	Tuesday, April 17
Reiles Acres	Tuesday, April 10
City of Argusville	Monday, April 2
City of Dilworth	Monday, April 9
Buffalo Red Watershed District	Monday, July 9
Fargo Commission	Monday, July 16

Public Meetings: USACE will hold a public meeting to discuss Plan B and the impacts associated with the Project during the 30-day public review period.

Cultural Resources: Section 106 coordination with tribes and State Historic Preservation Offices has continued consistent with the previous information provided in the FEIS and 2013 SEA.

Comments: The Draft Supplemental Environmental Assessment for Plan B is available for public review and comment. Substantive comments received during the review period will be used to address the effects of the Project.

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