

Outdoor Heritage Fund Grant Application



Instructions

After completing the form, applications and supporting documentation may be submitted by e-mail to ndicgrants@nd.gov. It is preferred that only electronic copies are submitted.

You are not limited to the spacing provided, except in those instances where there is a limit on the number of words. If you need additional space, please indicate that on the application form, answer the question on a separate page, and include with your submission.

The application and all attachments must be received by the application deadline. You may submit your application at any time prior to the application deadline. **Applicants are strongly encouraged to submit applications prior to the deadline for staff review in order ensure that proposals will be complete when submitted on deadline date.** Incomplete applications may not be considered for funding.

Please review the back of this form to determine project eligibility, definitions, budget criteria, and statutory requirements.

Project Name – Mayville Dam #2 Reconstruction & Recreation Project

Name of Organization – City of Mayville, North Dakota

Federal Tax ID#

Contact Person/Title – Karl Jorgenson, Mayor

Address – 21 1st St NE

City – Mayville

State – North Dakota

Zip Code – 58257

E-mail Address – gailolstad@cityofmayville.us

Web Site Address (If applicable)

Phone – (701) 788-2166

List names of co-applicants if this is a joint proposal

MAJOR Directive:

Choose only one response

- Directive A.** Providing access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;
- Directive B.** Improving, maintaining and restoring water quality, soil conditions, plant diversity, animal systems and by supporting other practices of stewardship to enhance farming and ranching;
- Directive C.** Developing, enhancing, conserving and restoring wildlife and fish habitat on private and public lands; and
- Directive D.** Conserving natural areas and creating other areas for recreation through the establishment and development of parks and other recreation areas.

Additional Directive:

Choose all that apply

- Directive A.**
- Directive B.**
- Directive C.**
- Directive D.**

Type of organization:

- State Agency
- Political Subdivision
- Tribal Entity
- Tax-exempt, nonprofit corporation.

Abstract/Executive Summary.

Summarize the project, including its objectives, expected results, duration, total project costs and participants. (no more than 500 words)

Mayville's Dam #2 is a low head dam on the south branch of the Goose River. The dam is located just south of Highway 200, adjacent to the Willowood Campground. The dam site historically provided a vital recreation destination for Mayville and Portland's combined 2,400 residents. The Willowood Campground hosts approximately 250 visitors each year. Moreover, because of the dam's proximity to both Willowood Campground and Island Park, this recreation site was frequently integrated into important community events like Veterans' Day celebrations, family reunions, graduation parties, and vacation bible school.

In May 2022, Dam #2 suffered a major failure as a result of spring flooding. The Goose River circumvented the dam on the south side and caused severe erosion along the riverbank. The City immediately took emergency action by partially breaching the dam and constructing a rock wall to slow the erosion. The damage caused by this event ultimately received a FEMA Emergency Declaration. In recent months, the City has partnered with FEMA and Moore Engineering Inc. to identify a solution to the current condition of the dam and surrounding area.

The project described here will restore and enhance this important recreation area by developing fish habitat within the Goose River and providing enhanced access for sportsmen. After removing the failed low head dam and reestablishing the eroded riverbank, the project will construct a new dam in the form of rock riffle structures.

The riffle structure will facilitate fish passage while also creating turbulent and aerated flows that improve oxygen levels. Additionally, the riffle structure will enable more natural sediment transport and will thus reduce sediment buildup on the upstream side of the structure. Enhanced oxygen levels and natural sediment transport are crucial steps towards a healthy aquatic environment for northern pike, bullhead catfish, channel catfish, bass, and the many other fish species targeted by anglers at this site.

In addition to producing cleaner and clearer water, the arched rock riffles will promote the site's use for recreational activities by creating a more natural and visually appealing environment. Crucially, the riffle structure will provide a safe environment for river access that lacks the dangers associated with low head dams. This project will thus restore, improve, and promote both in-stream and riverside access for sportsmen. The rock riffle structure will allow canoes, kayaks, and other small boats to safely access the river via Willowood Campground's launch area. Large, flat boulders at both the upstream and downstream sides of the dam will similarly enable safe riverside access for anglers.

The City has engaged with FEMA, the ND Department of Emergency Services, and the Department of Water Resources to fund \$2,617,700 of this effort. The current application is seeking \$396,595.48 to cover the remaining construction costs.

Project Duration:

Indicate the intended schedule for drawing down OHF funds.

The project will be performed from spring of 2024 through fall of 2024. The City intends to draw approximately \$49,575 each month beginning in March of 2024 and concluding in October of 2024.

Amount of Grant request: \$396,595.48

Total Project Costs: \$3,050,000

Note: in-kind and indirect costs can be used for matching funds.

Amount of Matching Funds: \$2,653,404.52

A minimum of 25% Match Funding is required. Indicate if the matching funds will be in-kind, indirect or cash. Please provide verification that these matching funds are available for your project. Note that effective as of July 1, 2015 no State General Fund dollars can be used for a match unless funding was legislatively appropriated for that purpose.

Amount of Match	Funding Source	Type of Match (Cash, In-kind or Indirect)
\$2,287,500	FEMA Hazard Mitigation Grant Program	Cash
\$305,000	DES Public Assistance	Cash
\$25,200	DWR Cost-Share Program	Cash
\$35,705	City of Mayville	Cash
\$		
\$		

Certifications

I certify that this application has been made with the support of the governing body and chief executive of my organization.

I certify that if awarded grant funding none of the funding will be used for any of the exemptions noted in the back of this application.

Narrative

Organization Information – Briefly summarize your organization’s history, mission, current programs and activities.

Include an overview of your organizational structure, including board, staff and volunteer involvement. (no more than 300 words)

The City of Mayville is located in Traill County, North Dakota. The City was founded in 1881 and its current population is 1,900. The City of Portland, which is home to an additional 600 people, is located just two miles west on Highway 200. Together, Mayville and Portland’s 2,500 residents account for approximately 30% of the population within Traill County. The cities are

home to more than 200 local businesses, and more than 1,000 students are currently enrolled at Mayville State University.

Mayville is committed to promoting the health and vitality of the community by providing residents with numerous recreation opportunities. Current recreation facilities include Camp Willowood, Island Park, Pioneer Park, a water park, frisbee golf course, and multiple sports complexes.

Purpose of Grant – Describe the proposed project identifying how the project will meet the specific directive(s) of the Outdoor Heritage Fund Program

Identify project goals, strategies and benefits and your timetable for implementation. Include information about the need for the project and whether there is urgency for funding. Indicate if this is a new project or if it is replacing funding that is no longer available to your organization. Identify any innovative features or processes of your project. Note: if your proposal provides funding to an individual, the names of the recipients must be reported to the Industrial Commission/Outdoor Heritage Fund. These names will be disclosed upon request.

For tree/shrub/grass plantings: provide a planting plan describing the site design, planting methods, number of trees/shrubs by species and stock size, grass species and future maintenance. A statement certifying that the applicant will adhere to USDA-NRCS tree/shrub/grass planting specifications along with the name of the governmental entity designing the planting may be substituted for a planting plan.

For projects including Section 319 funding: provide in detail the specific best management practices that will be implemented and the specific projects for which you are seeking funding.

For projects including fencing: A minimum cost share of 40% by the recipient is preferred. Include detailed information on the type of fencing to be installed, whether funding is requested for boundary fencing, new or replacement of existing fencing, and/or cross fencing.

Purpose of Grant

The reconstruction of Mayville’s Dam #2 is urgently required for several reasons. First, the dam’s current condition poses significant safety concerns related to the exposed sheet pile, unstable banks, unsteady rocks, and other loose debris. Second, the dam’s failure caused serious and ongoing erosion and sediment accumulation. In addition to degrading both public and private lands, these factors diminish water quality and aquatic habitat conditions within the Goose River. Finally, Dam #2 previously elevated water levels so that the school district and golf course could draw water for irrigation. The elevated water level upstream of the dam also enabled recreational use of the boat launch and landing at Willowood Campground. Ultimately, the Project described here will rectify urgent challenges related to safety hazards, water quality impairment, and habitat degradation, while also providing enhanced recreational access. This is a new Project, i.e., it is not replacing funding that is no longer available.

Is this project part of a Comprehensive Conservation Plan? Yes No

If yes, provide a copy with the application.

Note: Projects involving buildings and infrastructure will only be considered if part of a Comprehensive Conservation Plan. Please refer to the “Definitions” section at the back of the form for more details.

Management of Project – Provide a description of how you will manage and oversee the project to ensure it is carried out on schedule and in a manner that best ensures its objectives will be met.

Include a brief background and work experience for those managing the project.

The City has retained Moore Engineering Inc. (Moore) for the Dam #2 Reconstruction & Recreation Project. Moore has decades of experience providing water resource engineering services for communities throughout North Dakota. The firm regularly provides concept development, environmental review, design, permitting, and construction oversight for large watershed management and flood protection infrastructure projects that incorporate habitat enhancements for wildlife and recreation improvements for sportsmen. Moore will partner with the City to complete water modeling, geotechnical evaluation, plan and specification preparation, land acquisition coordination, permitting, bidding, and construction oversight of this effort. Moore’s proven and established project management standards and practices will ensure that objectives are achieved on-time, within budget, and in keeping with the highest quality standards.

Evaluation – Describe your plan to document progress and results.

Please be specific on the methods you will utilize to measure success. Note that regular reporting, final evaluation and expenditure reports will be required for every grant awarded.

The City will partner with Moore Engineering Inc. to develop a formal construction management plan that includes record keeping and invoice management practices. The City will submit a quarterly progress report to the Outdoor Heritage Fund that includes copies of invoices accrued and proposed activities for the subsequent reporting period. Moreover, the City will partner with Moore to use social media and digital marketing campaigns to advertise the Project, promote its benefits, and recognize its contributing partners. Marketing campaigns will occur during construction, upon completion of the project, and six months after completion.

Financial Information

Project Budget – Use the table below to provide an itemized list of project expenses and describe the matching funds being utilized for this project.

Indicate if the matching funds are in the form of cash, indirect costs or in-kind services. The budget should identify all other committed funding sources and the amount of funding from each source. **A minimum of 25% match funding is required.** An application will be scored higher the greater the amount of match funding provided. (See Scoring Form.)

Certain values have been identified for in-kind services as detailed under “Budget Information” at the back of this form. Refer to that section and utilize these values in identifying your matching funds. **NOTE: No indirect costs will be funded. Supporting documentation for project expenses, including bids, must be included or application will be considered incomplete.**

Project Expense	OHF Request	Applicant's Match Share (Cash)	Applicant's Match Share (In-Kind)	Applicant's Match Share (Indirect)	Other Project Sponsor's Share	Total Each Project Expense
Construction	\$396,595.48	\$	\$	\$	\$2,247,374.42	\$2,643,969.90
Design and engineering	\$	\$35,704.51	\$	\$	\$370,325.59	\$406,030.10
	\$	\$	\$	\$	\$	\$
	\$	\$	\$	\$	\$	\$
	\$	\$	\$	\$	\$	\$
	\$	\$	\$	\$	\$	\$
Total Costs	\$	\$	\$	\$	\$	\$3,050,000

Note: Costs for seeding, fencing, pipelines, wells, and cover crops cannot exceed NRCS Field Office Tech Guide without justification. Projects involving perimeter fencing must follow NRCS eligibility standards.

Budget Narrative – Use the space below to provide additional detail regarding project expenses.

The City immediately engaged with FEMA after the event and has partnered with the agency to fund this effort. FEMA’s Hazard Mitigation Grant Program will cover 75% of project costs (\$2,287,500). Moreover, ND’s Department of Emergency Services will provide 10% of project costs (\$305,000). The City recently applied to the Department of Water Resources Cost-Share Program, which will provide funding for design and engineering costs in the amount of \$25,200. The City plans to fund the remaining 35,704.51 for design and engineering services. The present application is seeking \$396,595.48 for construction costs not funded by FEMA or NDDDES.

Sustainability – Indicate how the project will be funded or sustained in future years.

Include information on the sustainability of this project after OHF funds have been expended and whether the sustainability will be in the form of ongoing management or additional funding from a different source.

The City will sustain the wildlife habitat and recreation enhancements accomplished during this project through a combination of general funds and revenue generated from the use of Willowood Campground, Island Park, and other public parks and recreation facilities managed by the City.

Partial Funding – Indicate how the project will be affected if less funding is available than that requested.

The City has a relatively small tax base and limited financial resources. The intent is to fund this project without placing a financial burden on the residents. If an Outdoor Heritage Fund award is not obtained, the Project may be delayed until full funding is secured.

Partnership Recognition - If you are a successful recipient of Outdoor Heritage Fund dollars, how would you recognize the Outdoor Heritage Fund partnership? * There must be signage at the location of the project acknowledging OHF funding when appropriate.

The City will post signage at Willowood Campground and other public access locations to acknowledge all project sponsors. This signage will ensure that sportsmen and other users are able to appreciate the State's contributions and commitment to improving fish and wildlife habitat and recreation opportunities. Moreover, the City will partner with its engineering consultant to use social media and digital marketing campaigns to advertise the Project, promote its benefits, and recognize its contributing partners.

Awarding of Grants - Review the appropriate sample contract for your organization on the website at <http://www.nd.gov/ndic/outdoor-infopage.htm>.

Can you meet all the provisions of the sample contract? Yes No

If there are provisions in that contract that your organization is unable to meet, please indicate below what those provisions would be:

ABOUT OHF:

The purpose of the North Dakota Outdoor Heritage Fund is to provide funding to state agencies, tribal governments, political subdivisions, and nonprofit organizations, with higher priority given to projects that enhance **conservation** practices in this state by:

Directive A. Providing access to private and public lands for sportsmen, including projects that create fish and wildlife habitat and provide access for sportsmen;

Directive B. Improving, maintaining and restoring water quality, soil conditions, plant diversity, animal systems and by supporting other practices of stewardship to enhance farming and ranching;

Directive C. Developing, enhancing, conserving and restoring wildlife and fish habitat on private and public lands; and

Directive D. Conserving natural areas and creating other areas for recreation through the establishment and development of parks and other recreation areas.

EXEMPTIONS

Outdoor Heritage Fund grants may not be used to finance the following:

- Litigation;
- Lobbying activities;
- Any activity that would interfere, disrupt, or prevent activities associated with surface coal mining operations; sand, gravel, or scoria extraction activities; oil and gas operations; or other energy facility or infrastructure development;
- The acquisition of land or to encumber any land for a term longer than twenty years; or

- Projects outside this state or projects that are beyond the scope of defined activities that fulfill the purposes of Chapter 54-17.8 of the North Dakota Century Code.

OHF funds may not be used, except after a finding of exceptional circumstances by the Industrial Commission, to finance:

- A completed project or project commenced before the grant application is submitted;
- A feasibility or research study;
- Maintenance costs;
- A paving project for a road or parking lot;
- A swimming pool or aquatic park;
- Personal property that is not affixed to the land;
- Playground equipment, except that grant funds may be provided for up to 25% of the cost of the equipment not exceeding \$10,000 per project and all playground equipment grants may not exceed 5% of the total grants per year (see Definitions/Clarifications for how this will be calculated);
- Staffing or outside consultants except for costs for staffing or an outside consultant to design and implement an approved project based on the documented need of the applicant and the expenditures may not exceed 5% of the grant to a grantee if the grant exceeds \$250,000 and expenditures may not exceed 10% of the grant to a grantee if the grant is \$250,000 or less (see Definitions/Clarifications for how this will be calculated);
- A building except for a building that is included as part of a comprehensive conservation plan for a new or expanded recreational project (see Definitions/Clarifications for definition of comprehensive conservation plan and new or expanded recreational project); or
- A project in which the applicant is not directly involved in the execution and completion of the project.

The goal of the Industrial Commission is that at a minimum 15% of the funding received for a biennium will be given priority for recreation projects that meet Directive D.

The following projects are not eligible for funding, unless there is a finding of exceptional circumstances by the Industrial Commission include:

- Construction or refurbishment of indoor/outdoor ice rinks,
- Construction or refurbishment of indoor/outdoor athletic courts and sports fields,
- Other substantially similar facilities.
- Infrastructure that is not part of a comprehensive conservation plan.
- Projects not meeting a minimum funding request of \$2,500.

Budget Information

In-kind services used to match the request for Outdoor Heritage Fund dollars shall be valued as follows:

- Labor costs \$15.00 an hour
- Land costs Average rent costs for the county as shown in the most recent publication of the USDA, National Agricultural Statistics Services, North Dakota Field Office
- Permanent Equipment Any equipment purchased must be listed separately with documentation

- Equipment usage showing actual cost. (For example: playground equipment)
- Seed & Seedlings Actual documentation
- Transportation Mileage at federal rate
- Supplies & materials Actual documentation

More categories will be added as we better understand the types of applications that will be submitted. We will use as our basis for these standards other State and Federal programs that have established rates. For example, the North Dakota Nonpoint Source Pollution Management Program has established rates. If your project includes work that has an established rate under another State Program, please use those rates and note your source.

Definitions/Clarifications:

Building - Defined as “A structure with a roof either with walls or without walls and is attached to the ground in a permanent nature.”

Comprehensive Conservation Plan - Defined as “A detailed plan that has been formally adopted by the governing board which includes goals and objectives--both short and long term, must show how this building will enhance the overall conservation goals of the project and the protection or preservation of wildlife and fish habitat or natural areas.” This does not need to be a complex multi-page document. It could be included as a part of the application or be an attachment.

New and Expanded Recreational Project means that the proposed building cannot be a replacement of a current building. The proposed building must also be related to either a new or expanded recreational project--either an expansion in land or an expansion of an existing building or in the opportunities for recreation at the project site.

Playground equipment calculation - Only the actual costs of the playground equipment (a bid or invoice showing the amount of the equipment costs must be provided) - cannot include freight or installation or surface materials or removal of old equipment, etc.

Staffing/Outside Consultants Costs - If you are requesting OHF funding for staffing or for an outside consultant, you must provide information in your application on the need for OHF funding to cover these costs. For example, if you are an entity that has engineering staff you must explain why you don't have sufficient staff to do the work or if specific expertise is needed or whatever the reason is for your entity to retain an outside consultant. If it is a request for reimbursement for staff time then a written explanation is required in the application of why OHF funding is needed to pay for the costs of that staff member(s)' time. **The budget form must reflect on a separate line item the specific amount that is being requested for staffing and/or the hiring of an outside consultant.** This separate line item will then be used to make the calculation of 5% or 10% as outlined in the law. Note that the calculation will be made on the grant less the costs for the consultant or staff.

Maintenance – Activities that preserve or keep infrastructure in a given existing condition, including repairs. Repair means to restore to sound condition after damage, to renew or refresh; except repairs due to damage caused by Acts of God.

Scoring of Grants

Oral Presentation. Please note that you will be given an opportunity to make a ten-minute Oral Presentation at a meeting of the Outdoor Heritage Fund Advisory Board. These presentations are strongly encouraged.

Open Record. Please note that your application and any attachments will be open records as defined by law and will be posted on the Industrial Commission/Outdoor Heritage Fund website.

All applications will be scored by the Outdoor Heritage Fund Advisory Board after your ten-minute oral presentation. The ranking form that will be used by the Board is available on the website at <http://www.nd.gov/ndic/outdoor-infopage.htm> .

Awarding of Grants

All decisions on requests will be reported to applicants no later than 30 days after Industrial Commission consideration. The Commission can set a limit on duration of an offer on each application or if there isn't a specific date indicated in the application for implementation of the project, then the applicant has until the next Outdoor Heritage Fund Advisory Board regular meeting to sign the contract and get the project underway or the commitment for funding will be terminated and the applicant may resubmit for funding. Applicants whose proposals have been approved will receive a contract outlining the terms and conditions of the grant.

Responsibility of Recipient

The recipient of any grant from the Industrial Commission must use the funds awarded for the specific purpose described in the grant application and in accordance with the contract. The recipient cannot use any of the funds for the purposes stated under Exemptions on the first page of this application.

If you have any questions about the application, the Commission can be reached at 701-328-3722 or outdoorheritage@nd.gov.

Revised: November 4, 2019, April 12, 2023

**Mayville Dam #2 Hydraulic Report
Mayville, ND
Alternate 2 Scenario 2 - Rock Riffles
4/28/2023**

Engineer's Preliminary Opinion of Cost

BID ITEM NO. & DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL	FEMA/NDEES (85%)	Local (15%)
Base Bid						
General						
1. Mobilization	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
2. Clearing and Grubbing	LS	1	\$10,000.00	\$10,000.00	\$8,500.00	\$1,500.00
3. Temporary Erosion Control	LS	1	\$20,000.00	\$20,000.00	\$17,000.00	\$3,000.00
4. Strip and Stockpile Topsoil	CY	278	\$10.00	\$2,780.00	\$2,363.00	\$417.00
5. Dewatering / Control of Water	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
6. Storm Water Management	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
Removals						
7. Remove Existing Dam	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Construction						
8. Regrade Channel Bottom	LS	1	\$200,000.00	\$200,000.00	\$170,000.00	\$30,000.00
9. Embankment Import	CY	14,000	\$20.00	\$280,000.00	\$238,000.00	\$42,000.00
10. Place Topsoil	CY	3,227	\$4.00	\$12,908.00	\$10,971.80	\$1,936.20
11. Seeding	ACRE	4	\$1,500.00	\$6,000.00	\$5,100.00	\$900.00
12. Erosion Control Blanket	SY	19,360	\$6.00	\$116,160.00	\$98,736.00	\$17,424.00
13. Install New Sheet Pile Dam	LS	1	\$300,000.00	\$300,000.00	\$255,000.00	\$45,000.00
14. 3'-5' Boulders	EA	125	\$600.00	\$75,000.00	\$63,750.00	\$11,250.00
15. 30" USACE Riprap	CY	463	\$75.00	\$34,725.00	\$29,516.25	\$5,208.75
16. Class II Riprap	CY	148	\$75.00	\$11,100.00	\$9,435.00	\$1,665.00
17. Class IV Riprap	CY	889	\$75.00	\$66,675.00	\$56,673.75	\$10,001.25
18. Riprap Filter Blanket	SY	2,111	\$5.00	\$10,555.00	\$8,971.75	\$1,583.25
19. Granual Filter USACE Type B2 (9" Nominal Thickness)	CY	185	\$75.00	\$13,875.00	\$11,793.75	\$2,081.25
20. Granual Filter USACE Type B2 (12" Nominal Thickness)	CY	389	\$75.00	\$29,175.00	\$24,798.75	\$4,376.25
21. Cobble Rock	TON	24	\$55.00	\$1,320.00	\$1,122.00	\$198.00
22. Chinking Rock	TON	24	\$50.00	\$1,200.00	\$1,020.00	\$180.00
23. Install Wedge Dam Over Sheet Piles	LS	1	\$40,000.00	\$40,000.00	\$34,000.00	\$6,000.00
24. Remove and Salvage Existing Riprap	CY	1,190	\$40.00	\$47,600.00	\$40,460.00	\$7,140.00
25. Riprap Import	CY	6,730	\$75.00	\$504,750.00	\$429,037.50	\$75,712.50
			Construction Subtotal	\$2,033,823.00	\$1,728,749.55	\$305,073.45
			Contingencies (30%)	\$610,146.90	\$518,624.87	\$91,522.04
			Design & Construction Engineering (20%)	\$406,030.10	\$345,125.59	\$60,904.52
			TOTAL PROJECT COST	\$3,050,000.00	\$2,592,500.00	\$457,500.00

Mayville Dam #2 Hydraulic Report for City of Mayville, ND

Prepared for
City of Mayville, ND

May 2023

Prepared by:
Yaping Chi, PE
Joshua M Hassell, PE
Kyle Hafliger, PE
Zach Cormican, EIT



Certification

I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota.

Kyle Hafliger

Kyle Hafliger, PE
ND Registration No. PE-10091
Date: 05/01/2023



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1. Background Data

The City of Mayville (the City) Dam #2 is a low head dam which was originally built on the south branch of the Goose River in 1935 for recreational and water supply purposes. The location of the dam is shown in Figure 1. The total drainage area of this dam is 785 square miles.

In early May 2022, the City's Dam #2 suffered a failure that resulted in the Goose River circumventing the dam on the south side and eroding the riverbank. The City took emergency action by partially breaching the dam and constructing a rock wall to slow the erosion. Some of the photos showing the dam failure and the bank erosion are shown in Appendix A. The damage caused by this weather event received a FEMA Emergency Declaration and the City began working with FEMA on a solution to the current condition of the dam and the surrounding area.

2. Introduction

This project is a feasibility study which consists of evaluating two alternatives: (1) the removal of the failed, existing dam; and (2) the relocation of Mayville Dam #2, as well as improvements adjacent to the existing dam such as bank correction, slope stabilization, and cleanup items from the May 2022 event.

The objective of this study is to provide options for how to proceed now that Mayville Dam #2 has failed. Some key points the City wants to address include keeping the Goose River high enough for the city golf course to continue drawing water for irrigation and to ensure the Willowood Campground still has river access for recreation purposes. This study evaluates alternatives for a permanent solution while also meeting requirements for FEMA funding and assisting in decision making for the City of Mayville.

3. Effective FIS Study

The current effective FIS study [1] for the City of Mayville dated in 2015 was determined using the SCS computer program WSP-2 [2]. A request was made to FEMA for the original WSP-2 model in November 2022. In February 2023, the requested data was available, which was stored as scanned punch card sheets. With the difficulty in reading the scanned data and unavailable computer program, it was determined to re-create a model using GeoHEC-RAS software [3].

City of Mayville – Dam #2 Hydraulic Report

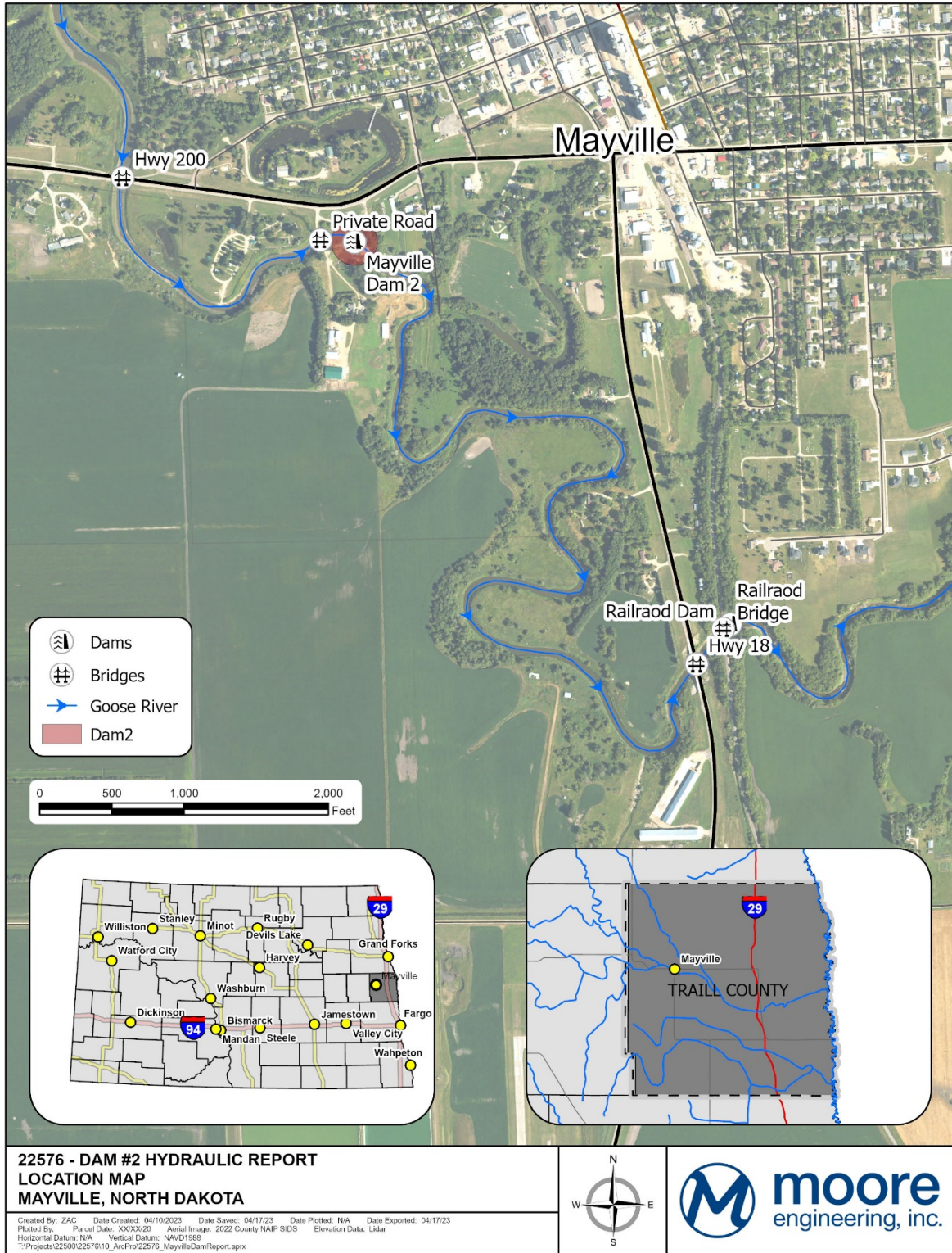


Figure 1 Location of the City of Mayville Dam #2

4. Hydrology

The 10-, 50-, 100-, and 500-year recurrence intervals have been selected for standard hydrologic and hydraulic analysis as stated in the Effective FIS report. “Peak discharges for the selected frequencies were based on a statistical analysis of discharge records using USGS gaging station No. 05066500, with 46 years of record (1931-1976), located at Hillsboro, and USGS gaging station No. 05065500, with 36 years of record (1940-1976), located near Portland. [1]” The flows used by the Effective FIS are shown in Table 1. These flows are used in this study for the hydraulic analysis.

Table 1 FIS Hydrology

Events	10-year	50-year	100-year	500-year
Peak Discharge (cfs)	4,500	10,000	13,000	21,200

5. Hydraulics

To compare the potential upstream impacts between the existing condition Dam’s configuration and the proposed alternatives, steady state GeoHECRAS models were developed as the same extent as the Effective FIS study. Figure 2 shows the GeoHECRAS model geometry layout for this study.

The hydrology and tailwater conditions from the Effective FIS study were used in all the models referenced in this report. Due to the limited data available for the Effective FIS model, which was developed in the 1970s, the Corrected Existing Conditions model was created with more detailed model geometry as the base model for this analysis, which was leveraged from the Effective FIS model.

Efforts have been made to recreate and modify the Effective FIS model based on the available data from the Effective FIS study and the new survey data. Step changes have been made to validate the new models as follows.

- 1- Modified FIS Model: Cross sections were created at the Effective FIS lettered cross section locations (Cross section C to N). Cross section geometries were modified with survey data when available. Where survey data was not available, LiDAR data was adjusted to reflect the channel bottom. Table 2 details the updates made to the cross sections.

City of Mayville – Dam #2 Hydraulic Report

- 2- Corrected Existing Conditions Model: Based on the modified FIS model, more cross sections were added upstream and downstream of the structures, as well as near the Dam.
- 3- Proposed Condition Models: The Corrected Existing Conditions model was used to create both Alternates 1 and 2 models.

The existing structure elevations were kept consistent in each of the models as seen in Table 3. The downstream boundary conditions utilized the water surface elevation from the Effective FIS study and are shown in Table 4 as the Tailwater Conditions.

Table 2 Modified FIS – Additional and Adjusted XS

Original FIS Model XS Name	GeoHECRAS Model XS Name	Modified from Original Alignment?	Reason for Modification
C	453	Yes	Adjusted XS to cross the oxbow only once
D	2170	Yes	Adjusted XS to be perpendicular to flow
E	4466	Yes	Adjusted XS to be perpendicular to flow
F	7319	Yes	Adjusted XS to be perpendicular to flow
	7604	NA	Added to model upstream of the railroad dam
G	7646	Yes	Adjusted XS to be perpendicular to flow
	7978	NA	Added to model upstream of the railroad bridge
H	8585	Yes	Tied up to high ground
I	9485	Yes	Tied up to high ground
J	15940	Yes	Adjusted XS to be perpendicular to flow
K	16329	Yes	Moved upstream of Dam
L	16522	Yes	Moved downstream of bridge
M	18644	Yes	Adjusted XS to be perpendicular to flow
N	29146	Yes	Adjusted XS to be perpendicular to flow

Table 3 Existing Structure Elevations

Structure	Top of Weir Elevation (ft)	High Chord (ft)	Low Chord (ft)
Hwy 200		959.3	955.2
Alt 2 – New Mayville Dam #2	941.5		
Private Road		956.7	956.1
Mayville Dam #2	941.5		
Hwy 18		956.6	952.6
Railroad Bridge		963.5	955.5
Railroad Dam	932.9		

Table 4 Tailwater Conditions

Events	10-year	50-year	100-year	500-year
Downstream Water Surface Elevation (ft)	939.0	944.0	945.0	947.6

5.1 Coordinate Systems

Horizontal datum: NAD 1983 State Plane_North Dakota North FIPS_3301_Feet

Vertical datum: North American Vertical Datum 1988

*The vertical datum used in the Effective FIS report is North American Vertical Datum 1929 so all of these elevations were increased by a scaling factor of 1.1 feet, in this region, to match into this report

5.2 Modified FIS Model

5.2.1 Model Geometry

Cross sections from the Effective FIS were modified to create the Modified FIS model as seen in Figure 2. These modifications were made to allow GeoHECRAS to create flood maps and for other reasons as stated in Table 2. The channel bottom elevations were developed photogrammetrically from aerial photographs taken in 1976 for the effective FIS model. The Modified FIS model uses updated elevations from a survey, completed by Moore Engineering Inc. on 10/26/2022, when available and an assumed channel bottom elevation everywhere else. Since LiDAR data represents water surface elevation in rivers, for cross sections that do not have survey data, the difference in elevation between the surveyed channel bottom and LiDAR data from the surveyed cross sections was applied to estimate the actual channel bottom. The detailed channel bottom elevations for the model can be found in Appendix B.

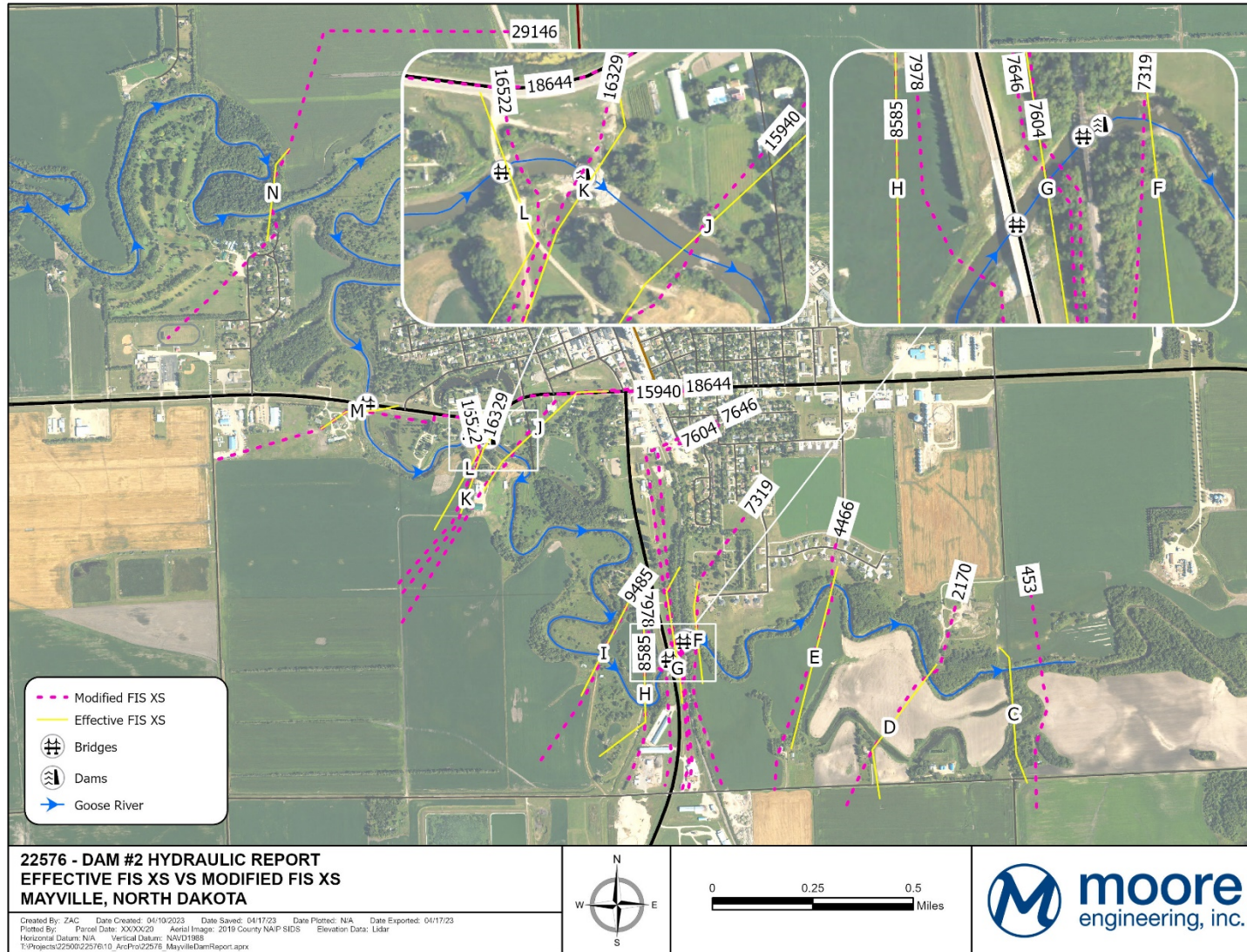


Figure 2 Effective FIS VS Modified FIS Model Geometry Layout

5.3 Corrected Existing Conditions Model

5.3.1 Model Geometry

The Modified FIS model geometry was used as a base to create the Corrected Existing Conditions model as seen in Figure 3. Additional cross sections were added at the surveyed locations, as well as upstream and downstream of the structures as required by the model. The detailed cross section modifications can be seen in Table 5. The road crossings at N.D. State Highway 200 and the private road were also added to this model. With more detailed geometry updates, this Corrected Existing Conditions model is able to generate more accurate hydraulic results.

Table 5 Corrected Ex Additional XS

Modified FIS XS	XS Sta	XS Added to Corrected Ex Model?	Reason for Additional XS
29146	29146	No	NA
	18873	Yes	Needed for the upstream XS of HWY 200 bridge
18644	18644	No	NA
	18560	Yes	Needed for the second downstream XS of HWY 200 bridge
	16851	Yes	RiverPro Surveyed XS
	16736	Yes	RiverPro Surveyed XS
	16639	Yes	RiverPro Surveyed XS
16522	16522	No	NA
	16393	Yes	RiverPro Surveyed XS
16329	16329	No	NA
	16157	Yes	RiverPro Surveyed XS
	16029	Yes	RiverPro Surveyed XS
15940	15940	No	NA
	15727	Yes	RiverPro Surveyed XS
9485	9485	No	NA
8585	8585	No	NA
7978	7978	No	NA
7646	7646	No	NA
7604	7604	No	NA
7319	7319	No	NA
	7220	Yes	Needed for the second downstream XS of the railroad dam
4466	4466	No	NA
2170	2170	No	NA
453	453	No	NA

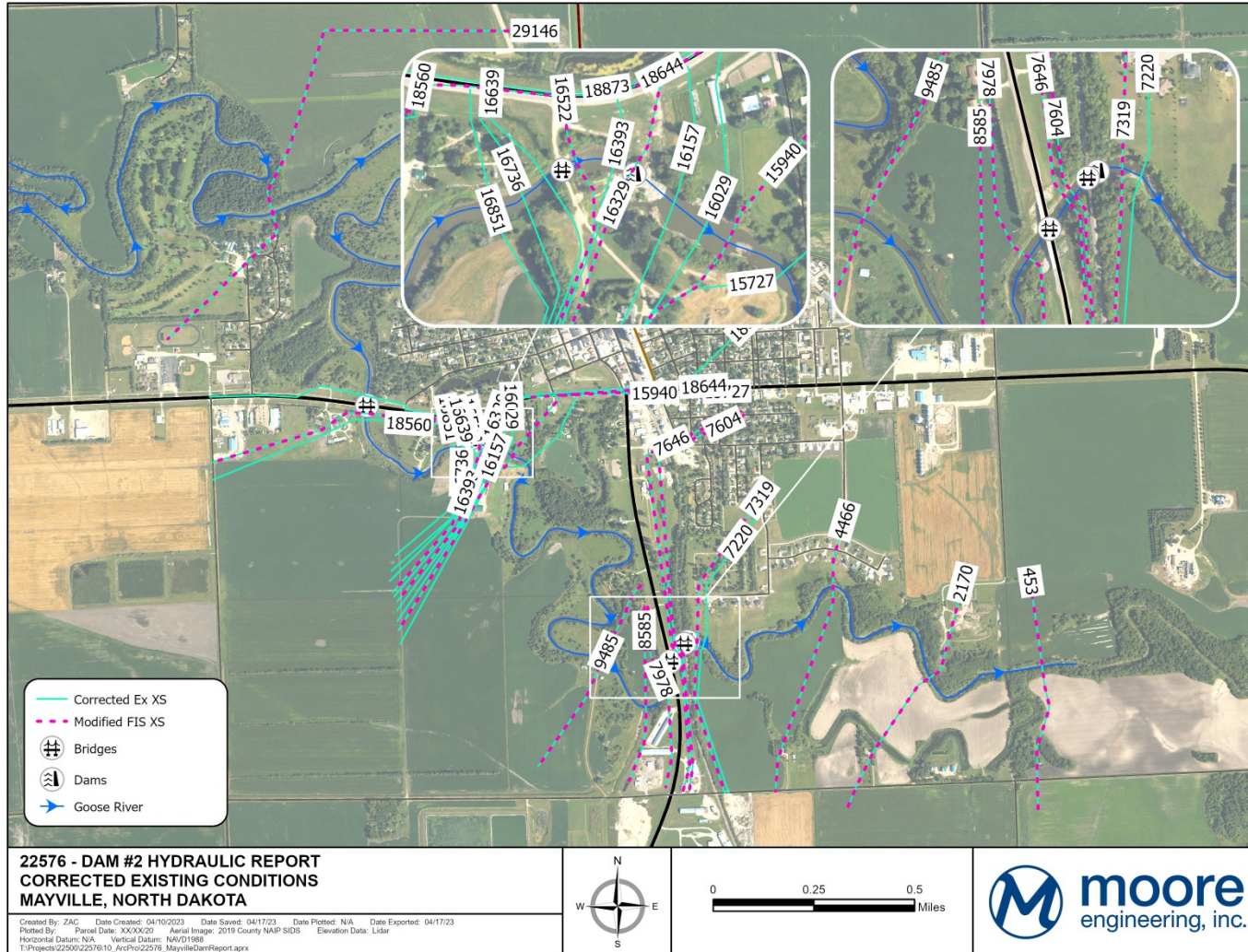


Figure 3 Corrected Existing Conditions Model VS Modified FIS Model Geometry Layout

5.4 Comparison of the Results among the Three Existing Condition Models

The water surface profiles for the 10-, 50-, 100-, and 500-year recurrence intervals were compared among the Effective FIS, Modified FIS, and Corrected Existing Conditions models, which are shown in Appendix C. The reason to start with the Effective FIS and create the Modified FIS is to replace the old elevation data to the updated survey data, but keeping the original cross section locations. Then the reason to go from the modified FIS to the corrected existing conditions model is to add more detail to the model and increase model accuracy.

It can be seen, in the “Effective FIS vs. Modified FIS” plot, that the channel bottom profile from the effective FIS model is consistently higher than that from the modified FIS model due to the photogrammetrically generation elevations as noted in section 5.2.1 Model Geometry. The model calculates from downstream to upstream, with tailwaters starting at the same elevations. The water surface elevations are all modeled within one foot of each other at the cross sections C through J just downstream of Mayville Dam #2. Upstream of Mayville Dam #2 there are some discrepancies between the models for the 10-year and the 500-year events. In this area these discrepancies are due to extra constriction upstream of the dam at cross section 16329 and extra constriction near Highway 200. These modifications are justified because the data utilized within the Modified FIS model is more accurate as described in section 5.2.1. The 50-year and 100-year events carry downstream to upstream with little deviation between models. With these results, we can conclude that the modified FIS model is a reasonable representation of the effective FIS model and can be built upon to further this study.

The “Modified FIS vs. Corrected Existing Conditions” plot has additional details added to generate more accurate results. The Corrected model brings in more cross sections, all the channel bottom survey elevations, and bridge data while starting with the same tailwater conditions as the Effective FIS and Modified FIS models. From cross section C through cross section I, there are no differences between the models. At cross section I, the Corrected channel bottom gets shallower so the water isn’t moving downstream as fast and raises all four of the Corrected profiles up to the Mayville Dam #2. The Dam #2 geometry is the same in both models, but the addition of the Private Road and Highway 200 constrict the flow, generating higher water surface elevations for the 50-, 100-, and 500-year events upstream of Dam #2. The 10-year event is not affected due to the lower flow conditions and the water not rising to the level where the new geometry has any effect. The 500-year profile is significantly higher due to being blocked by both the Private Road and Highway 200. These results are expected and reasonable when considering the former models were missing this data. This Corrected Existing Conditions model is a suitable base to compare the Alternates.

5.5 Alternative 1 – Removal of the Existing Dam

5.5.1 Model Geometry

All the geometry from the Corrected Existing Conditions model was used with the exception of the existing Mayville Dam #2, which was removed in this Alternative 1 model.

The channel bottom was graded in the location of the existing Mayville Dam #2 to cut out the failed structure and fill in the scour holes.

The change in the channel bottom can be seen in Appendix D.

5.6 Alternative 2 – Dam Relocation

5.6.1 Model Geometry

All of the geometry from the Corrected Existing Conditions model was used with the exception of the existing Mayville Dam #2, which was removed from the model. A “New Mayville Dam” was added at station 16674, which is about 161 feet upstream of the private road, with a weir elevation the same as the original dam at 941.5 feet and 62 feet wide.

The channel bottom was graded in the location of the existing Mayville Dam #2 to cut out the failed structure and fill in the scour holes.

The change in the channel bottom can be seen in Appendix D.

5.7 Result Comparison

Table 6 through Table 9 compare the water surface elevation results for the 10-, 50-, 100-, and 500-year recurrence intervals modeled in this report. These results can be seen as profile plots in Appendix C.

Table 6 Comparison of Water Surface Elevations for the 500-year Event

Original FIS XS	XS Sta	Effective FIS	Corrected Existing Conditions	Alt 1 - Dam Removal	Alt 2 - Dam Relocation
N	29146	960.9	963.65	963.7	963.69
	18873	#N/A	959.22	958.99	959.01
M	18644	955.6	958.66	958.25	958.27
	18560	#N/A	958.6	958.19	958.21
	16851	#N/A	957.98	957.51	957.53
	16736	#N/A	957.85	957.37	957.39
	16639	#N/A	957.58	957.05	957.05
L	16522	955.2	956.1	955.26	955.26
	16393	#N/A	955.66	954.75	954.75
K	16329	954.5	955.59	954.63	954.63
	16157	#N/A	955.84	954.92	954.92
	16029	#N/A	955.85	954.95	954.95
J	15940	954	955.86	954.95	954.95
	15727	#N/A	955.83	954.91	954.91
I	9485	953.1	952.7	952.7	952.7
H	8585	952.9	952.5	952.5	952.5
	7978	#N/A	951.73	951.73	951.73
G	7646	951.7	951.35	951.35	951.35
	7604	#N/A	951.41	951.41	951.41
F	7319	949.9	950.04	950.04	950.04
	7220	#N/A	949.93	949.93	949.93
E	4466	949.1	949.12	949.12	949.12
D	2170	948.3	948.4	948.4	948.4
C	453	947.7	947.6	947.6	947.6

Table 7 Comparison of Water Surface Elevations for the 100-YR Event

Original FIS XS	XS Sta	100YR Effective FIS	100YR Corrected Existing Conditions	100YR Alt 1 - Remove Dam	100YR Alt 2 - Move Dam
N	29146	958.9	959.99	959.74	959.74
	18873	#N/A	955.56	954.7	954.7
M	18644	954.8	955.16	954.29	954.29
	18560	#N/A	955.29	954.43	954.43
	16851	#N/A	954.68	953.59	953.59
	16736	#N/A	954.56	953.43	953.42
	16639	#N/A	954.27	953.03	953.03
L	16522	953.9	953.61	952.34	952.34
	16393	#N/A	953.29	951.96	951.96
K	16329	951	953.07	951.57	951.57
	16157	#N/A	952.84	951.92	951.92
	16029	#N/A	952.84	951.92	951.92
J	15940	950.9	952.83	951.9	951.9
	15727	#N/A	952.77	951.84	951.84
I	9485	949.5	949.23	949.23	949.23
H	8585	949.1	948.87	948.87	948.87
	7978	#N/A	948.31	948.31	948.31
G	7646	948.5	948.04	948.04	948.04
	7604	#N/A	947.98	947.98	947.98
F	7319	947.6	947.54	947.54	947.54
	7220	#N/A	947.46	947.46	947.46
E	4466	947	946.5	946.5	946.5
D	2170	945.7	945.75	945.75	945.75
C	453	945.1	945	945	945

Table 8 Comparison of Water Surface Elevations for the 50-YR Event

Original FIS XS	XS Sta	50YR Effective FIS	50YR Corrected Existing Conditions	50YR Alt 1 - Remove Dam	50YR Alt 2 - Move Dam
N	29146	957.5	958.14	957.92	957.94
	18873	#N/A	954.05	953.26	953.31
M	18644	953.5	953.79	952.95	953
	18560	#N/A	953.87	953.02	953.07
	16851	#N/A	953.27	952.19	952.26
	16736	#N/A	953.17	952.03	952.11
	16639	#N/A	952.92	951.78	951.78
	16522	952.5	952.56	950.85	950.85
	16393	#N/A	952.32	950.55	950.55
K	16329	950	952.1	950.14	950.14
	16157	#N/A	951.4	950.46	950.46
	16029	#N/A	951.39	950.45	950.45
J	15940	949.6	951.36	950.4	950.4
	15727	#N/A	951.32	950.36	950.36
I	9485	947.7	948.01	948.01	948.01
	8585	947.5	947.61	947.61	947.61
H	7978	#N/A	947.17	947.17	947.17
	7646	947.1	946.97	946.97	946.97
G	7604	#N/A	946.92	946.92	946.92
	7319	946.5	946.66	946.66	946.66
F	7220	#N/A	946.59	946.59	946.59
	4466	945.9	945.74	945.74	945.74
E	2170	944.7	944.76	944.76	944.76
D	453	944	944	944	944
C					

Table 9 Comparison of Water Surface Elevations for the 10-YR Event

Original FIS XS	XS Sta	10YR Effective FIS	10YR Corrected Existing Conditions	10YR Alt 1 - Remove Dam	10YR Alt 2 - Move Dam
N	29146	952.2	953.19	952.24	952.89
	18873	#N/A	950.46	947.26	949.68
M	18644	949.4	950.35	946.99	949.55
	18560	#N/A	950.34	946.92	949.51
	16851	#N/A	949.88	945.73	948.97
	16736	#N/A	949.81	945.55	948.88
	16639	#N/A	949.75	945.4	945.4
	16522	949	949.67	944.59	944.59
L	16393	#N/A	949.58	944.44	944.44
	16329	947	949.45	943.95	943.95
K	16157	#N/A	945.67	944.24	944.24
	16029	#N/A	945.65	944.22	944.22
	15940	944.8	945.62	944.2	944.2
J	15727	#N/A	945.54	944.1	944.1
	9485	942.2	941.92	941.92	941.92
I	8585	941.9	941.34	941.34	941.34
	7978	#N/A	941.03	941.03	941.03
H	7646	941.5	940.87	940.87	940.87
	7604	#N/A	940.83	940.83	940.83
G	7319	941	940.6	940.6	940.6
	7220	#N/A	940.58	940.58	940.58
E	4466	940.6	939.94	939.94	939.94
D	2170	939.6	939.38	939.38	939.38
C	453	939	939	939	939

6. Conclusion

One of the main focuses of this analysis was to ensure that the Mayville golf course intake near the Effective FIS cross section N would still be able to draw from the Goose River for irrigation. Based on the analyses, during a 10-year event at cross section N, the dam relocation Alternative 2 will result in a 0.3 feet lower water surface elevation than the profile from the Corrected Existing Conditions model. With the Dam removal alternative, the water surface elevation at the golf course will be lowered by approximately one foot for the 10-year event. The differences in water surface elevation diminish for larger events.

Another focus was on the recreation use at the Willowood Campground between Highway 200 and the private road. At cross section 16851 in Table 9, Alternative 1 (remove dam) would result

in a 4.15 feet lower water surface elevation during the 10-year event while Alternative 2 (move dam) would result in a 0.91 feet lower water surface elevation during the 10-year event.

In addition to the analysis of the potential alternatives, a preliminary geotechnical evaluation was completed in the area proposed for the new dams in Alternative 2. The preliminary findings of the geotechnical evaluation indicated that the area will support a similar type dam structure. However, if relocation of the dam is selected, further geotechnical evaluation and design will be necessary to verify the type of dam will be supported geotechnically and will meet current design standards.

7. Cost Estimate

Preliminary cost estimates were prepared to provide information to assist with decision making as the City considers options moving forward.

- Alternate 1 – Remove Dam: This alternate removes the current dam then regrades and adds riprap to approximately 200 feet of the channel. It also brings in fill to rebuild the eroded bank section.
- Alternate 2 Scenario 1 – Rock Wedge: This scenario constructs a sheet pile dam at the same weir elevation as the original Mayville Dam #2 but upstream of the private bridge. This design provides a wedge transition to eliminate the roller effect of a low head dam. The wedge is composed of riprap at a 25% grade for this estimate but may be adjusted during final design. The channel will be regraded from the bottom of the wedge and reinforced with riprap for approximately 500 feet. This reinforcement goes through the location of the original dam which will be removed. It also brings in fill to rebuild the eroded bank section.
- Alternate 2 Scenario 2 – Rock Riffles: This scenario constructs a sheet pile dam at the same weir elevation as the original Mayville Dam #2 but upstream of the private bridge. This design provides a step transition, using rock riffles, over 500 feet from the new sheet pile through the failed structure. This transition has less than a 3% grade with pools to provide fish passage and recreational opportunities. The estimate includes fill required to build up the channel base below the rock riffle structures. The current dam will be removed and area reinforced. It also brings in fill to rebuild the eroded bank section.
- Alternate 2 Scenario 3 – Concrete Step Dam: This scenario constructs a concrete dam with a stepped spillway. The top of the dam will be the same elevation as the original Mayville Dam #2 but upstream of the private bridge. This design provides a step transition to eliminate the roller effect of a low head dam. The current dam will be removed then the channel will be regraded and reinforced with riprap for approximately 500 feet, through the location of the original dam. It also brings in fill to rebuild the eroded bank section.

The estimates were prepared based on experience with similar projects. However, it is important to note that additional design will be necessary to verify that assumptions made in the estimates are accurate. Table 10 contains the summary of the estimates and a range for what the project could cost based on the level of detail so far. More detailed cost estimates are included in Appendix E. It is assumed that between FEMA and the NDDDES, 85% of the project costs will be covered. Additionally, it is anticipated that there will be funding available for the Alternate 1 (dam removal) and the Alternate 2-Scenario 2 (arched rock riffle) from the USFWS for fish passage.

Table 10 Cost Estimates

Total Project Cost Estimates	Low	Estimate	High
Alt 1 - Remove Dam	\$ 800,000	\$ 1,030,000	\$ 1,400,000
Alt 2 Scenario 1 - Rock Wedge	\$ 1,800,000	\$ 2,350,000	\$ 3,100,000
Alt 2 Scenario 2 - Rock Riffles	\$ 2,300,000	\$ 3,050,000	\$ 4,000,000
Alt 2 Scenario 3 - Concrete Steps	\$ 3,000,000	\$ 3,900,000	\$ 5,100,000

8. References

- [1] Federal Emergency Management Agency, "Flood Insurance Study - Traill County, North Dakota and Incorporated Areas," October 16, 2015.
- [2] U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, "Technical Release 61, WSP-2 Computer Program," May 1976.
- [3] CivilGEO Engineering Software, *GeoHECRAS, version 3.1.0.1192*, September, 2021.

Appendix A – Photos of the Dam Failure and Bank Erosion

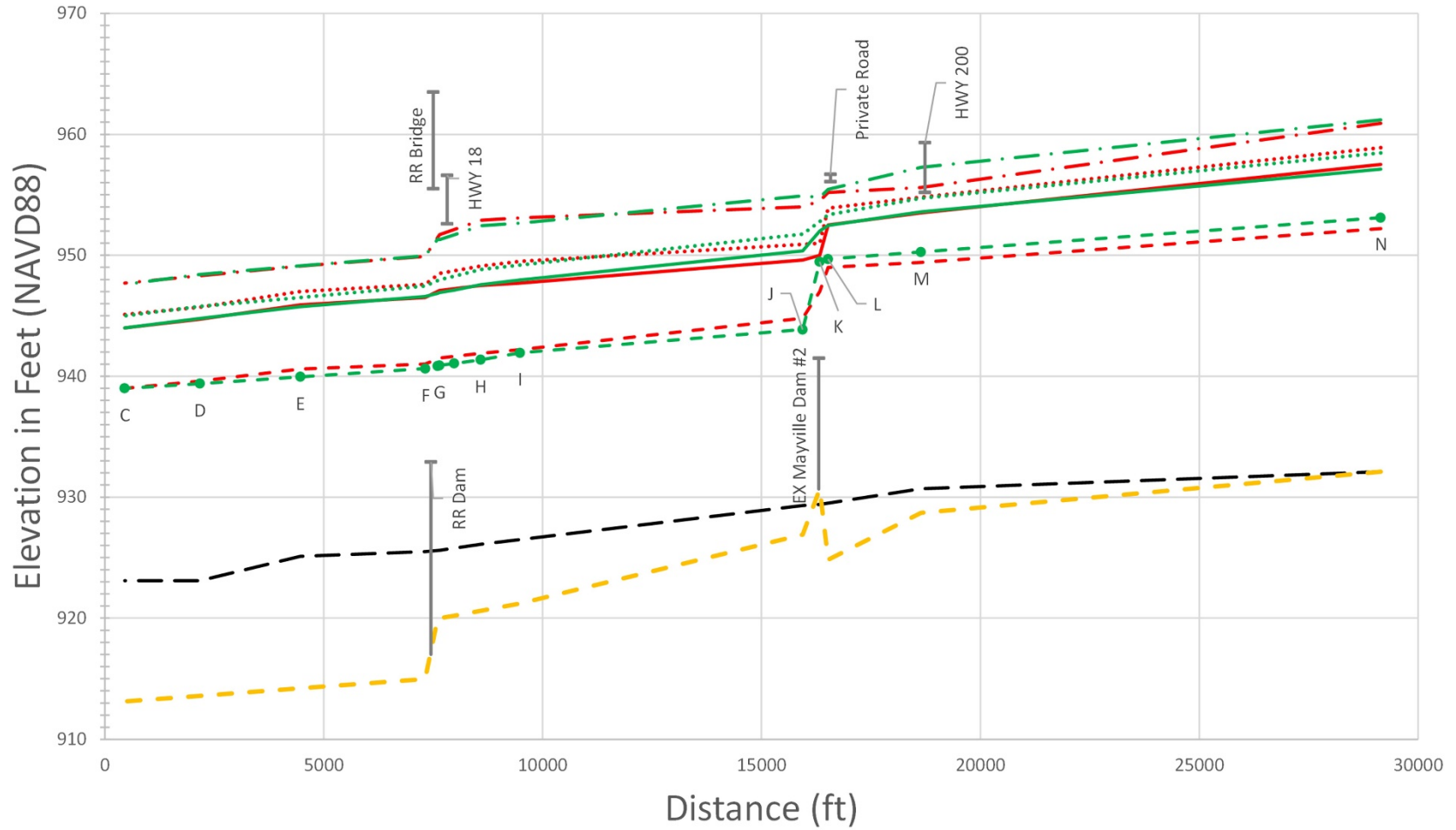


Appendix B – Channel Bottom Elevations

Effective FIS Model XS Name	Modeled River Station	RiverPro Survey Bottom Elev. (ft)	Effective FIS Bottom Elev. (ft)	Modified FIS Bottom Elev. (ft)	Corrected Existing Conditions Bottom Elev. (ft)	Alts 1 & 2 Bottom Elev. (ft)
N	29146		932.1	932.1	932.1	932.1
	18873				928.8	928.8
M	18644		930.7	928.7	928.7	928.7
	18560				928.7	928.7
	16851	928.3			928.3	928.2
	16736	929.7			929.7	928.1
New Mayville Dam #2	16674					941.5
	16639	928.4			928.4	928.1
L	16522	924.9	929.5	924.9	924.9	928.1
	16393	928.8			928.8	928.0
K	16329		929.4	928.0	928.0	928.0
Mayville Dam #2	16309		941.5		941.5	
	16157	918.8			918.8	925.3
	16029	920.8			920.8	925.3
J	15940	926.9	929.3	926.9	926.9	925.2
	15727	925.1			925.1	925.1
I	9485		926.5	921.2	921.2	921.2
H	8585		926.1	920.6	920.6	920.6
	7978			920.2	920.2	920.2
G	7646			920.0	920.0	920.0
	7604		925.6	920.0	920.0	920.0
RR Dam	7451		932.9		932.9	932.9
F	7319		925.5	915.0	915.0	915.0
	7220				915.0	915.0
E	4466		925.1	914.2	914.2	914.2
D	2170		923.1	913.5	913.5	913.5
C	453		923.1	913.0	913.0	913.0

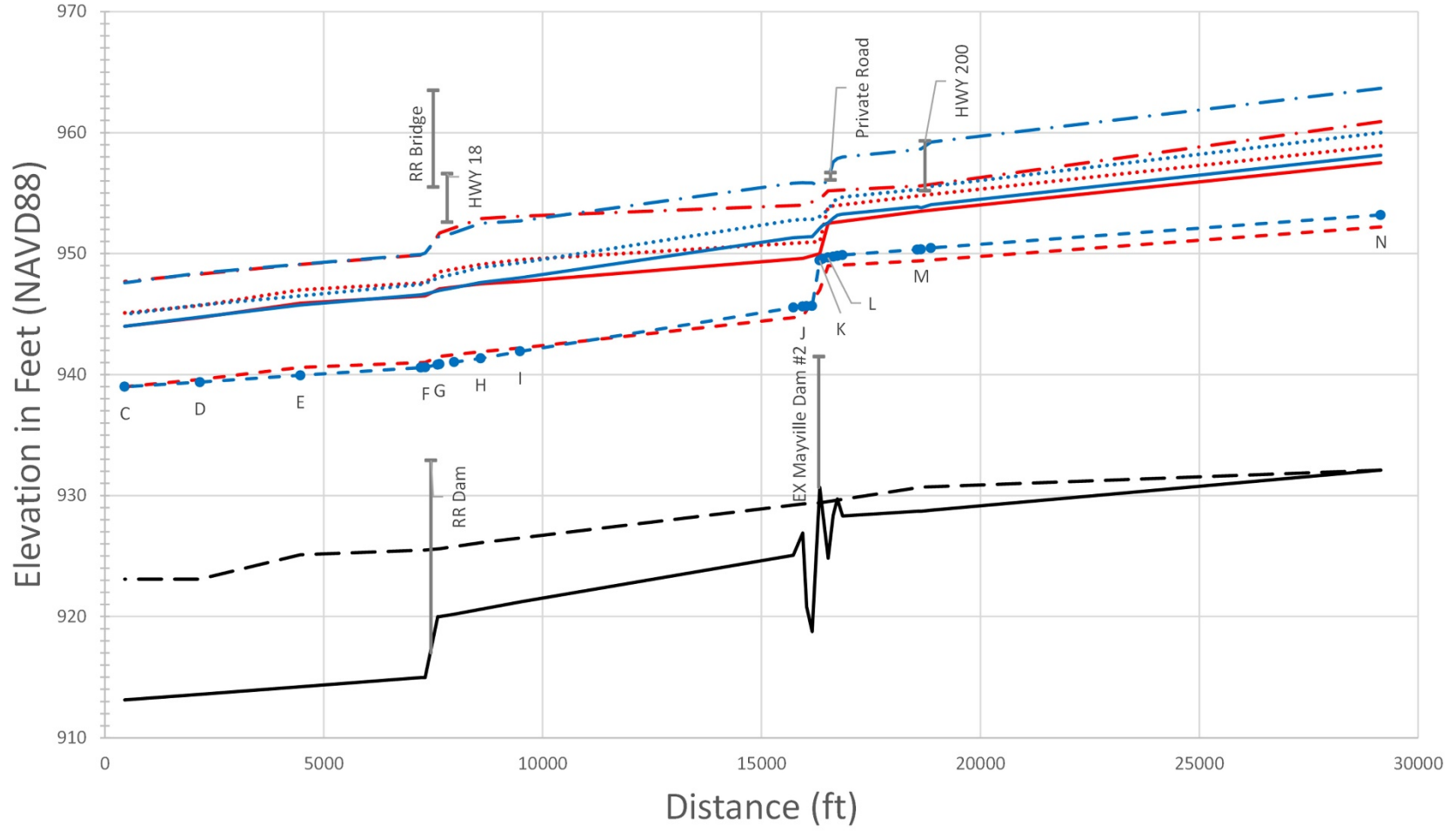
Appendix C – Comparison of Profile Plots among the Effective FIS, Modified FIS, and the Corrected Existing Condition Models

WSE Effective FIS VS Modified FIS



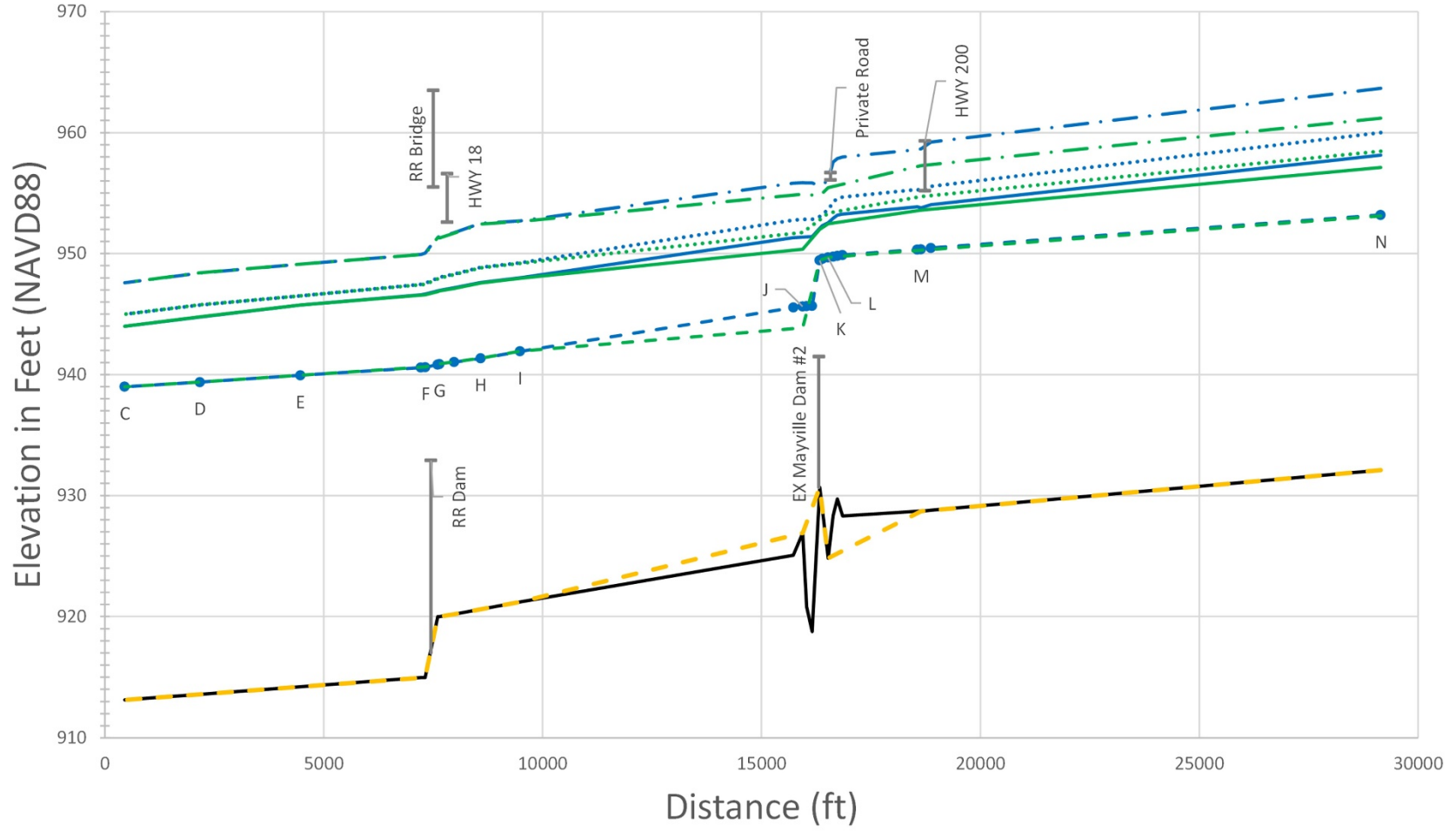
- Effective FIS Channel Btm Elev
- 50YR Effective FIS
- 50YR Modified FIS
- 10YR Modified FIS
- 500YR Effective FIS
- 10YR Effective FIS
- 100YR Effective FIS
- 100YR Modified FIS
- Modified FIS Model Channel Btm Elev
- 50YR Modified FIS

WSE Effective FIS VS Corrected Existing Conditions



- Effective FIS Channel Btm Elev
- 50YR Effective FIS
- 50YR Corrected Existing Conditions
- 10YR Corrected Existing Conditions
- . - 500YR Effective FIS
- - - 10YR Effective FIS
- • • • • 100YR Effective FIS
- • • • • 100YR Corrected Existing Conditions
- Corrected Ex Model Channel Btm Elev
- 50YR Corrected Existing Conditions

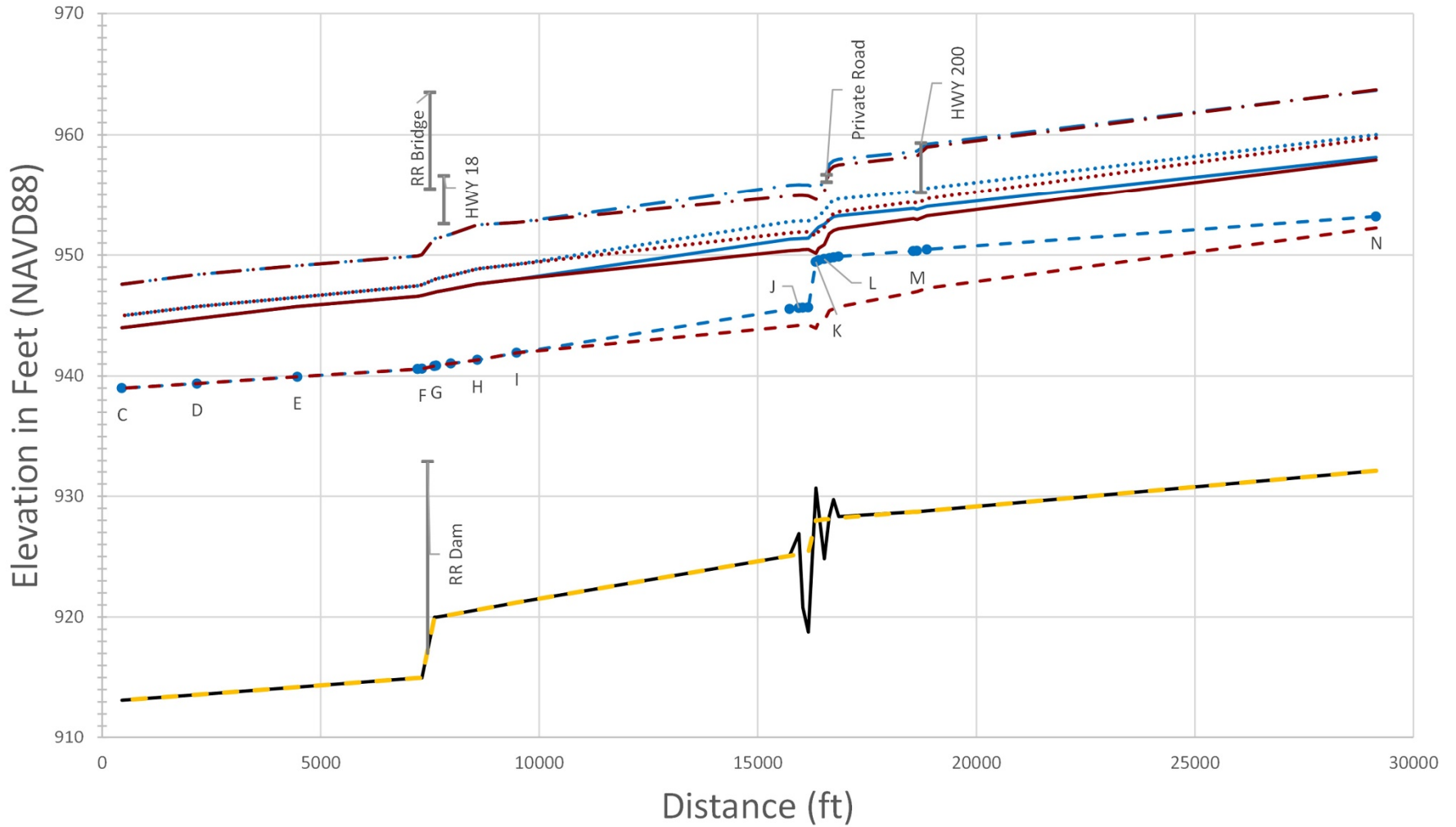
WSE Modified FIS VS Corrected Existing Conditions



- Corrected Ex Model Channel Btm Elev
- Modified FIS Model Channel Btm Elev
- 50YR Corrected Existing Conditions
- 50YR Modified FIS
- 10YR Corrected Existing Conditions
- 10YR Modified FIS
- 100YR Corrected Existing Conditions
- 100YR Modified FIS
- 50YR Modified FIS

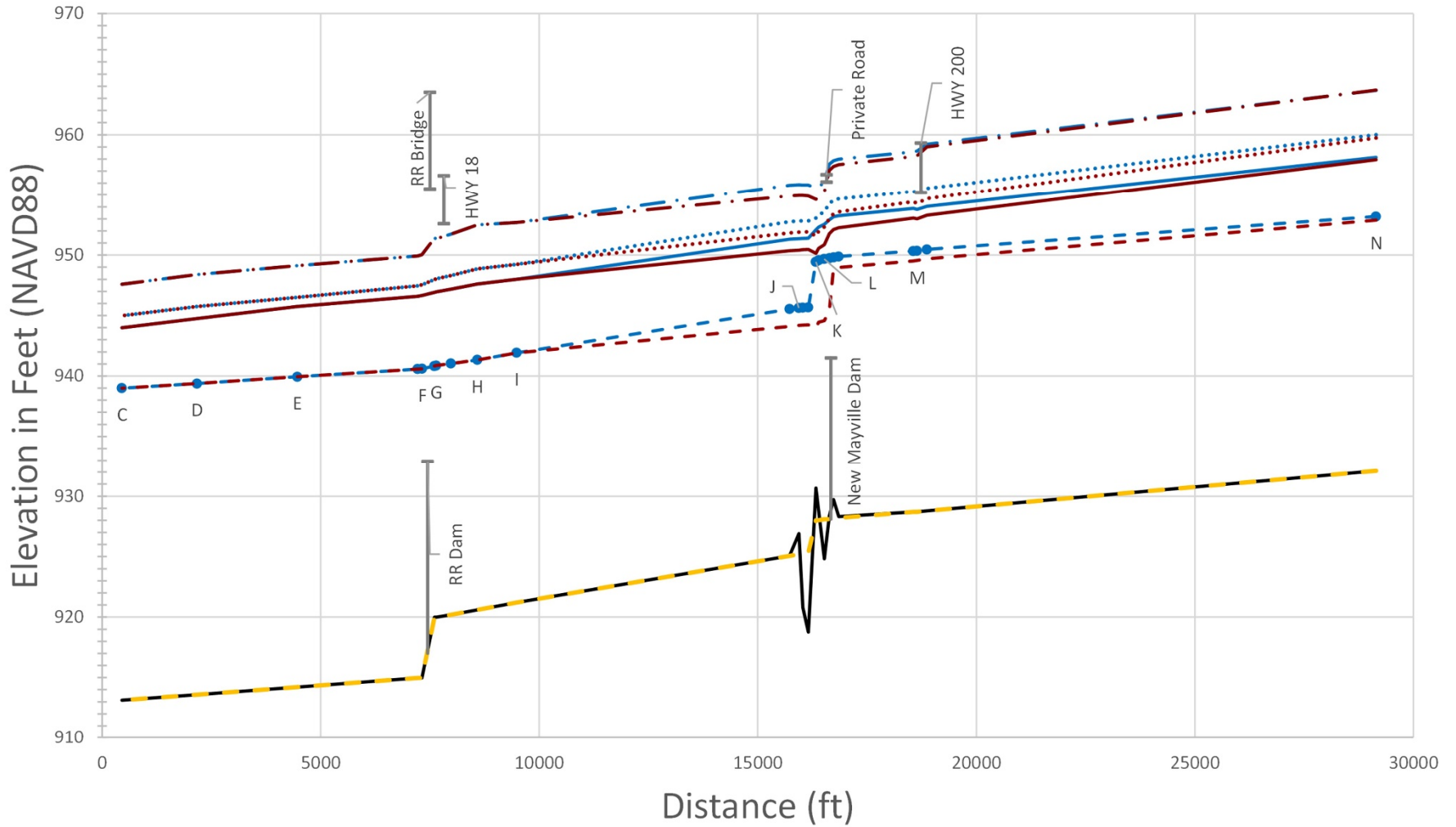
Appendix D – Comparison of Profile Plots between the Corrected Existing Condition Model and the Alternatives

WSE Corrected Existing Conditions VS Alt 1 - Remove Dam



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|---|--|--|
| <ul style="list-style-type: none"> — Corrected Ex Model Channel Btm Elev — 50YR Corrected Existing Conditions — 50YR Alt 1 - Remove Dam — 10YR Alt 1 - Remove Dam | <ul style="list-style-type: none"> - - - 50YR Corrected Existing Conditions - - - 10YR Corrected Existing Conditions 100YR Alt 1 - Remove Dam | <ul style="list-style-type: none"> 100YR Corrected Existing Conditions - - - Alt 1 Model Channel Btm Elev 50YR Alt 1 - Remove Dam |
|---|--|--|

WSE Corrected Existing Conditions VS Alt 2 - Move Dam



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| <ul style="list-style-type: none"> — Corrected Ex Model Channel Btm Elev — 50YR Corrected Existing Conditions — 50YR Alt 2 - Move Dam — 10YR Alt 2 - Move Dam | <ul style="list-style-type: none"> — 50YR Corrected Existing Conditions — 10YR Corrected Existing Conditions — 100YR Alt 2 - Move Dam — New Mayville Dam | <ul style="list-style-type: none"> — 100YR Corrected Existing Conditions — Alt 2 Model Channel Btm Elev — 100YR Alt 2 - Move Dam — 50YR Alt 2 - Move Dam |
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Appendix E – Detailed Cost Estimates

Mayville Dam #2 Hydraulic Report
Mayville, ND
Alternate 1 - Remove Dam
4/28/2023

Engineer's Preliminary Opinion of Cost

<i>BID ITEM NO. & DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>TOTAL</i>	<i>FEMA/NDDDES (85%)</i>	<i>Local (15%)</i>
<u>Base Bid</u>						
General						
					\$0.00	\$0.00
1. Mobilization	LS	1	\$40,000.00	\$40,000.00	\$34,000.00	\$6,000.00
2. Clearing and Grubbing	LS	1	\$10,000.00	\$10,000.00	\$8,500.00	\$1,500.00
3. Temporary Erosion Control	LS	1	\$20,000.00	\$20,000.00	\$17,000.00	\$3,000.00
4. Strip and Stockpile Topsoil	CY	230	\$10.00	\$2,300.00	\$1,955.00	\$345.00
5. Dewatering / Control of Water	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
6. Storm Water Management	LS	1	\$30,000.00	\$30,000.00	\$25,500.00	\$4,500.00
Removals						
7. Remove Existing Dam	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Construction						
8. Regrade Channel Bottom	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
9. Embankment Import	CY	14,000	\$20.00	\$280,000.00	\$238,000.00	\$42,000.00
10. Seeding	ACRE	2	\$1,500.00	\$3,000.00	\$2,550.00	\$450.00
11. Erosion Control Blanket	SY	9,680	\$6.00	\$58,080.00	\$49,368.00	\$8,712.00
12. Remove and Salvage Existing Riprap	CY	1,190	\$40.00	\$47,600.00	\$40,460.00	\$7,140.00
13. Riprap Import	CY	300	\$75.00	\$22,500.00	\$19,125.00	\$3,375.00
			Construction Subtotal	\$688,480.00	\$585,208.00	\$103,272.00
			Contingencies (30%)	\$206,544.00	\$175,562.40	\$30,981.60
			Design & Construction Engineering (20%)	\$134,976.00	\$114,729.60	\$20,246.40
			TOTAL PROJECT COST	\$1,030,000.00	\$875,500.00	\$154,500.00

Mayville Dam #2 Hydraulic Report
Mayville, ND
Alternate 2 Scenario 1 - Rock Wedge
4/28/2023

Engineer's Preliminary Opinion of Cost

BID ITEM NO. & DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL	FEMA/NDDDES (85%)	Local (15%)
Base Bid						
General						
					\$0.00	\$0.00
1. Mobilization	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
2. Clearing and Grubbing	LS	1	\$10,000.00	\$10,000.00	\$8,500.00	\$1,500.00
3. Temporary Erosion Control	LS	1	\$20,000.00	\$20,000.00	\$17,000.00	\$3,000.00
4. Strip and Stockpile Topsoil	CY	280	\$10.00	\$2,800.00	\$2,380.00	\$420.00
5. Dewatering / Control of Water	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
6. Storm Water Management	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
Removals						
7. Remove Existing Dam	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Construction						
8. Regrade Channel Bottom	LS	1	\$200,000.00	\$200,000.00	\$170,000.00	\$30,000.00
9. Embankment Import	CY	14,000	\$20.00	\$280,000.00	\$238,000.00	\$42,000.00
10. Place Topsoil	CY	3,227	\$4.00	\$12,908.00	\$10,971.80	\$1,936.20
11. Seeding	ACRE	4	\$1,500.00	\$6,000.00	\$5,100.00	\$900.00
12. Erosion Control Blanket	SY	19,360	\$6.00	\$116,160.00	\$98,736.00	\$17,424.00
13. Install New Sheet Pile Dam	LS	1	\$300,000.00	\$300,000.00	\$255,000.00	\$45,000.00
14. Install Wedge Dam Over Sheet Piles	LS	1	\$40,000.00	\$40,000.00	\$34,000.00	\$6,000.00
15. Remove and Salvage Existing Riprap	CY	1,190	\$40.00	\$47,600.00	\$40,460.00	\$7,140.00
16. Riprap Import	CY	3,760	\$75.00	\$282,000.00	\$239,700.00	\$42,300.00
Construction Subtotal				\$1,567,468.00	\$1,332,347.80	\$235,120.20
Contingencies (30%)				\$470,240.40	\$399,704.34	\$70,536.06
Design & Construction Engineering (20%)				\$312,291.60	\$265,447.86	\$46,843.74
TOTAL PROJECT COST				\$2,350,000.00	\$1,997,500.00	\$352,500.00

**Mayville Dam #2 Hydraulic Report
Mayville, ND
Alternate 2 Scenario 2 - Rock Riffles
4/28/2023**

Engineer's Preliminary Opinion of Cost

<i>BID ITEM NO. & DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>TOTAL</i>	<i>FEMA/NDES (85%)</i>	<i>Local (15%)</i>
Base Bid						
General						
1. Mobilization	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
2. Clearing and Grubbing	LS	1	\$10,000.00	\$10,000.00	\$8,500.00	\$1,500.00
3. Temporary Erosion Control	LS	1	\$20,000.00	\$20,000.00	\$17,000.00	\$3,000.00
4. Strip and Stockpile Topsoil	CY	278	\$10.00	\$2,780.00	\$2,363.00	\$417.00
5. Dewatering / Control of Water	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
6. Storm Water Management	LS	1	\$50,000.00	\$50,000.00	\$42,500.00	\$7,500.00
Removals						
7. Remove Existing Dam	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Construction						
8. Regrade Channel Bottom	LS	1	\$200,000.00	\$200,000.00	\$170,000.00	\$30,000.00
9. Embankment Import	CY	14,000	\$20.00	\$280,000.00	\$238,000.00	\$42,000.00
10. Place Topsoil	CY	3,227	\$4.00	\$12,908.00	\$10,971.80	\$1,936.20
11. Seeding	ACRE	4	\$1,500.00	\$6,000.00	\$5,100.00	\$900.00
12. Erosion Control Blanket	SY	19,360	\$6.00	\$116,160.00	\$98,736.00	\$17,424.00
13. Install New Sheet Pile Dam	LS	1	\$300,000.00	\$300,000.00	\$255,000.00	\$45,000.00
14. 3'-5' Boulders	EA	125	\$600.00	\$75,000.00	\$63,750.00	\$11,250.00
15. 30" USACE Riprap	CY	463	\$75.00	\$34,725.00	\$29,516.25	\$5,208.75
16. Class II Riprap	CY	148	\$75.00	\$11,100.00	\$9,435.00	\$1,665.00
17. Class IV Riprap	CY	889	\$75.00	\$66,675.00	\$56,673.75	\$10,001.25
18. Riprap Filter Blanket	SY	2,111	\$5.00	\$10,555.00	\$8,971.75	\$1,583.25
19. Granual Filter USACE Type B2 (9" Nominal Thickness)	CY	185	\$75.00	\$13,875.00	\$11,793.75	\$2,081.25
20. Granual Filter USACE Type B2 (12" Nominal Thickness)	CY	389	\$75.00	\$29,175.00	\$24,798.75	\$4,376.25
21. Cobble Rock	TON	24	\$55.00	\$1,320.00	\$1,122.00	\$198.00
22. Chinking Rock	TON	24	\$50.00	\$1,200.00	\$1,020.00	\$180.00
23. Install Wedge Dam Over Sheet Piles	LS	1	\$40,000.00	\$40,000.00	\$34,000.00	\$6,000.00
24. Remove and Salvage Existing Riprap	CY	1,190	\$40.00	\$47,600.00	\$40,460.00	\$7,140.00
25. Riprap Import	CY	6,730	\$75.00	\$504,750.00	\$429,037.50	\$75,712.50
			Construction Subtotal	\$2,033,823.00	\$1,728,749.55	\$305,073.45
			Contingencies (30%)	\$610,146.90	\$518,624.87	\$91,522.04
			Design & Construction Engineering (20%)	\$406,030.10	\$345,125.59	\$60,904.52
			TOTAL PROJECT COST	\$3,050,000.00	\$2,592,500.00	\$457,500.00

Mayville Dam #2 Hydraulic Report
Mayville, ND
Alternate 2 Scenario 3 - Concrete Step Dam
4/28/2023

Engineer's Preliminary Opinion of Cost

<i>BID ITEM NO. & DESCRIPTION</i>	<i>UNIT</i>	<i>QUANTITY</i>	<i>UNIT PRICE</i>	<i>TOTAL</i>	<i>FEMA/NDEDES (85%)</i>	<i>Local (15%)</i>
<u>Base Bid</u>						
General						
1. Mobilization	LS	1	\$100,000.00	\$100,000.00	\$85,000.00	\$15,000.00
2. Clearing and Grubbing	LS	1	\$10,000.00	\$10,000.00	\$8,500.00	\$1,500.00
3. Temporary Erosion Control	LS	1	\$20,000.00	\$20,000.00	\$17,000.00	\$3,000.00
4. Strip and Stockpile Topsoil	CY	280	\$10.00	\$2,800.00	\$2,380.00	\$420.00
5. Dewatering / Control of Water	LS	1	\$150,000.00	\$150,000.00	\$127,500.00	\$22,500.00
6. Storm Water Management	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Removals						
7. Remove Existing Dam	LS	1	\$75,000.00	\$75,000.00	\$63,750.00	\$11,250.00
Construction						
8. Regrade Channel Bottom	LS	1	\$200,000.00	\$200,000.00	\$170,000.00	\$30,000.00
9. Embankment Import	CY	14,000	\$20.00	\$280,000.00	\$238,000.00	\$42,000.00
10. Place Topsoil	CY	3,227	\$4.00	\$12,908.00	\$10,971.80	\$1,936.20
11. Seeding	ACRE	4	\$1,500.00	\$6,000.00	\$5,100.00	\$900.00
12. Erosion Control Blanket	SY	19,360	\$6.00	\$116,160.00	\$98,736.00	\$17,424.00
13. Install New Concrete Step Dam	CY	1,050	\$1,250.00	\$1,312,500.00	\$1,115,625.00	\$196,875.00
14. Remove and Salvage Existing Riprap	CY	1,190	\$40.00	\$47,600.00	\$40,460.00	\$7,140.00
15. Riprap Import	CY	2,520	\$75.00	\$189,000.00	\$160,650.00	\$28,350.00
			Construction Subtotal	\$2,596,968.00	\$2,207,422.80	\$389,545.20
			Contingencies (30%)	\$779,090.40	\$662,226.84	\$116,863.56
			Design & Construction Engineering (20%)	\$523,941.60	\$445,350.36	\$78,591.24
			TOTAL PROJECT COST	\$3,900,000.00	\$3,315,000.00	\$585,000.00