

WATER PERMIT NO. FC39-3

Name of Applicant: **Upper Minnesota River Watershed District**

Address: **211 2nd Street SE, Ortonville MN 56278** Phone: **320-839-3411**

Amount of Water Claimed: **N/A** Total Acres: **N/A**

Source of Water Supply: **Whetstone River/Big Stone Lake**

Water to be used for: **Flood Control Project** County: **Grant**

Type of Waste Disposal System:

Location: **Southeast city limits of Big Stone City**

PRIORITY Date Received: **02-17-26**

Application/License Fee: **\$700.00**

Corrected Application Received: **02-19-26**

Period of Annual Use: **January 1 – December 31**

Remarks:

Diversion Point: **NW 1/4 SE 1/4 Sec 17-T121N-
R46W**

Land to be Irrigated: **N/A**

Depth of Well:

Well Driller:

Remarks:

Type of Map: **aerial**

			17		
			✕		

Reviewed and the Number Assigned on: **02-23-26**

By: **Rachel Rodriguez**

Notice of Hearing - date to intervene: _____

SOUTH DAKOTA FLOOD CONTROL PERMIT NO. FC39-3

Date of first receipt of application February 17, 2026.

Date of return to applicant for corrections, amendments or changes February 17, 2026.

Date of receipt of corrected application February 19, 2026.

The Chief Engineer, on behalf of the Water Management Board, issues Flood Control Permit No. FC39-3 to Upper Minnesota River Watershed District, 211 2nd Street SE, Ortonville MN 56278, subject to the following limitations, conditions and qualifications:

1. Floor Control Permit No. FC39-3 for the Whetstone River Restoration Project (Preferred Alternative 2B). This project involves restoring ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning in the NE 1/4 SE 1/4 Section 17-T121N-R46W and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930's, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake. Diverting flows back to the historical river channel will be accomplished by constructing a weir (crest elevation approximately 972.2 feet mean sea level [NAVD 88]) on the bypass channel in the NE1/4 SE1/4 Section 17-T121N-R46W. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and Minnesota River via the existing bypass channel. This project will reduce flooding around Big Stone Lake by reducing flood flows entering the lake with downstream measures implemented, including levee construction and road enhancements/reconfiguration, to mitigate flooding risks to downstream property. Project works are located along the southeastern edge of Big Stone City, South Dakota, in the SE1/4 Section 17-T121N-R46W and into Minnesota.
2. This project will reduce flooding around Big Stone Lake and mitigate flooding risks to downstream property.
3. The date of approval of Flood Control Permit No. FC39-3 is July 6, 2026.
5. All construction is to be completed on or before July 6, 2031.

QUALIFICATIONS

- 1) Flood Control Permit No. FC39-3 is subject to securing easements or acquisitions of any areas where construction activities are occurring or lands that may be flooded by development of this permit. Any easements must be filed with the Water Rights Program prior to development of the project.
- 2) The Water Management Board retains jurisdiction of Flood Control Permit No. FC39-3 in the event additional information shows this project causes an increase in the severity of flood damage in areas other than the project area.
- 3) The permit holder is responsible for operation and maintenance of the flood control works.
- 4) Senior water right holders, who in compliance with the laws of the State of South Dakota acquired a right to use water, may not be unlawfully impaired by this flood control permit.

(continued)

- 5) Operation of the flood control structures may not impair management of Big Stone Lake by the U.S. Army Corps of Engineers.
- 6) Final plans and specifications must be submitted to and approved by the Water Rights Program, prior to licensing of this permit.
- 7) Final plans and specifications for this project may not substantively change project design parameters as analyzed for this recommendation. Any changes in the finalized plans and specifications that may substantively change the design parameters as analyzed may require an amendment to this permit or a new application.

WATER MANAGEMENT BOARD

By: Adam Mathiowetz
Adam Mathiowetz, PE
Chief Engineer
Water Rights Program
Department of Agriculture and Natural Resources

9/3/26
date



FORM 2: Application for flood control permit

(type or print)

Mail to: DENR - Water Rights 523 E Capitol Ave Pierre, SD 57501-3182 ph. (605) 773-3352	No. <u>FC39-3</u>	(office use only) Hydrologic Unit <u>07020001</u>
	Basin <u>Upper Minnesota</u>	
	Newspaper <u>Milbank/Grant County Review</u>	
	<u>Watertown Public Opinion</u>	

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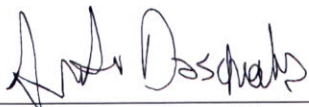
FEB 17 2026

Water Rights
Program**Application For Flood Control Permit Within The State Of South Dakota**

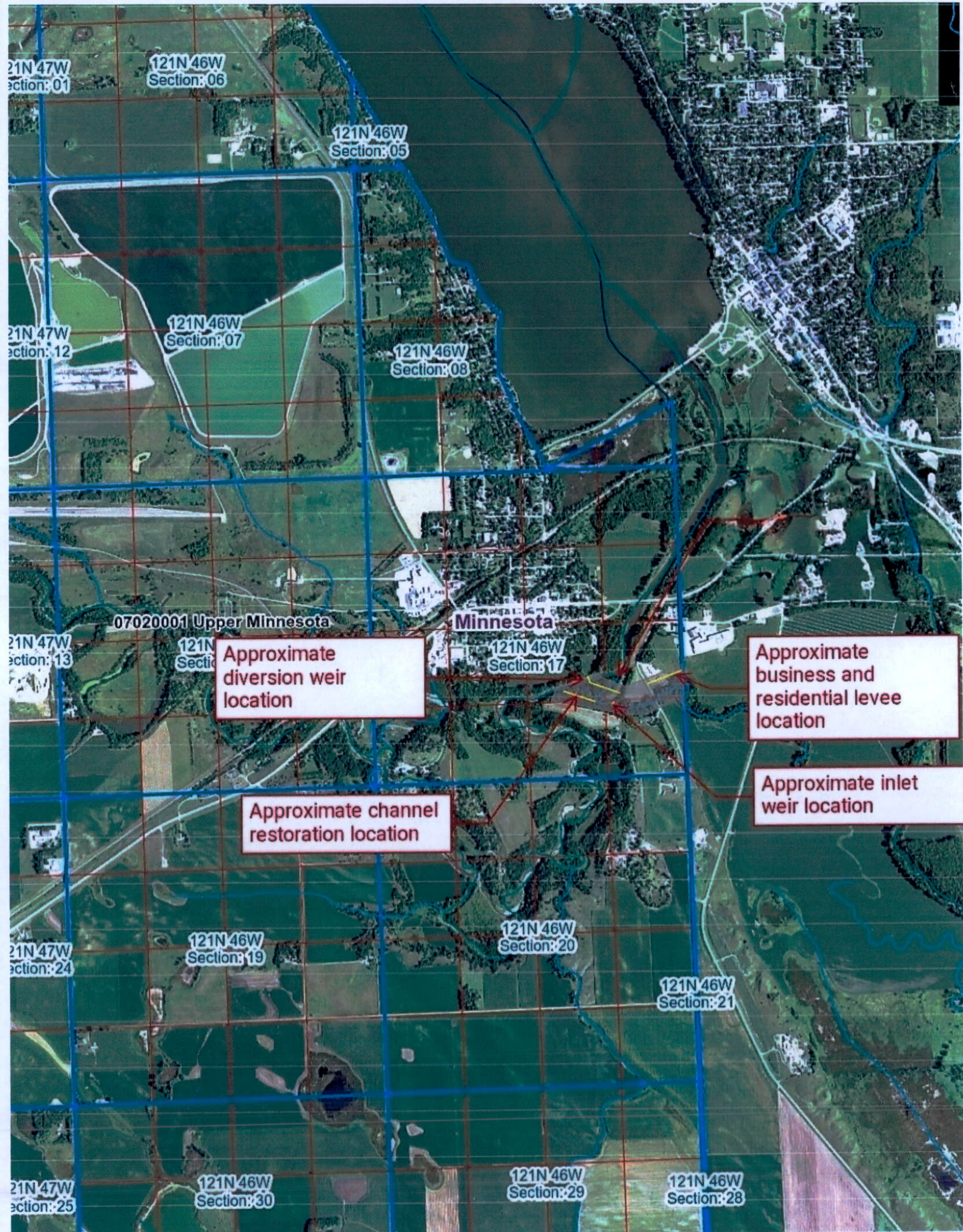
1. Name of Applicant Upper Minnesota River Watershed District Phone 320-839-3411
- Mailing Address 211 2nd St SE Ortonville MN 56278
(Address) (City) (State) (Zip Code)
2. Name of watercourse Whetstone River
3. Location of project SE 1/4 Sec 17, T121N, R46W
(example - SW1/4 NE1/4 section 12-T104N-R53W)

4. County or counties where project is located Grant County SD and Big Stone County MN
5. Give a brief description of the proposed project including the type of project (Dam, Dikes, Channel Modifications, etc.) and purpose for the project. When available include any preliminary engineering reports or other information that will help explain the project. (Attach sheet if more space is needed.)

See Narrative Memorandum Dated 2-4-2026

I,  Amber Doschadis Administrator/ Director, the applicant, certify under
Name of Person Title (if applicable)

penalty of perjury that I have read this application, examined the attached map, and that the matters stated are true. I further certify, if acting on behalf of an entity or individual other than myself, that I am authorized to submit this application.



121N 47W
Section: 01

121N 46W
Section: 06

121N 46W
Section: 05

121N 47W
Section: 12

121N 46W
Section: 07

121N 46W
Section: 08

121N 47W
Section: 13

121N
Section: 14

07020001 Upper Minnesota

Minnesota

121N 46W
Section: 17

Approximate
diversion weir
location

Approximate
business and
residential levee
location

Approximate channel
restoration location

Approximate inlet
weir location

121N 47W
Section: 24

121N 46W
Section: 19

121N 46W
Section: 20

121N 46W
Section: 21

121N 47W
Section: 25

121N 46W
Section: 30

121N 46W
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121N 46W
Section: 28



122N 47W
Section: 36

122N 46W
Section: 31

121N 47W
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07020001 Upper Minnesota

Minnesota

121N 47W
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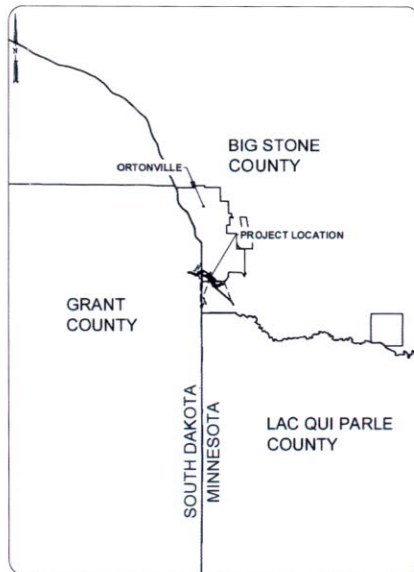
Water Rights
Program

30% PRELIMINARY DESIGN PLANS FOR UPPER MINNESOTA RIVER WATERSHED DISTRICT WHETSTONE RIVER RESTORATION

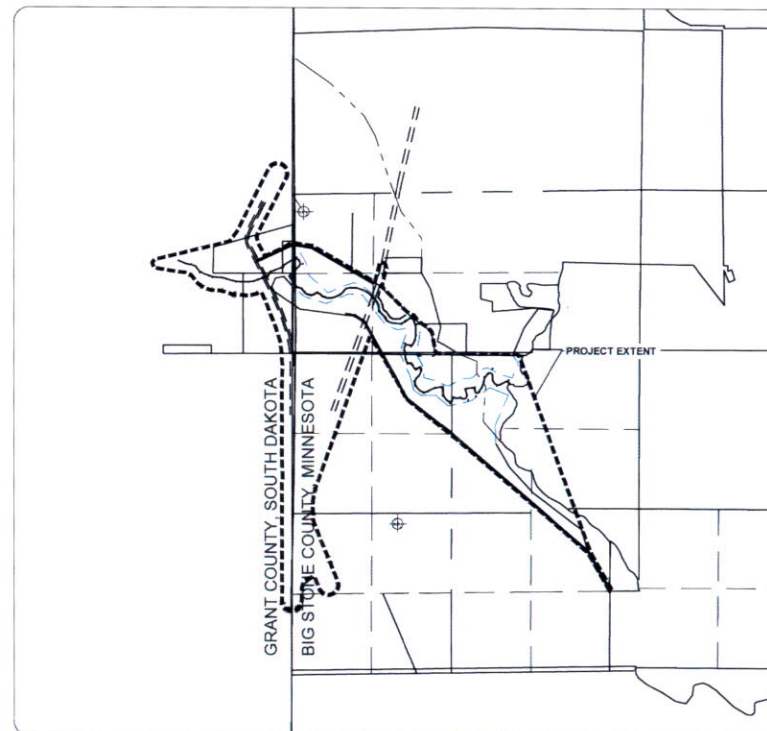
ORTONVILLE, MN
MARCH, 2021

HOUSTON
engineering, inc.

7550 MERIDIAN CIR N
SUITE 120
MAPLE GROVE, MN 55369
P: 763.493.4522
T: 1.866.319.2040
www.houstoneng.com



VICINITY MAP



LOCATION MAP

UTILITY NOTE:

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION, AS-BUILT MAPS AS PROVIDED BY MUNICIPALITIES OR UTILITY COMPANIES, AND/OR EXISTING DRAWINGS. THERE IS NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN INDICATE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. NOR IS THERE A GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES. THE CONTRACTOR AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MAY RESULT FROM THEIR FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UTILITIES.

PRELIMINARY
NOT FOR CONSTRUCTION

H:\JMS\3300\3304\3304_0022 whetstone river restoration\CAD\Draw\General\3304_Sheet Index.dwg G-2 SHEET INDEX & LEGEND 3/9/2021 10:09 AM (J.Morgan)

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S-7	SUPERSTRUCTURE DETAILS

LEGEND

	EXISTING	NEW
WELL	○	
UTILITY POLE	⊙	
W/ GUY WIRE	⊙—	
TELEPHONE RISER	⊙—	
ELECTRICAL PLUG IN	⊙	
OVERHEAD POWER	— OHP —	
UNDERGROUND ELECTRIC	— UGE —	
UNDERGROUND TELEPHONE	— UGT —	
UNDERGROUND FIBER OPTIC	— FO —	
CABLE TV	— CTV —	
GAS MAIN	— GAS —	
ROAD CENTERLINE	— R/W —	
PARCEL BOUNDARY	—	
CHANNEL BOUNDARY	—	
TREE CLEARING LIMITS	—	
WASTE COVER		
FLOODPLAIN BOUNDARY		
LEVEE BOUNDARY		
HABITAT OXBOW		
MESIC PRAIRIE VEGETATION		
FLOODPLAIN FOREST VEGETATION		
CLEAR CUT VEGETATION		
ROADSIDE VEGETATION		
RIPRAP		
BANK STABILIZATION		
IRON MONUMENT FOUND	⊙	
IRON MONUMENT SET	⊙	
CHISELED MARK ON CONCRETE	⊙	
PK NAIL	⊙	
SOIL BORING	⊙	

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNE SOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNE SOTA

SHEET INDEX & LEGEND



Whetstone Engineering Inc.
Maple Grove

P: 763.483.4522
F: 763.493.5571

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AMZ

REVIEWED BY
DDM

DATE
3-9-2021

PROJECT NUMBER
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G-2

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CONSTRUCTION NOTES:

STATEMENT OF ESTIMATED QUANTITIES

PENDING FINAL
CONSTRUCTION PLANS

CONTROL SURVEY:

NOTES:

1. COORDINATE SYSTEMS
 - 1.1. MINNESOTA DOT: BIG STONE COUNTY, US FOOT
 - 1.2. VERTICAL DATUM NAVD 88
2. MNDOT 0608T BENCHMARK USED TO VERIFY SURVEY DATA.
3. PRIOR TO ANY EXCAVATION WORK, THE CONTRACTOR IS RESPONSIBLE UNDER MINNESOTA STATE STATUTE 216D AND MINNESOTA RULES CHAPTER 7560 TO CONTACT GOPHER STATE ONE CALL FOR THE LOCATION OF UNDERGROUND UTILITY FACILITIES IN PROXIMITY TO THE EXCAVATION SITE.

No.	Revision	Date

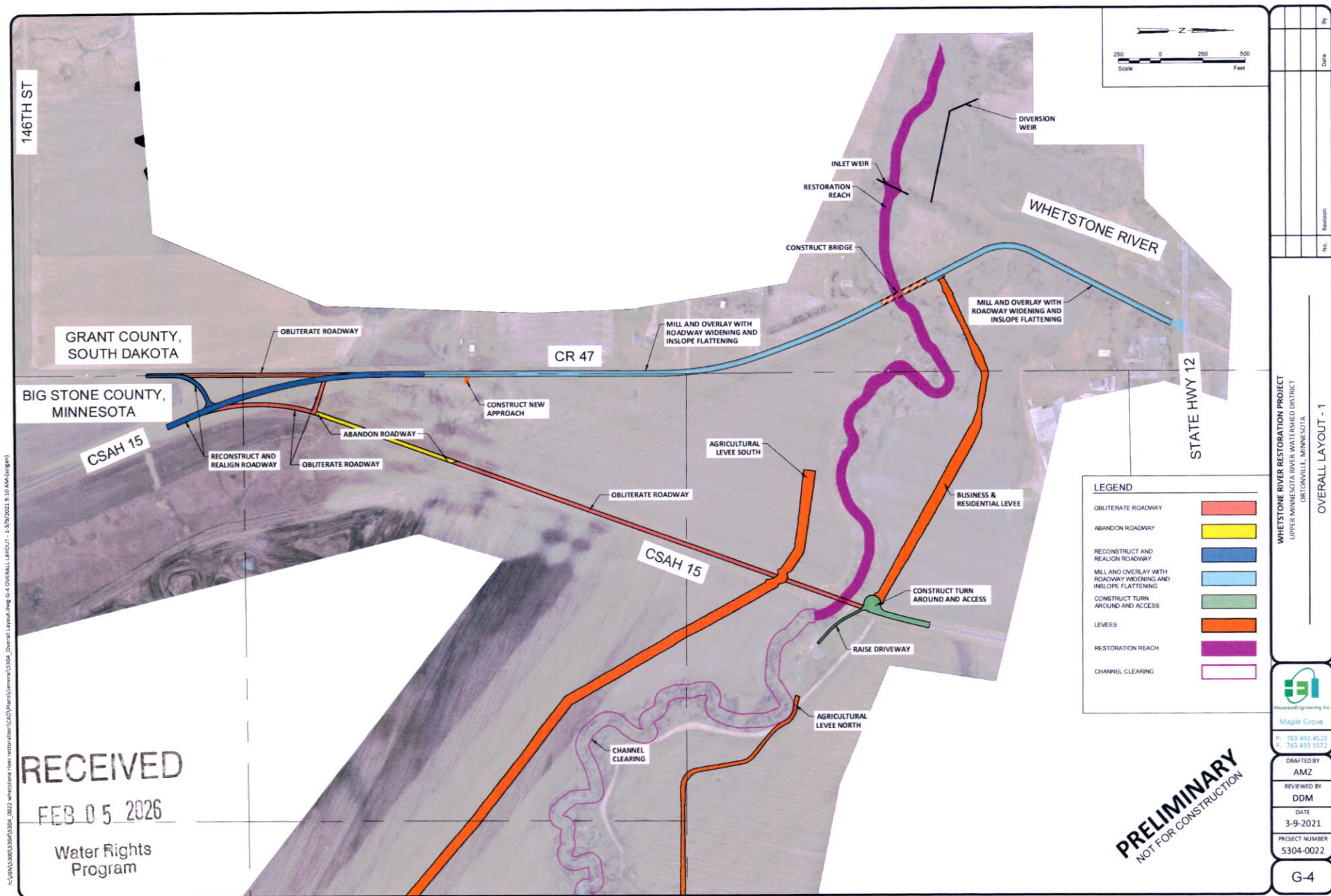
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CONST NOTES & QUANTITIES

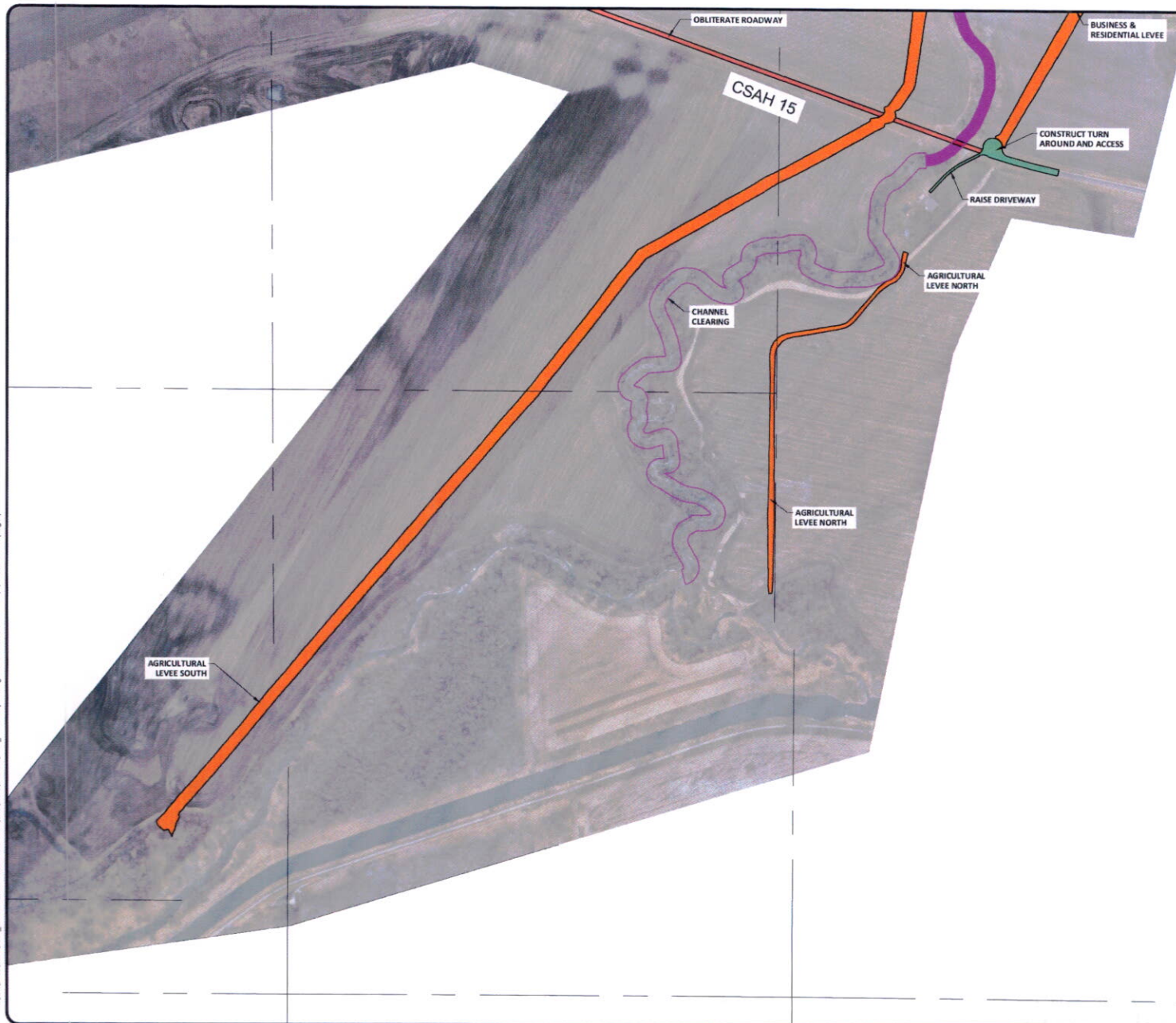


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G-3



H:\BMS\3005\3004\3004_0022\whetstone river restoration\CSAH\Plan\General\3004_Overall Layout.dwg 6-5 OVERALL LAYOUT - 3-9-2021 9:11 AM (caggs)



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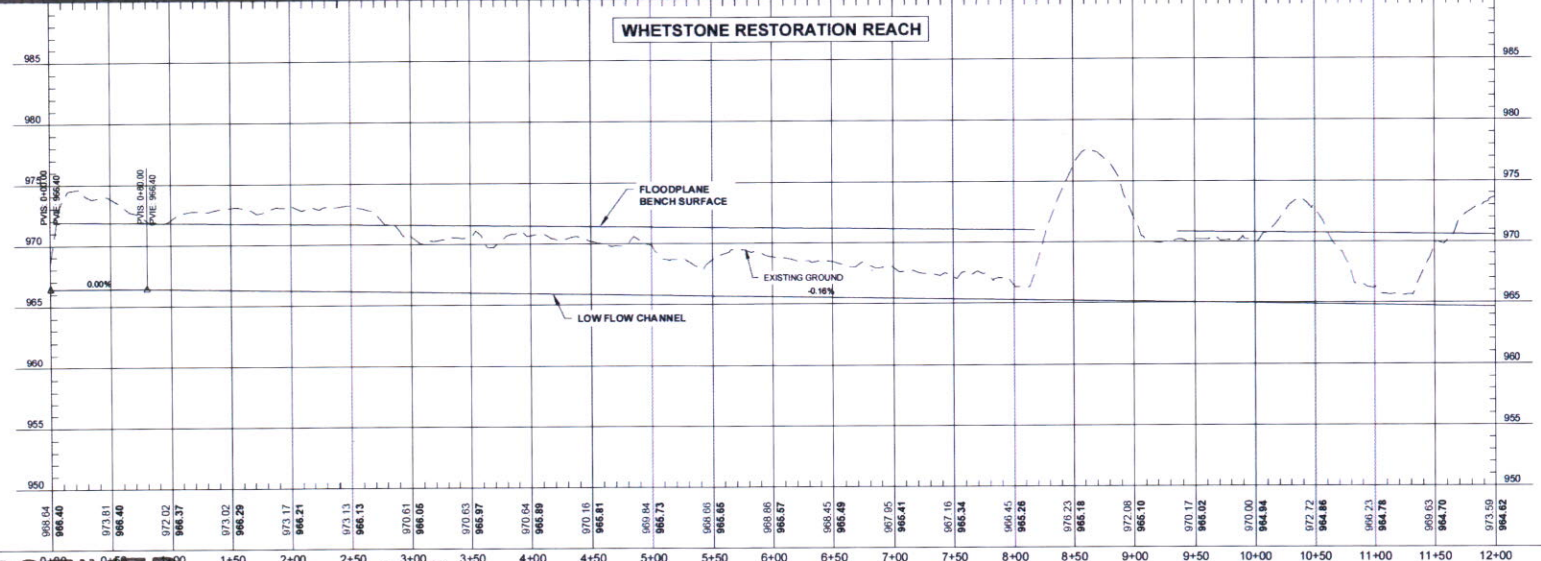
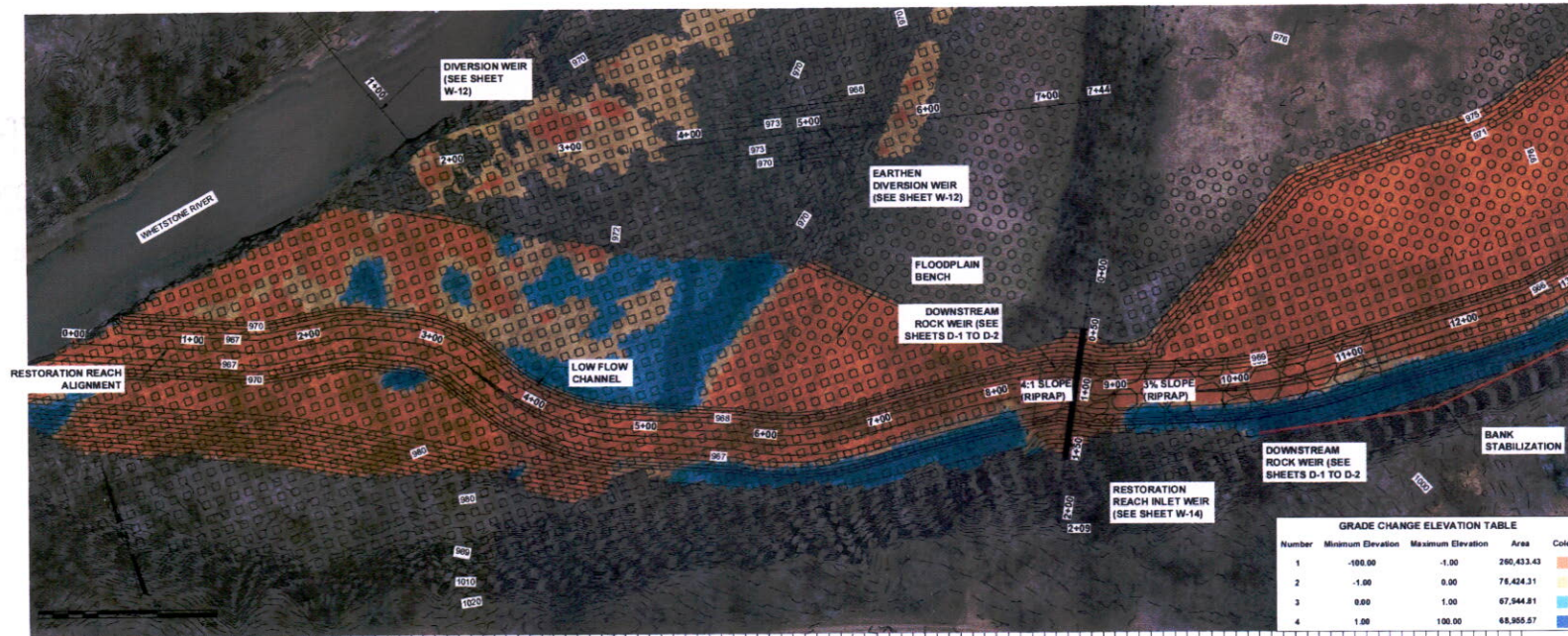
LEGEND

- OBLITERATE ROADWAY
- ABANDON ROADWAY
- RECONSTRUCT AND REALIGN ROADWAY
- MILL AND OVERLAY WITH ROADWAY WIDENING AND SLOPE FLATTENING
- CONSTRUCT TURN AROUND AND ACCESS
- LEVEES
- RESTORATION REACH
- CHANNEL CLEARING

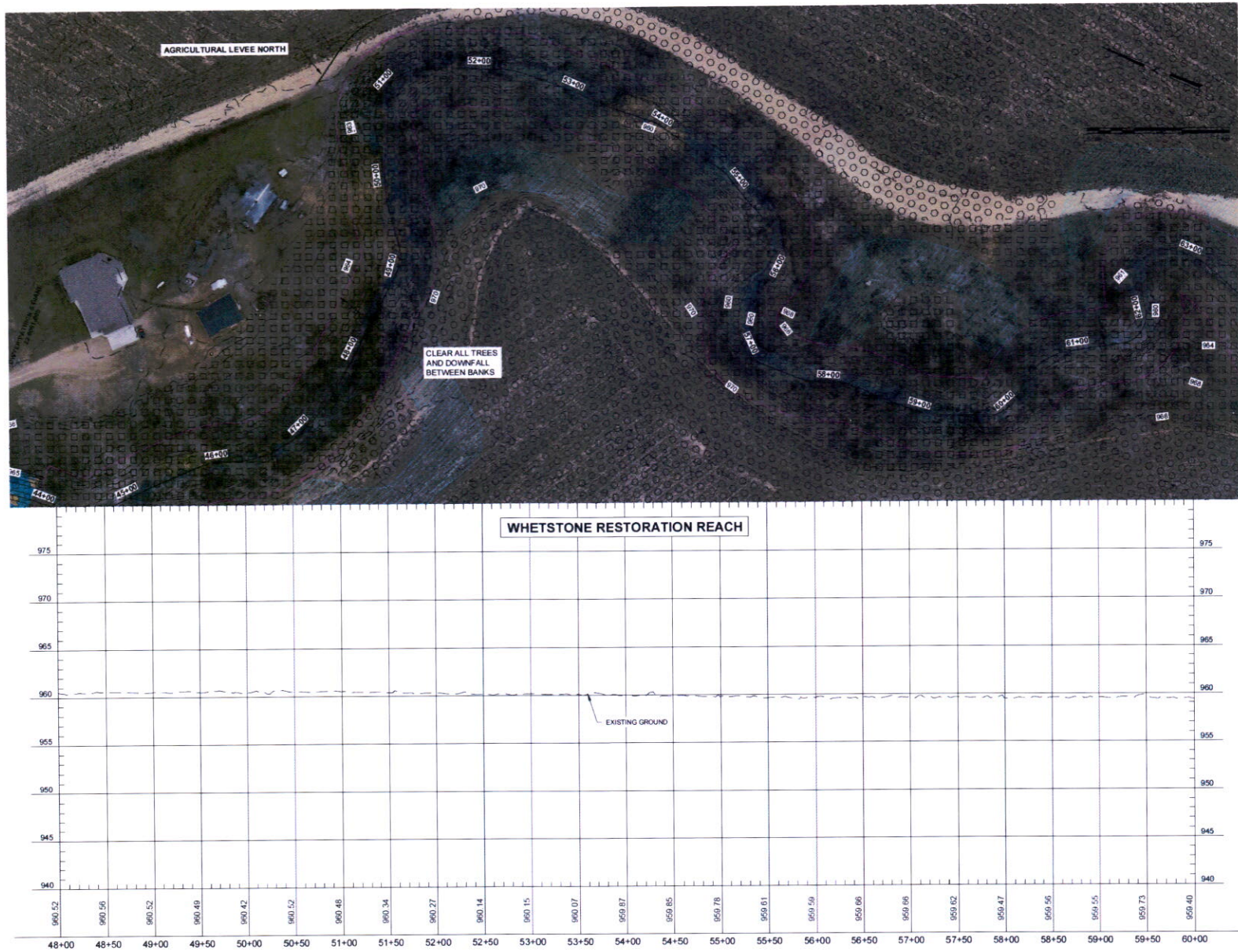
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 NOT FOR CONSTRUCTION

No.	Revision	Date							
WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT OTTOWILLE, MINNESOTA									
OVERALL LAYOUT - 2									
 Hazen Engineering Inc. Maple Grove P: 763.493.4122 F: 763.493.5572									
DRAFTED BY: AMZ REVIEWED BY: DDM DATE: 3-9-2021 PROJECT NUMBER: 5304-0022									
G-5									

\\hwy3300\3300\3300_002\whetstone_river_restoration\CAD\Plan\Water Resources\3304_Plan_Channel.dwg W-4 WHETSTONE RESTORATION REACH PLAN & PROFILE 3/7/2021 3:13 AM (zlgan)



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH PLAN & PROFILE



Houseland Engineering Inc.

Maple Grove

P: 763.493.4522

F: 763.493.5572

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DATE

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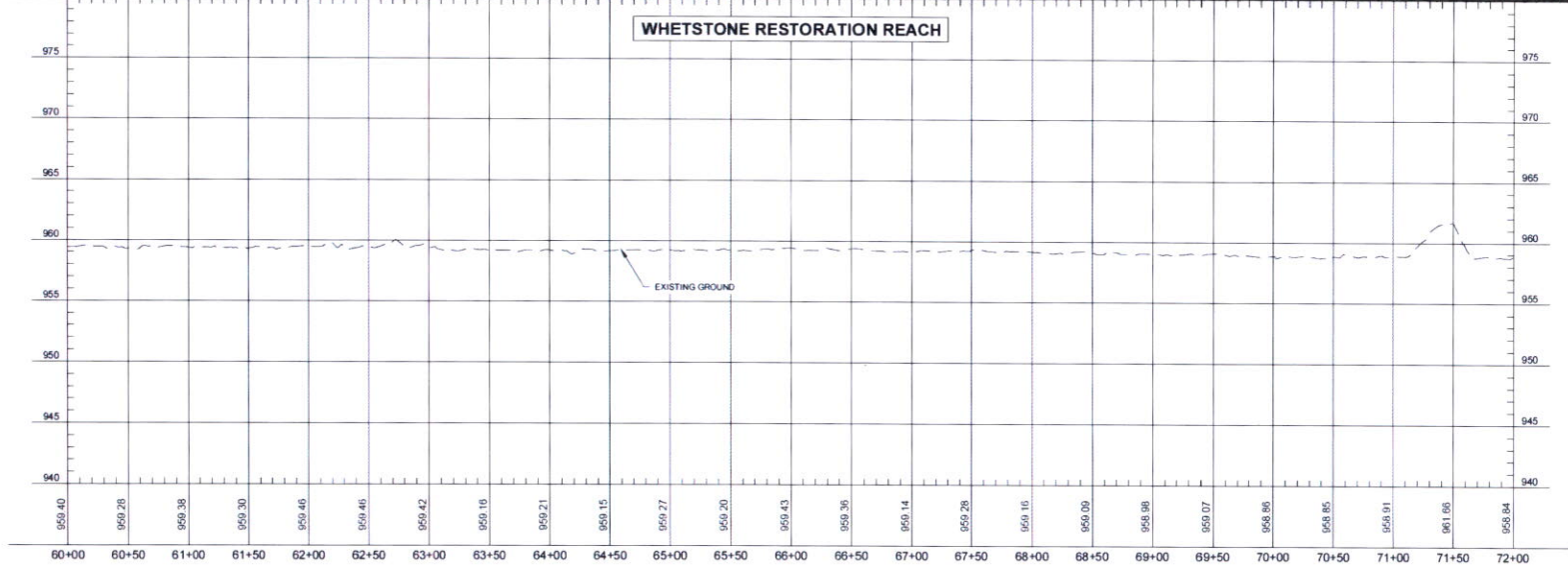
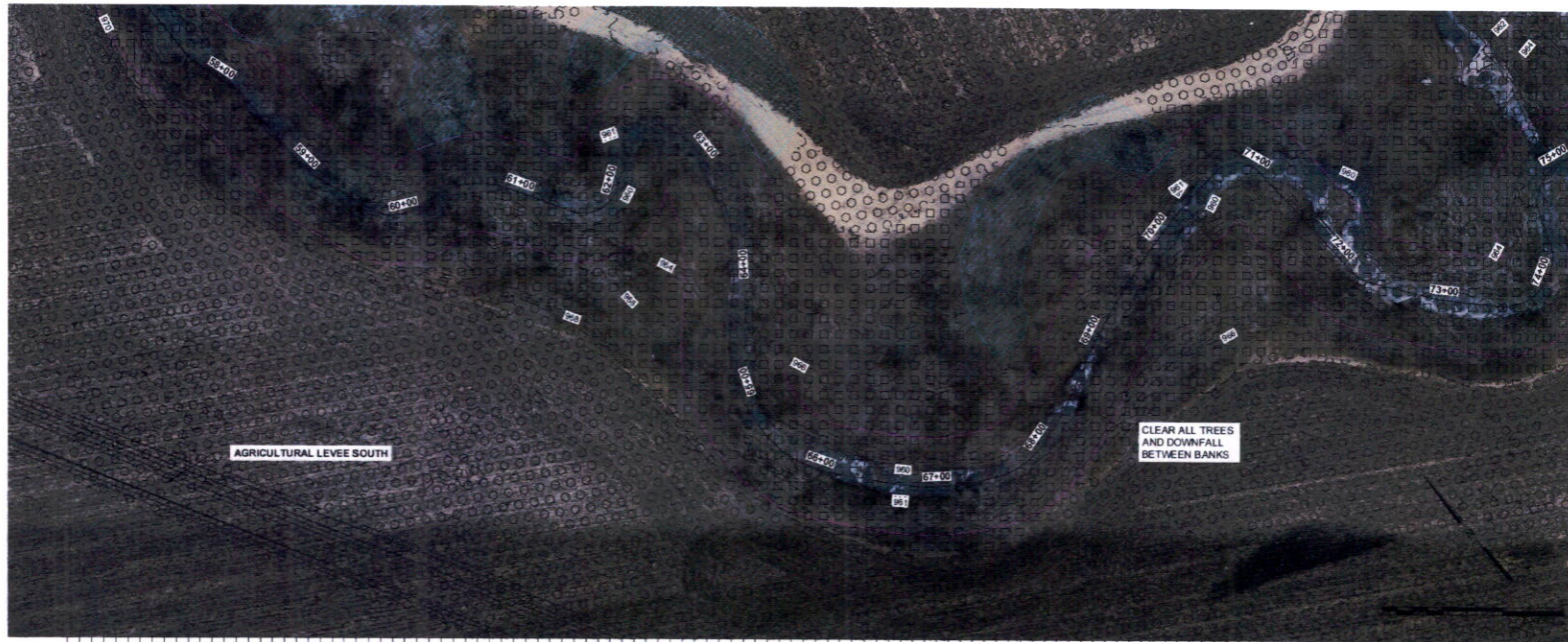
PROJECT NUMBER

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W-8

No.	Revision	Date	By

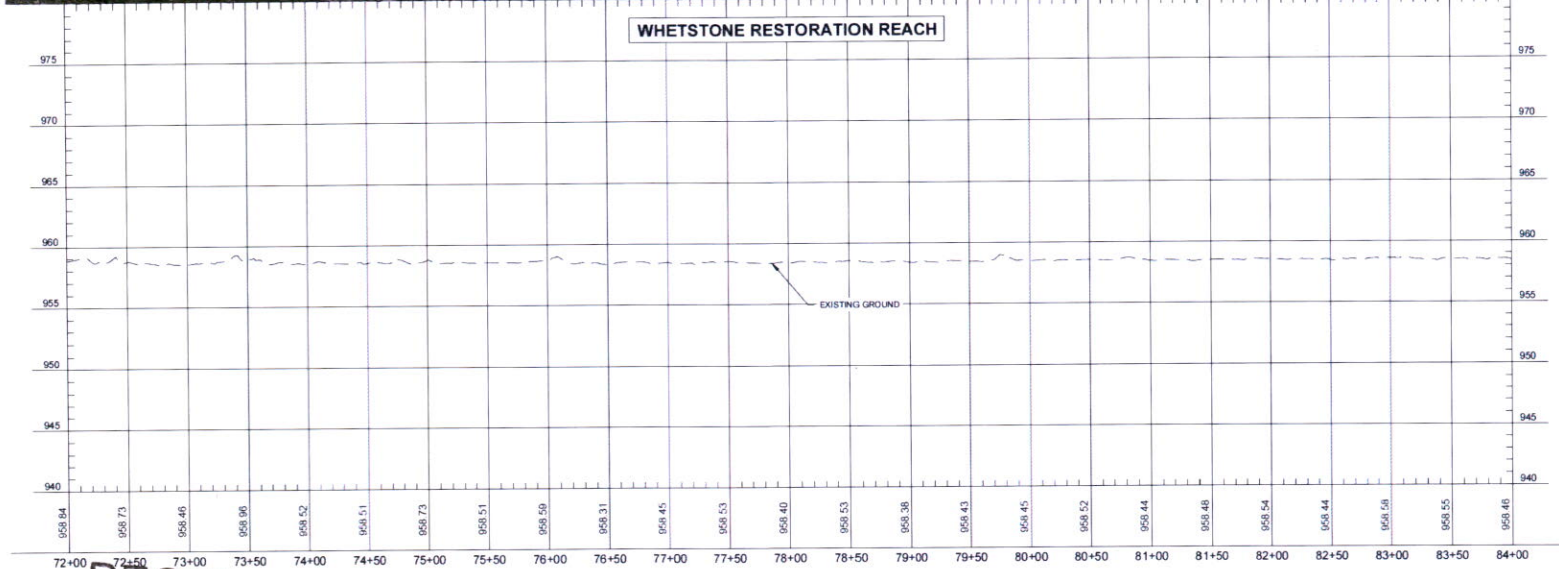
n:\jms\3304\3304_002\whetstone river restoration\3304_002_Channel.dwg W-9 WHETSTONE RESTORATION REACH PLAN & PROFILE 3/2/2021 9:18 AM (jms)



WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		No. _____ Revision _____ Date _____ By _____
WHETSTONE RESTORATION REACH PLAN & PROFILE		
 Hewlett Engineering, Inc. Maple Grove P. 763.493.4522 F. 763.493.5572		
DRAFTED BY AMZ		
REVIEWED BY DDM		
DATE 3-9-2021		
PROJECT NUMBER 5304-0022		
W-9		

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N:\VIA\3304\3304\3304_0021 whetstone river restoration\CAUV\Plan\Water Resources\3304_RMP_Channel.dwg W-10 WHETSTONE RESTORATION REACH PLAN & PROFILE 3/9/2021 9:16 AM (sagitt)



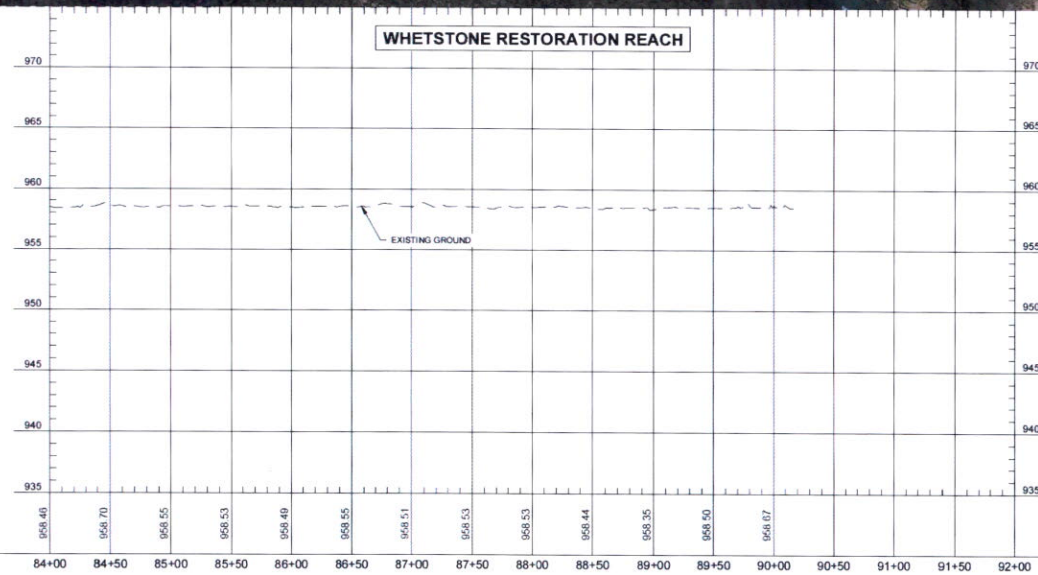
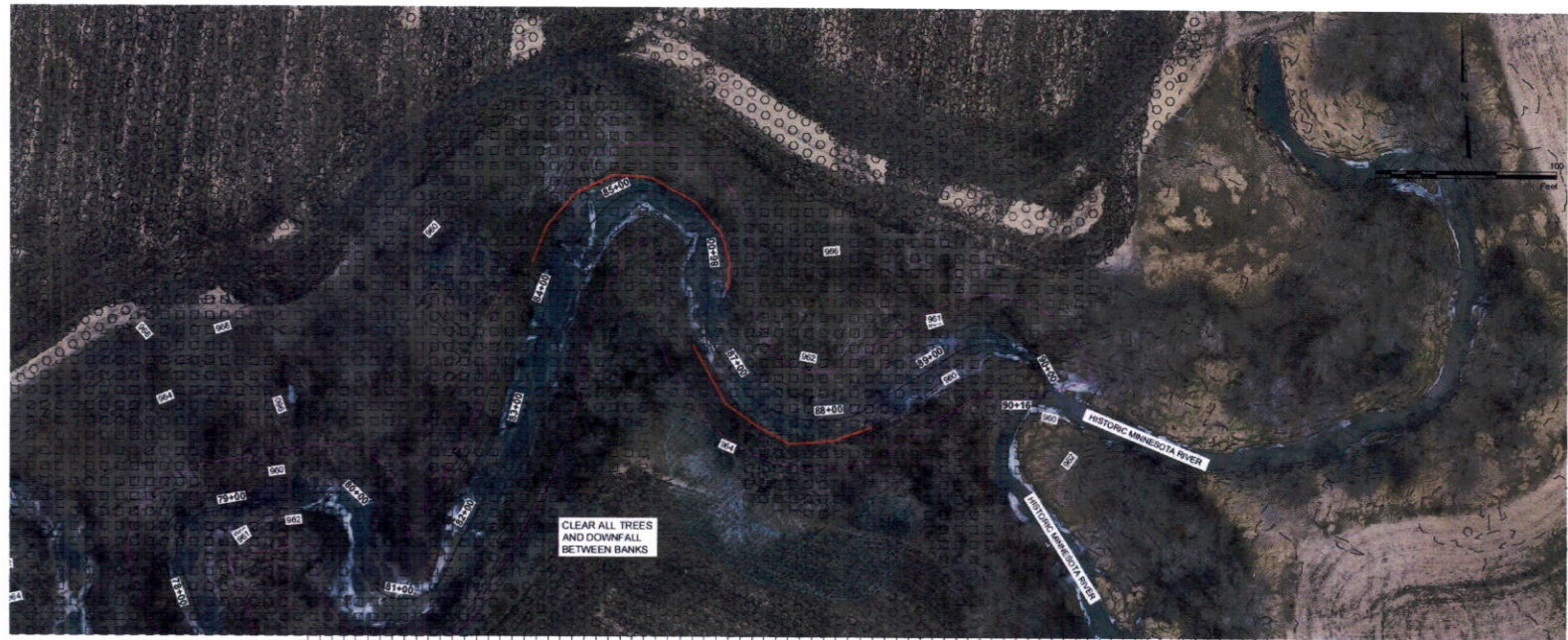
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WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		No.	Revision	Date	By
WHETSTONE RESTORATION REACH PLAN & PROFILE					
DRAFTED BY AMZ					
REVIEWED BY DDM					
DATE 3-9-2021					
PROJECT NUMBER 5304-0022					
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH PLAN & PROFILE



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PROJECT NUMBER
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W-11

I:\MS\3005\3004\0023 whetstone river restoration\3004\Plan\Water Resources\3004_Diversion Weir.dwg W-12 DIVERSION WEIR PLAN 3/7/2021 9:18 AM (jrgm)

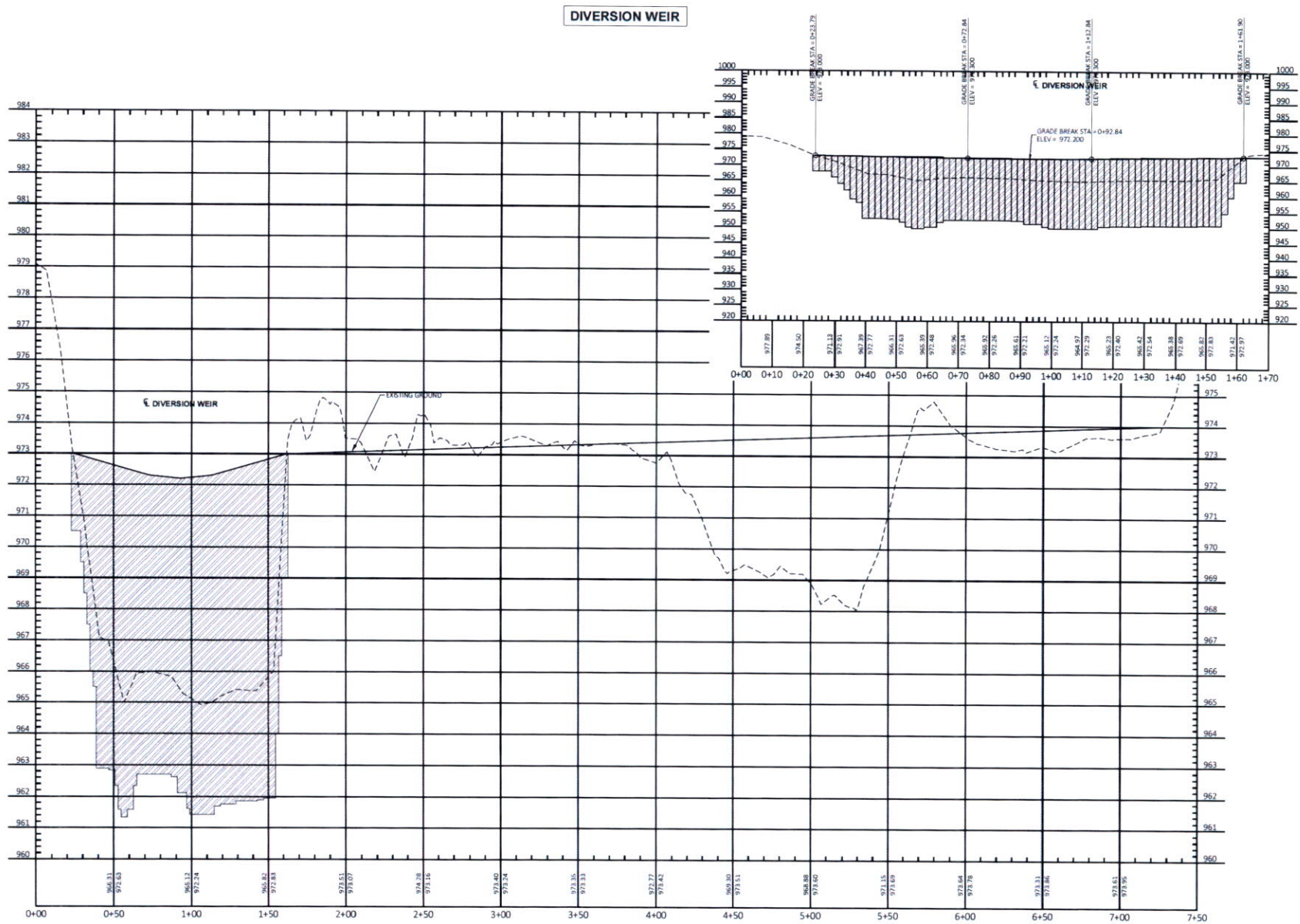


GRADE CHANGE ELEVATION TABLE				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-100.00	-1.00	2,618.07	Red
2	-1.00	0.00	20,253.13	Orange
3	0.00	1.00	4,999.81	Blue
4	1.00	100.00	5,838.11	Dark Blue

WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		No.	Revisions	Date	By
DIVERSION WEIR PLAN					
 Houston Engineering Inc. Maple Grove P: 763.493.4522 F: 763.493.5572		DRAFTED BY AMZ			
		REVIEWED BY DDM			
		DATE 3-9-2021			
		PROJECT NUMBER 5304-0022			
		W-12			

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

DIVERSION WEIR PROFILE



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3-9-2021
PROJECT NUMBER
5304-0022

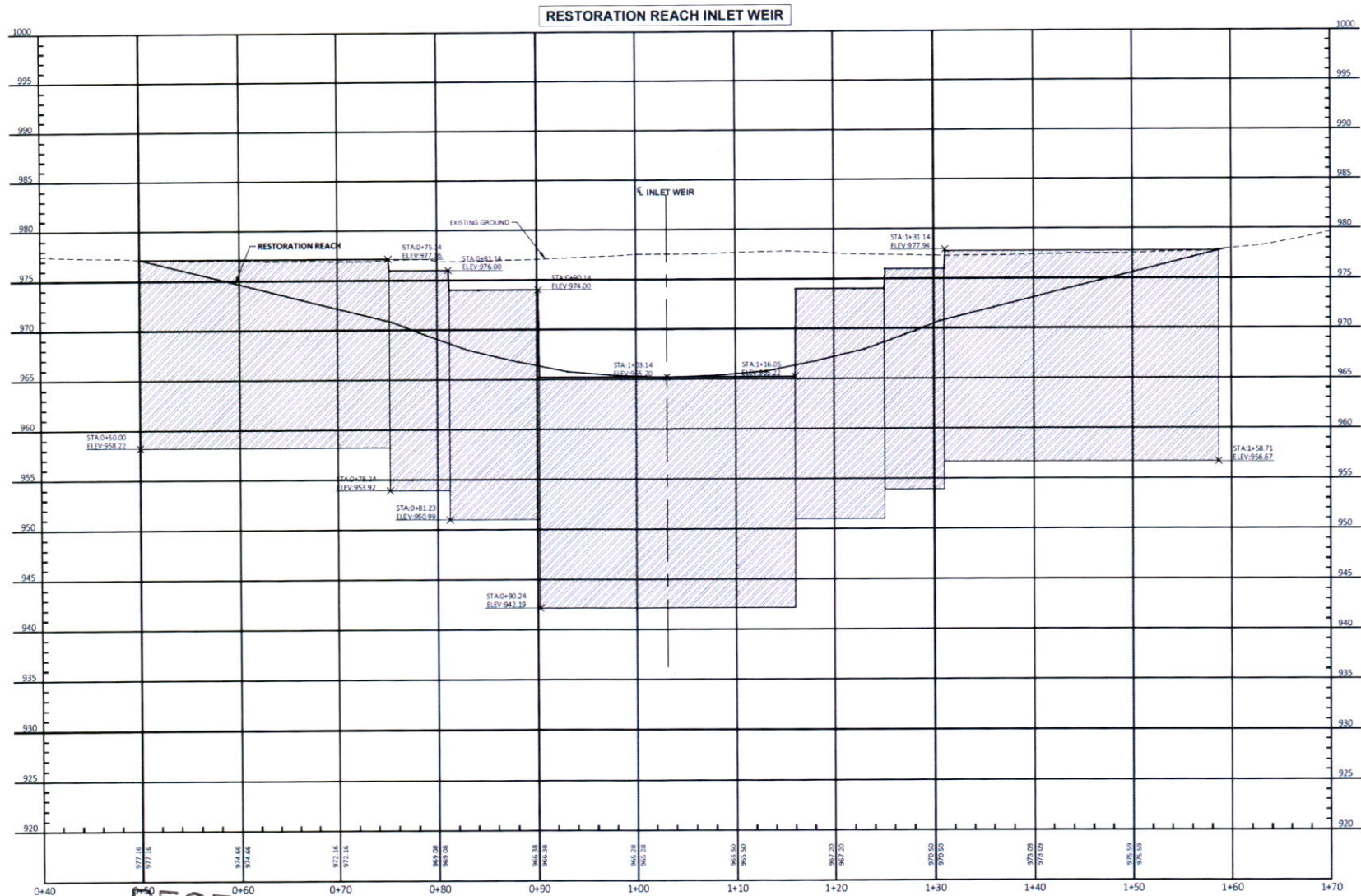
W-13

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Water Rights
Program

I:\Users\33004\3304_0022\whetstone_river_restoration\CAU\plan\Water Resources\3304_inlet Weir.dwg W-14 RESTORATION REACH INLET WEIR 3/7/2021 9:19 AM (jrgun)



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Water Rights
Program

WHESTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

RESTORATION REACH INLET WEIR

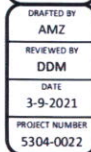

Resident Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

DRAFTED BY
AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-14



WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

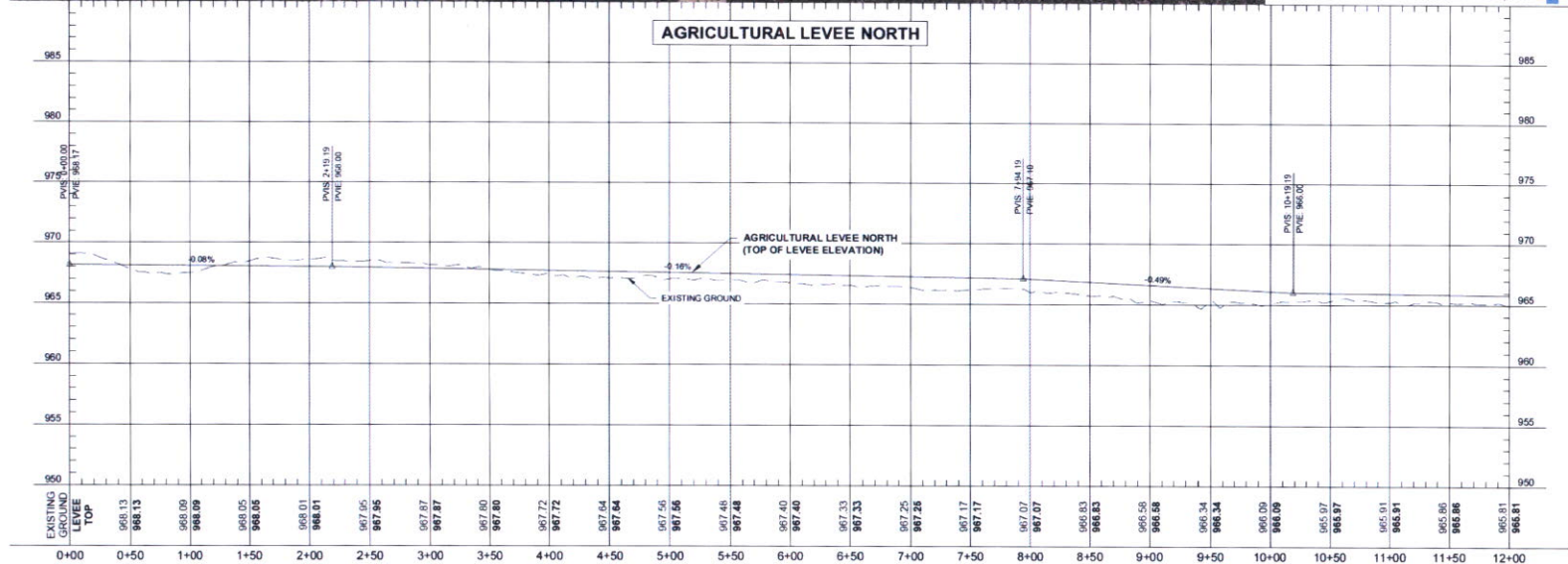


W-15

**Water Rights
Program**



GRADE CHANGE ELEVATION TABLE				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-100.00	-1.00	38,086.10	
2	-1.00	0.00	44,141.70	
3	0.00	1.00	96,851.55	
4	1.00	100.00	278,017.80	



WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

AGRICULTURAL LEVEE NORTH PLAN & PROFILE



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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

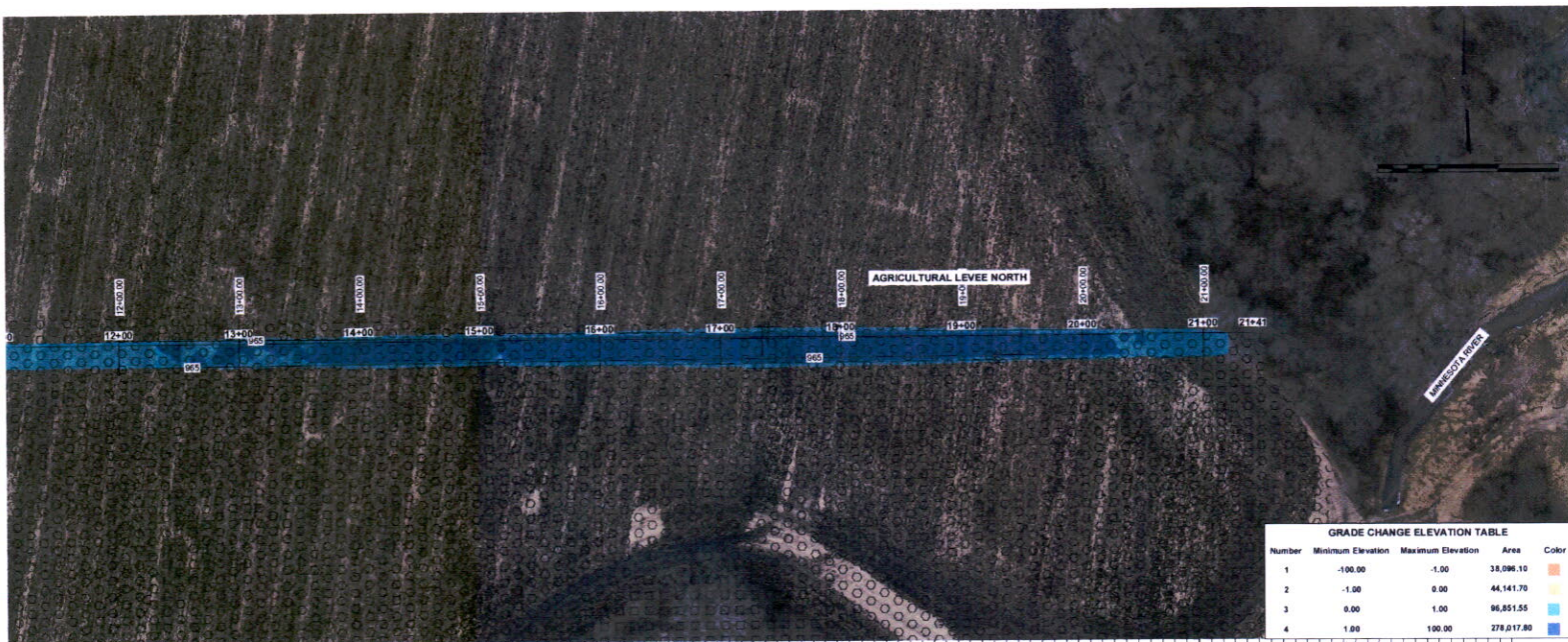
W-17

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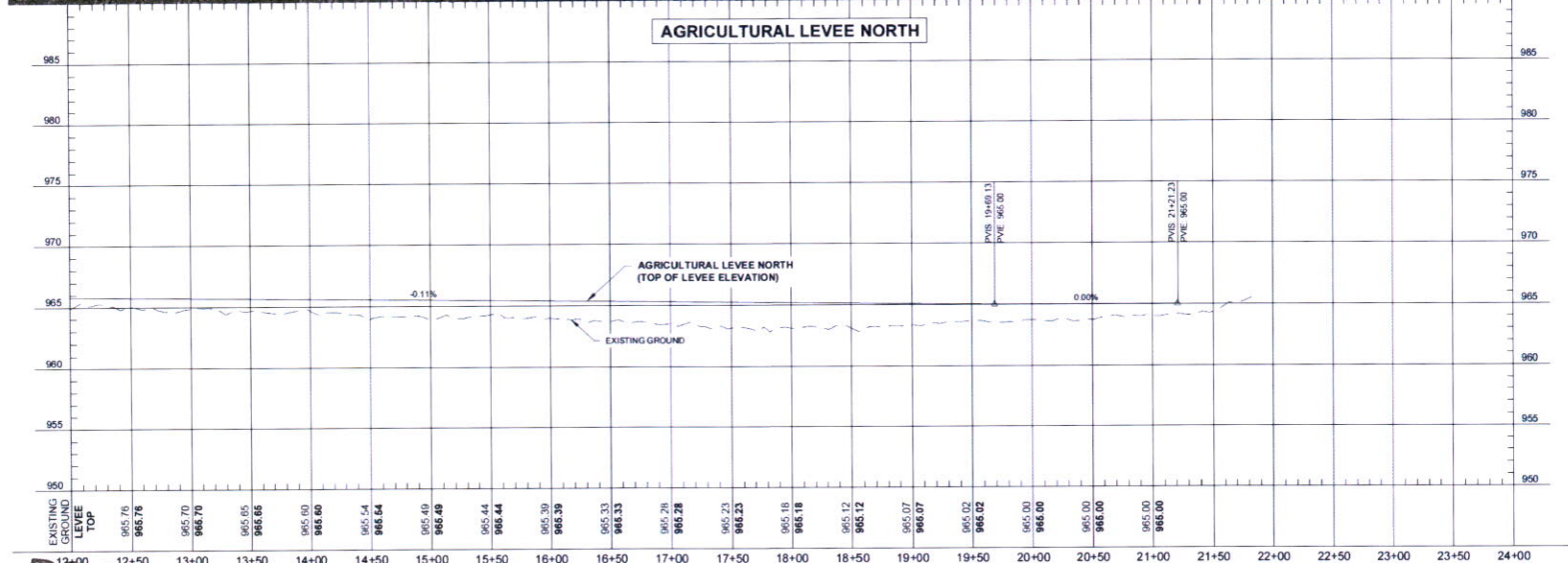
FEB 05 2026

Water Rights
Program

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GRADE CHANGE ELEVATION TABLE				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-100.00	-1.00	31,086.10	Orange
2	-1.00	0.00	44,141.70	Yellow
3	0.00	1.00	96,851.55	Light Blue
4	1.00	100.00	279,017.80	Dark Blue



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Program

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

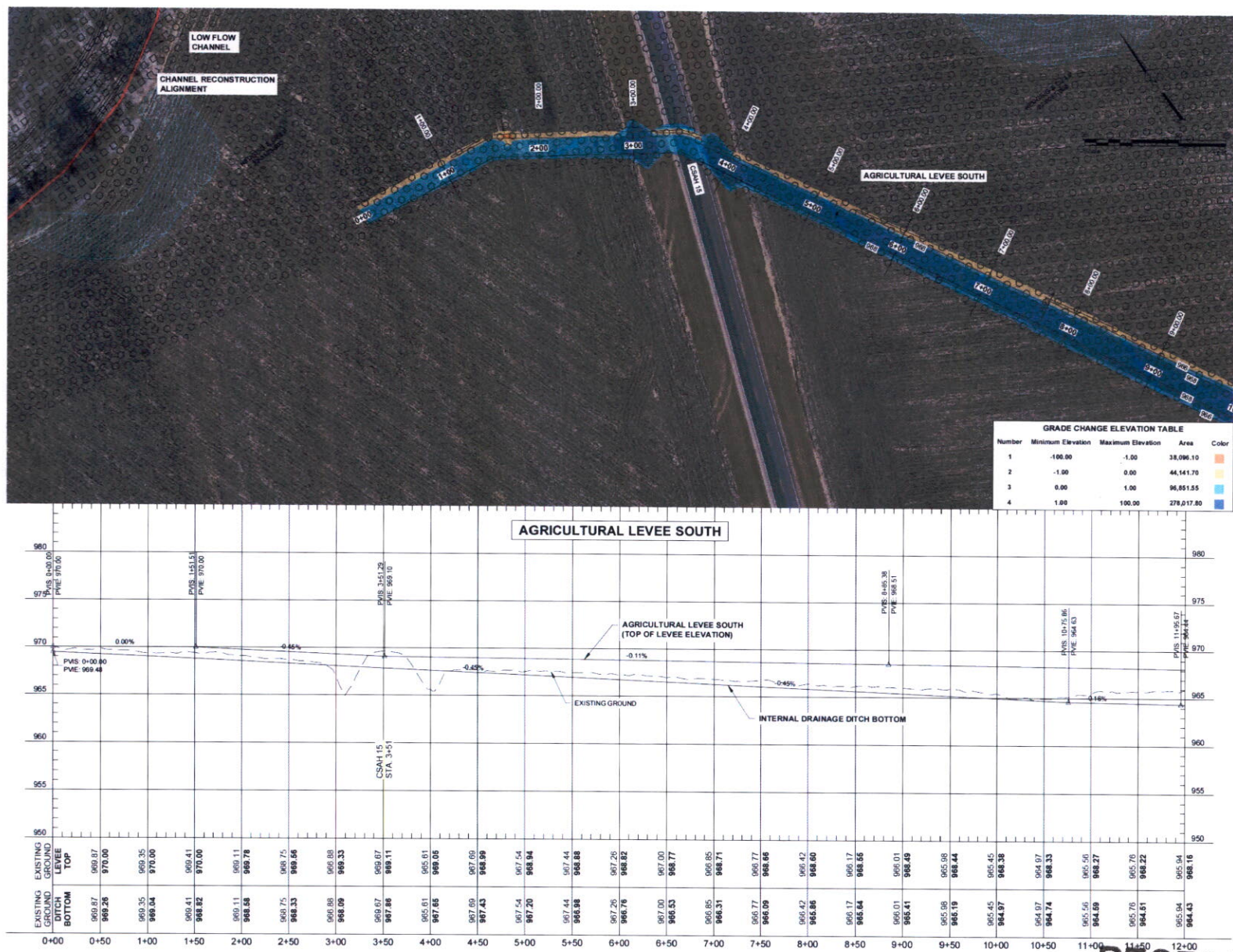
AGRICULTURAL LEVEE NORTH PLAN & PROFILE


Hess & Associates, Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5573

DRAFTED BY
AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-18

H:\JAN\3304\3304\3304_003 whetstone river restoration\CAO\Plan\Water Resources\3304_RLP_030.dwg W-19 AGRICULTURAL LEVEE SOUTH PLAN & PROFILE 3/7/2021 10:13 AM (argan)

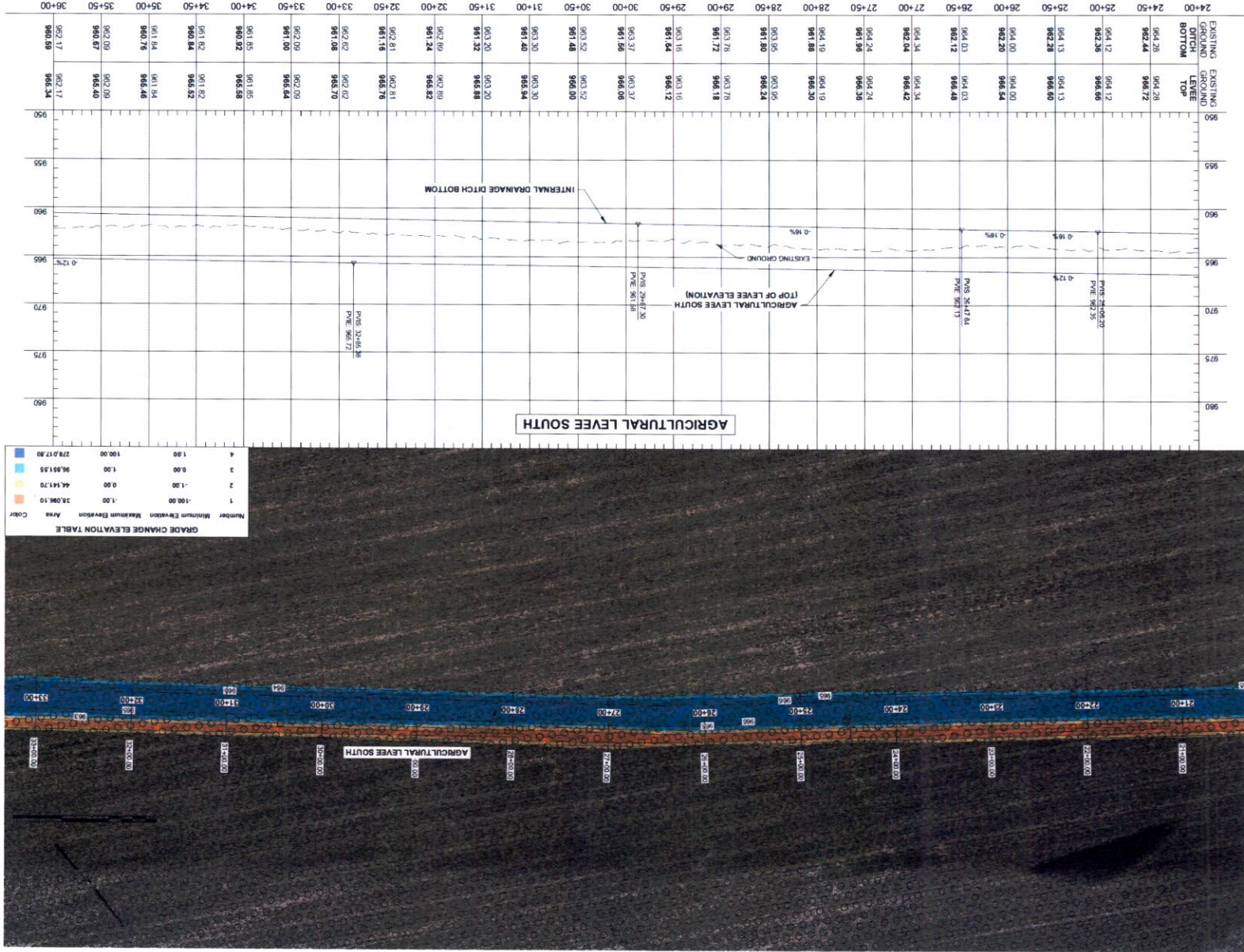


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Water Rights
Program

WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA	
AGRICULTURAL LEVEE SOUTH PLAN & PROFILE	
PROJECT NUMBER	5304-0022
DRAFTED BY	AMZ
REVIEWED BY	DDM
DATE	3-9-2021
W-19	



W-21

PROJECT NUMBER
5304-0022

DATE
3-9-2021

REVIEWED BY
DDM

DRAWN BY
AMZ

DESIGNED BY
NSA 463.45.23
P 763.493.5573

Magpie Grove
Engineering Inc.

WHITSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
CARROLL, MINNESOTA

AGRICULTURAL LEVEE SOUTH PLAN & PROFILE

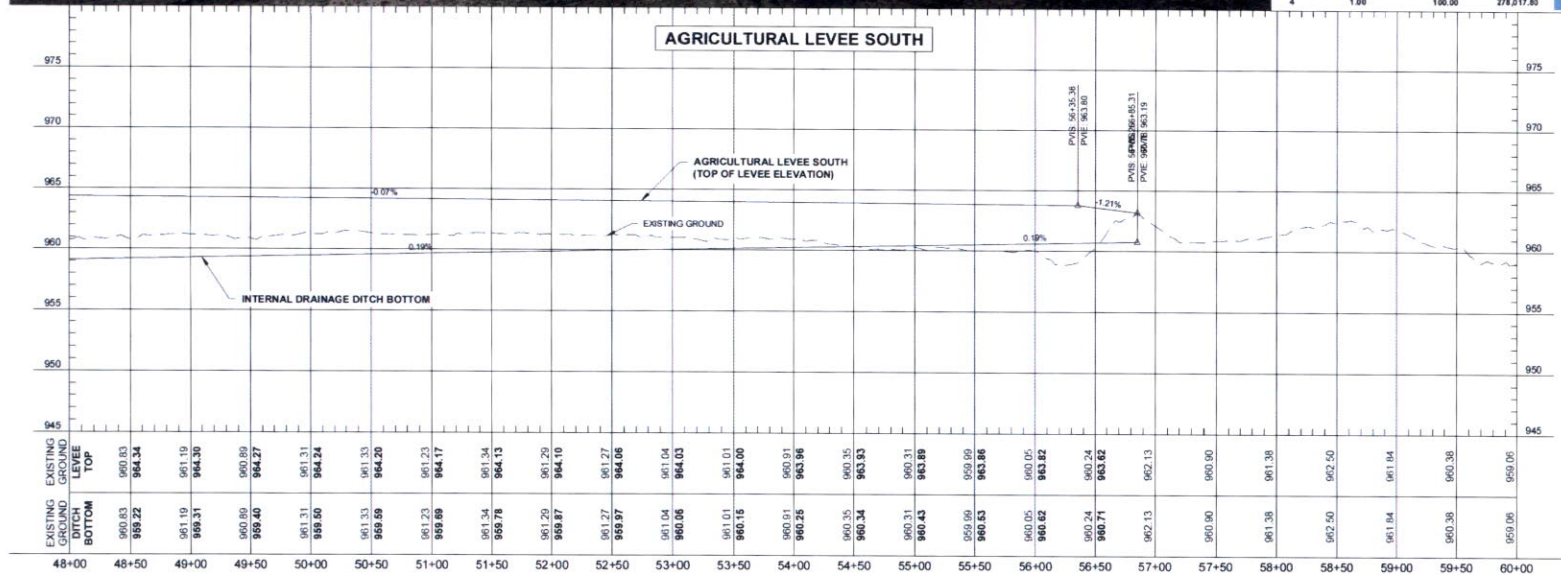
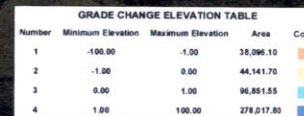
No.

Revision

Date

By

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Water Rights
Program



c:\jbrn\5300\5304\5304_0022 whetstone river restoration\CAD\plans\Water Resources\5304_P&P_Dikes.dwg-W-23 AGRICULTURAL LEVEE SOUTH PLAN & PROFILE-3/9/2021 10:29 AM-(azigan)

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

AGRICULTURAL LEVEE SOUTH PLAN & PROFILE



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DDM

DATE
3-9-2021

PROJECT NUMBER
5304-0022

W 22

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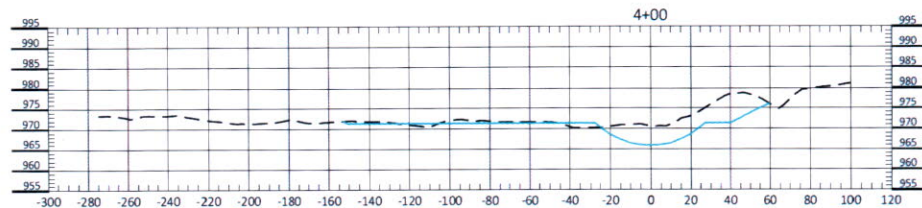
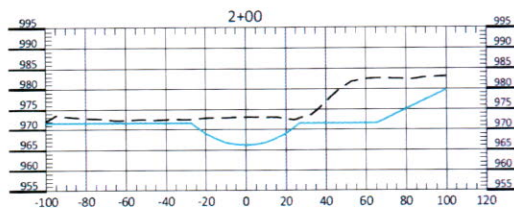
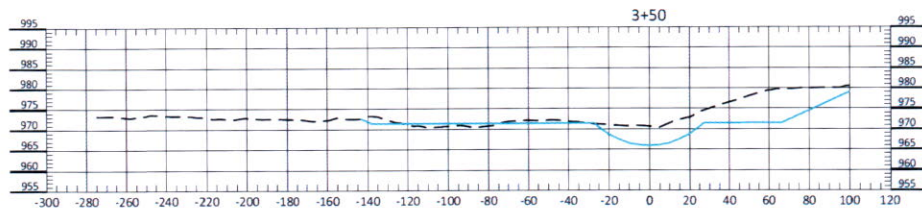
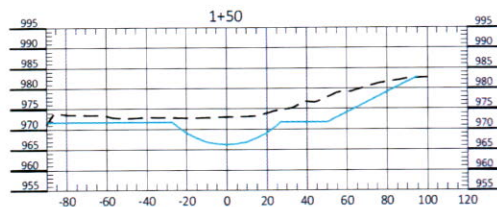
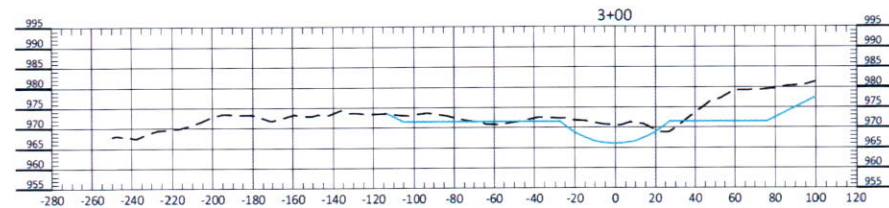
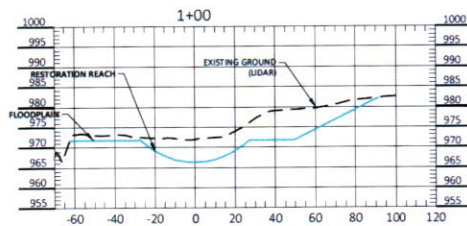
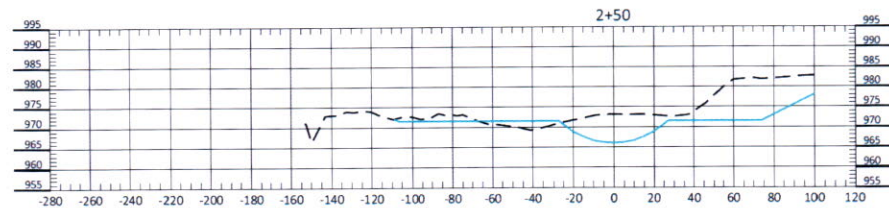
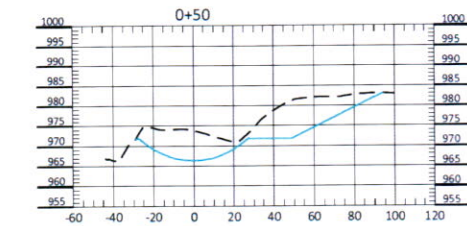
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Water Rights
Program



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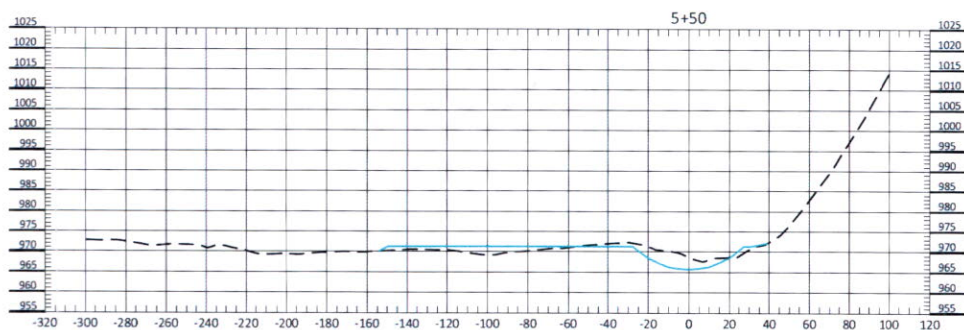
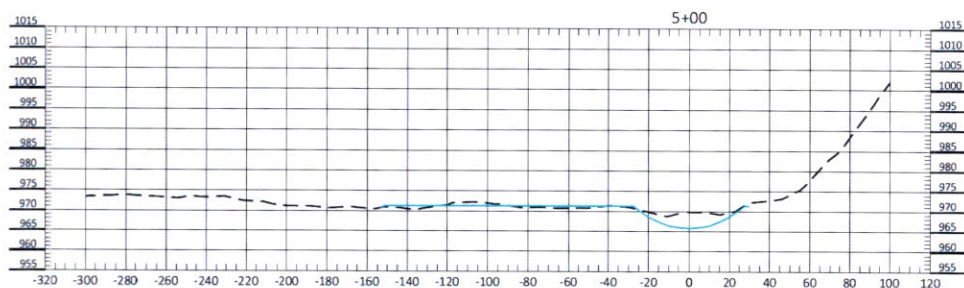
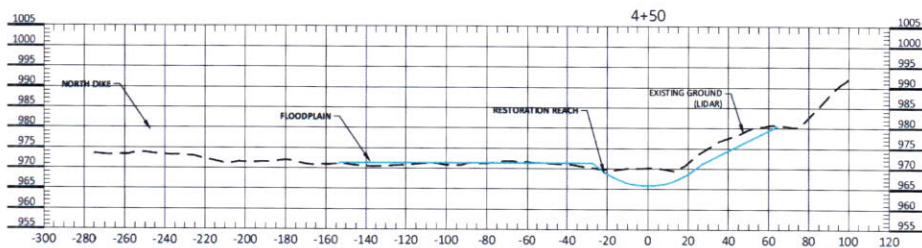
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS

3i
Resident Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

DRAFTED BY
AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-24



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Water Rights
Program

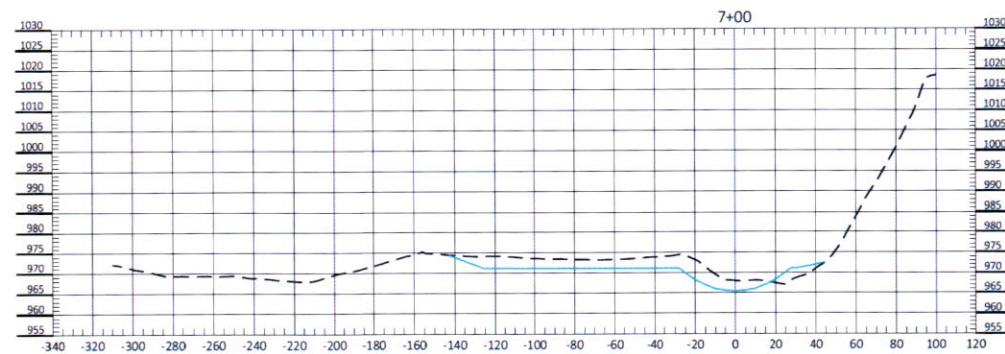
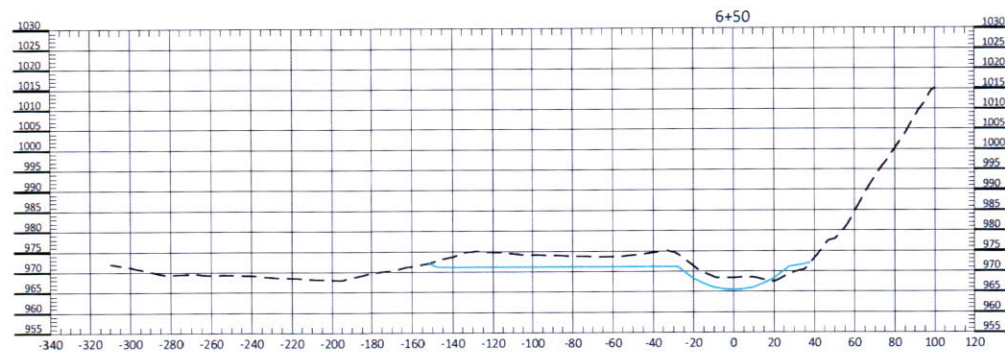
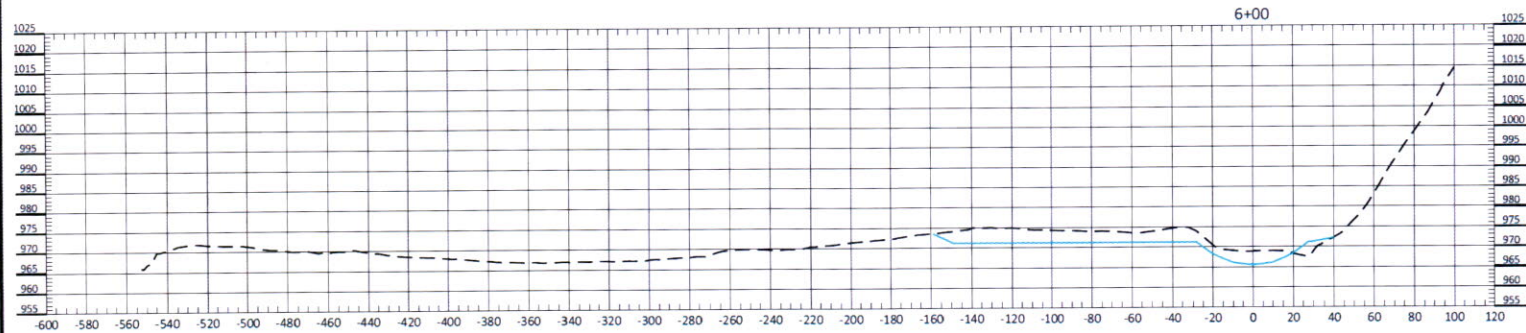
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
WHETSTONE RESTORATION REACH X-SECTIONS



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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-25

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Water Rights
Program

WHESTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHESTONE RESTORATION REACH X-SECTIONS



P: 763.493.4522
F: 763.493.5572

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AMZ

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DDM

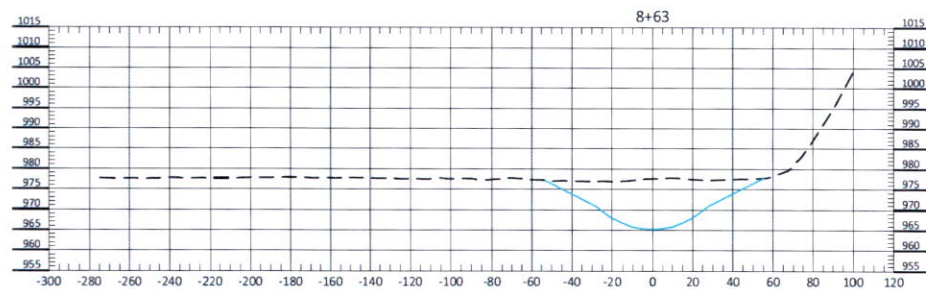
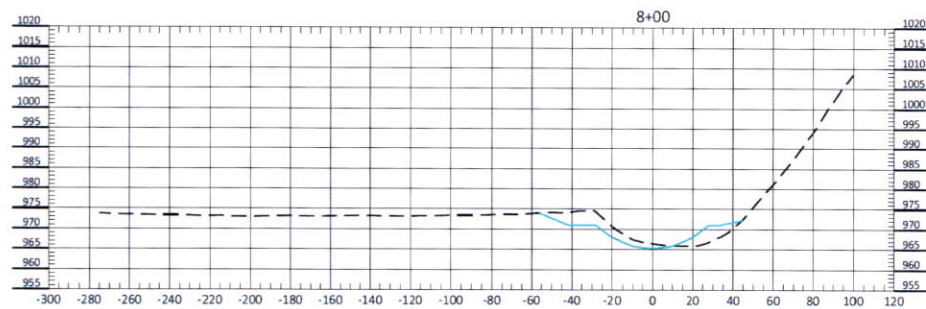
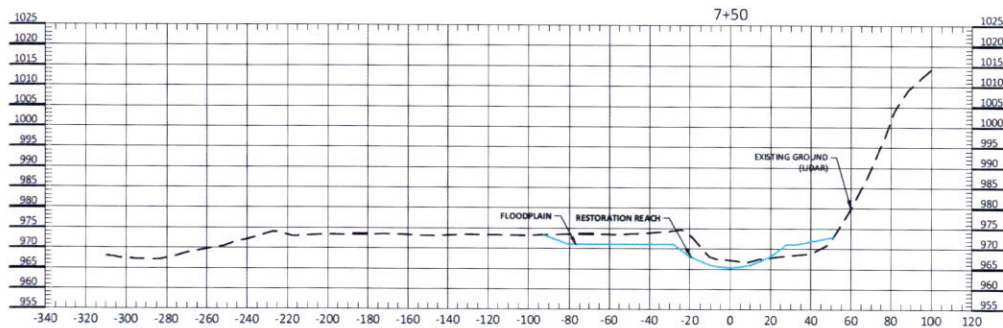
DATE
3-9-2021

PROJECT NUMBER
5304-0022

W-26

No.	Revision	Date	By

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Program

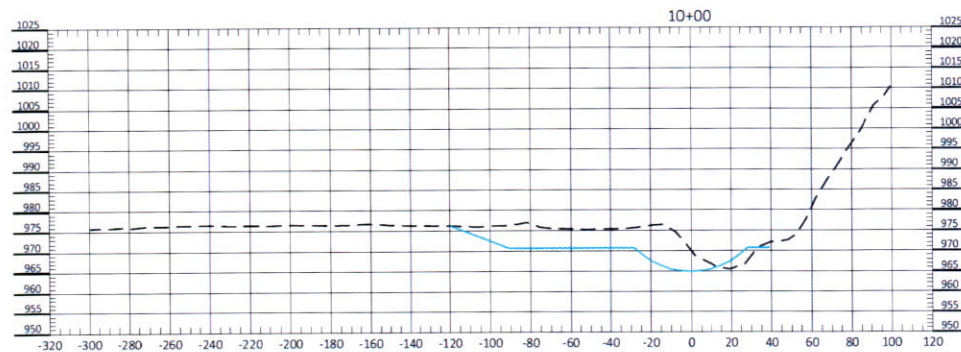
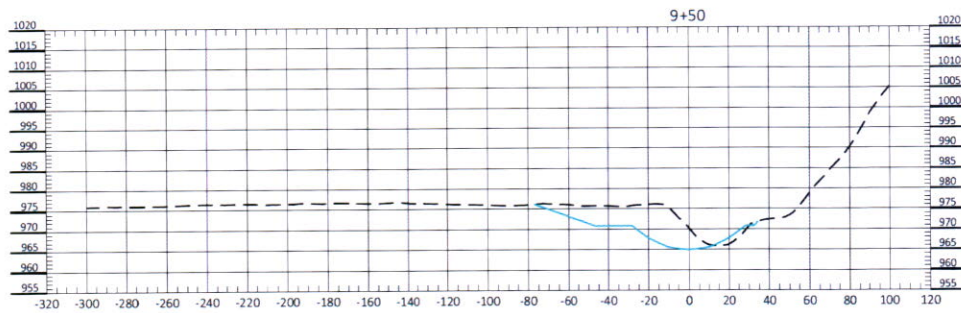
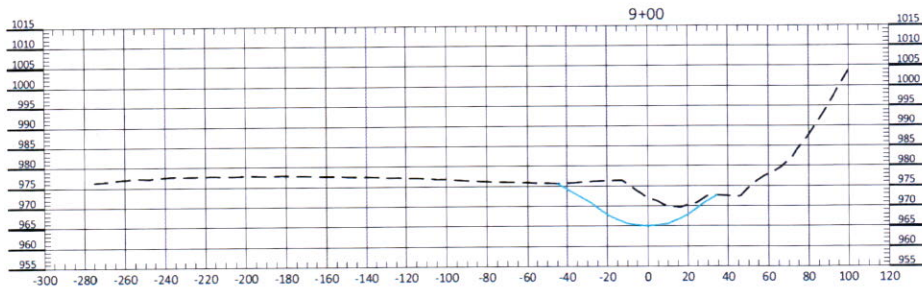
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
WHETSTONE RESTORATION REACH X-SECTIONS



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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-27

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FEB 05 2026

Water Rights
Program

By		Date	
No.		Revision	
WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA			
WHETSTONE RESTORATION REACH X-SECTIONS			
 Hewlett-Packard Engineering Inc. Maple Grove P: 763.493.4522 F: 763.493.5572			
DRAFTED BY AMZ			
REVIEWED BY DDM			
DATE 3-9-2021			
PROJECT NUMBER 5304-0022			
W-28			

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No.	Revision	Date	By

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS



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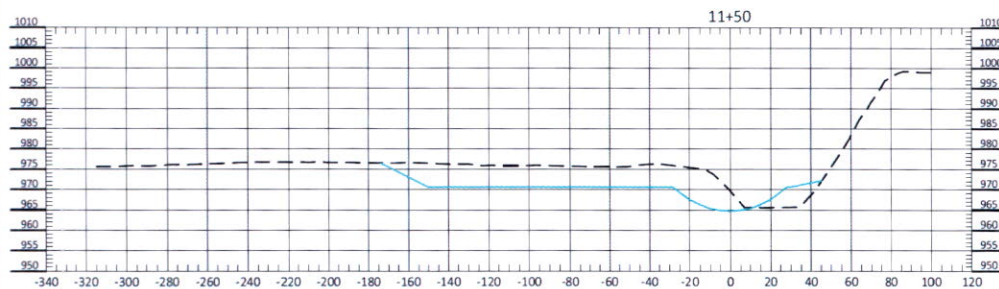
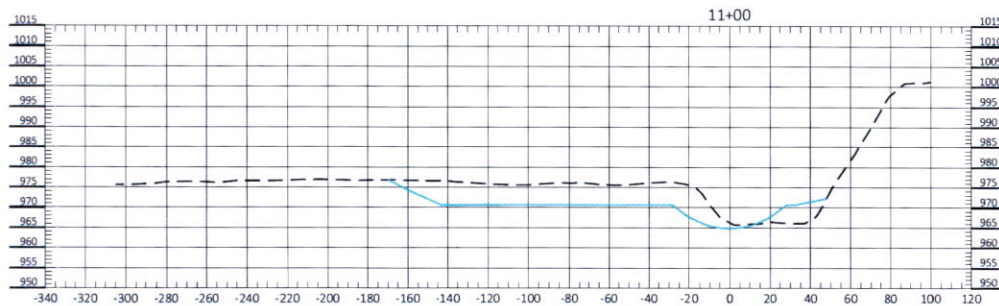
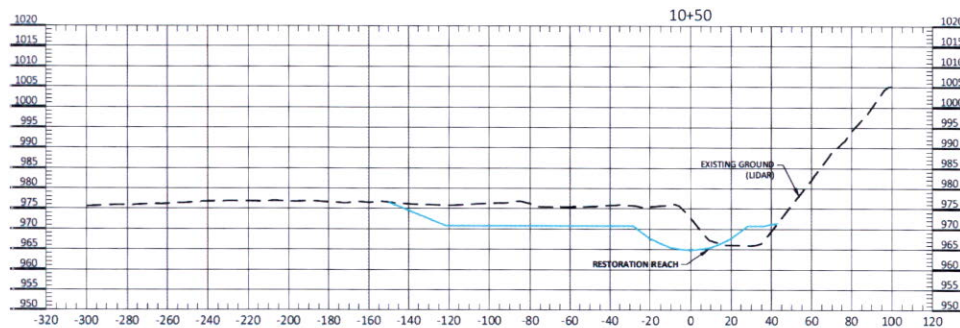
REVIEWED BY
DDM

DATE
3-9-2021

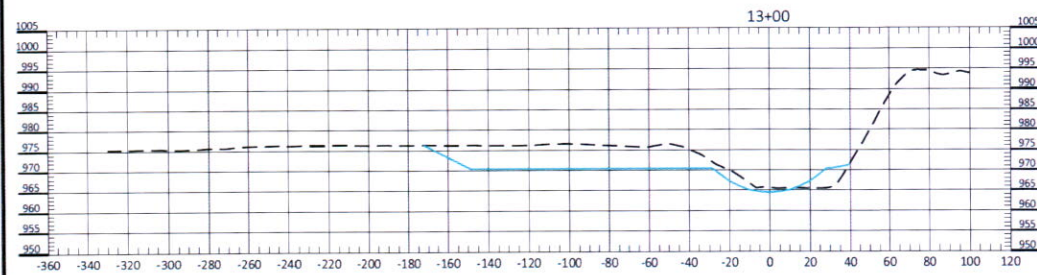
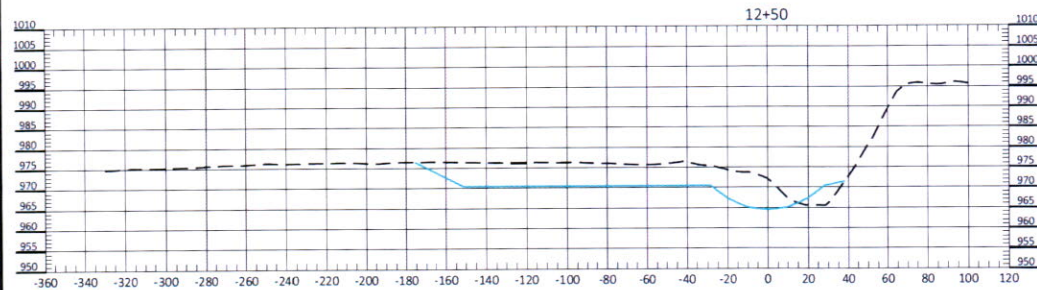
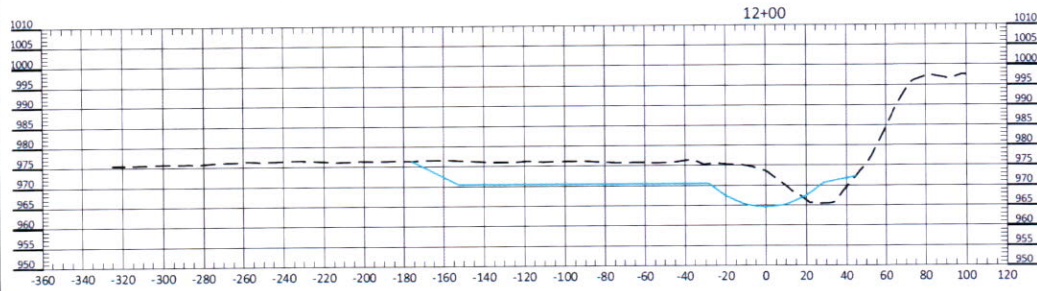
PROJECT NUMBER
5304-0022

W-29

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I:\Users\33005555\Documents\2022\Whetstone River Restoration\3304_Whetstone Reach & Sections.dwg W 30 WHETSTONE RESTORATION REACH & SECTIONS 3/9/2021 2:24 AM (large)



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS



Newland Engineering Inc.

Maple Grove

P: 763.493.4522

F: 763.493.5572

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DATE

3-9-2021

PROJECT NUMBER

5304-0022

W-30

No. Revision

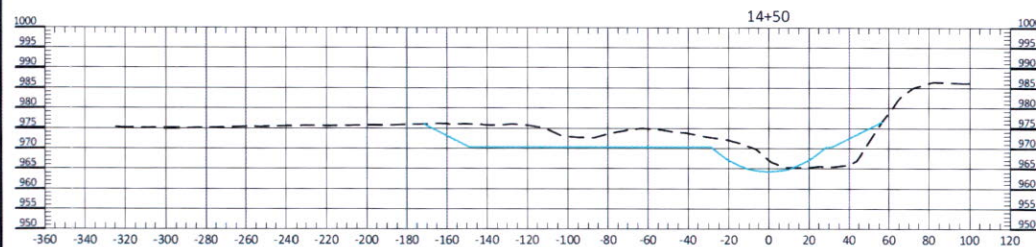
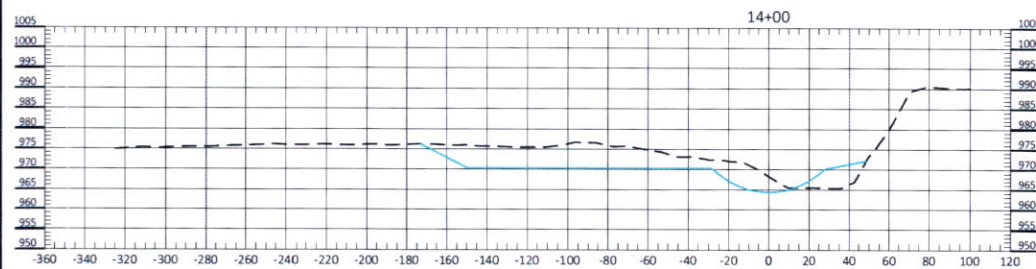
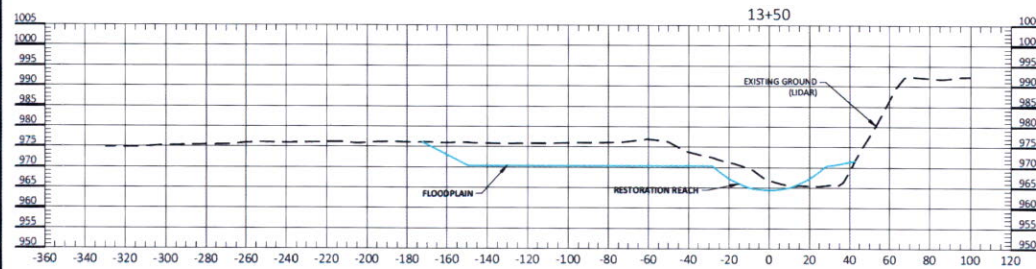
Date

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Water Rights
Program



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS



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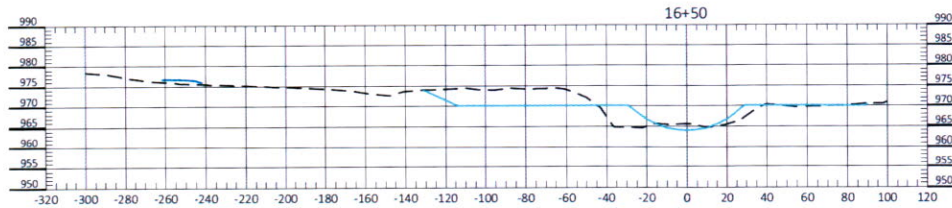
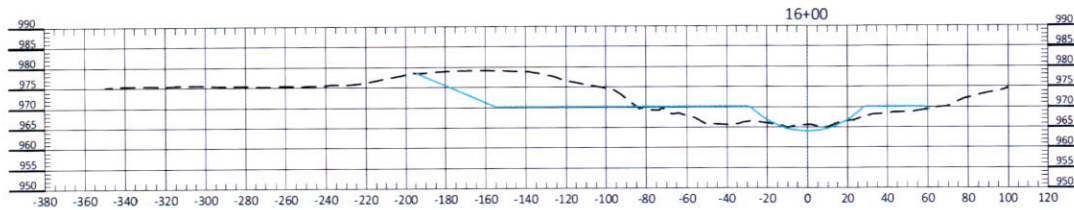
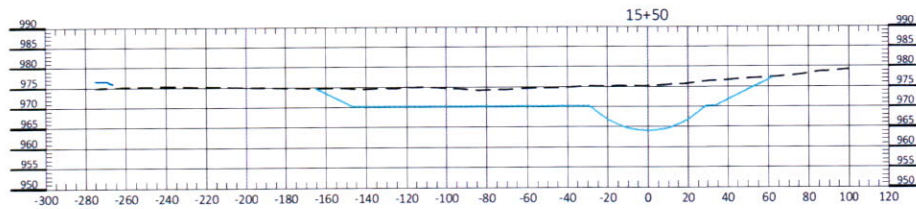
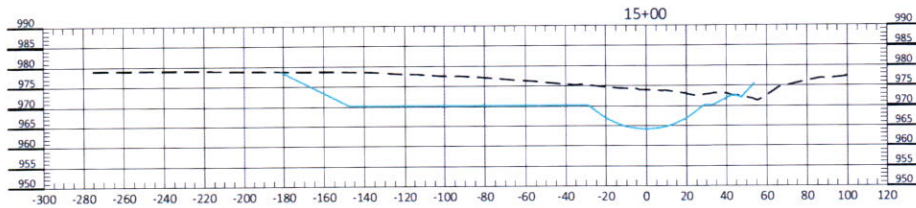
REVIEWED BY
DDM

DATE
3-9-2021

PROJECT NUMBER
5304-0022

W-31

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
WHETSTONE RESTORATION REACH X-SECTIONS

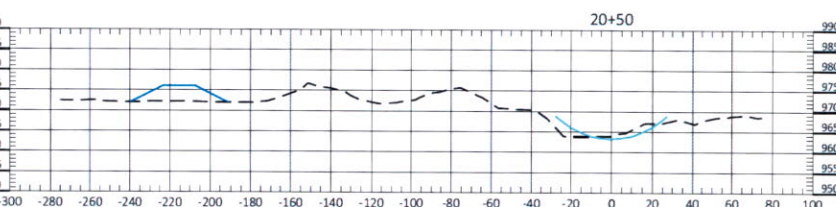
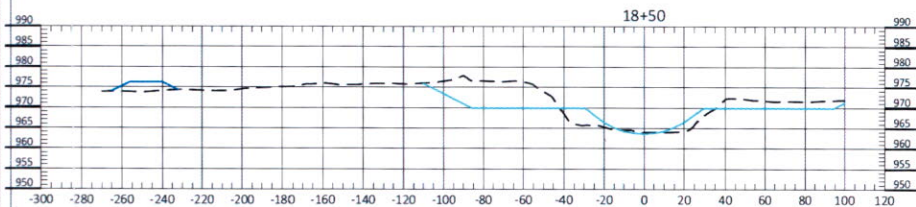
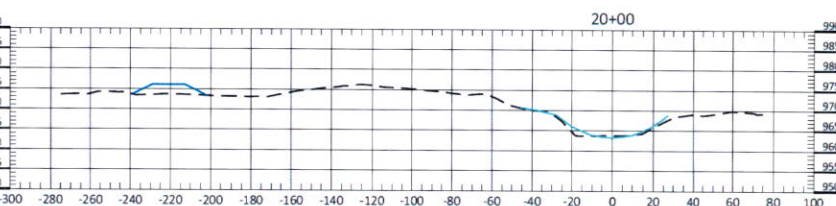
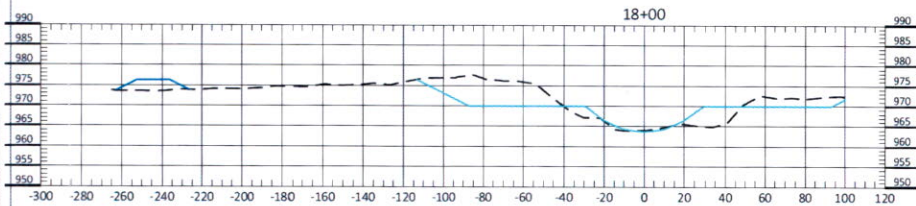
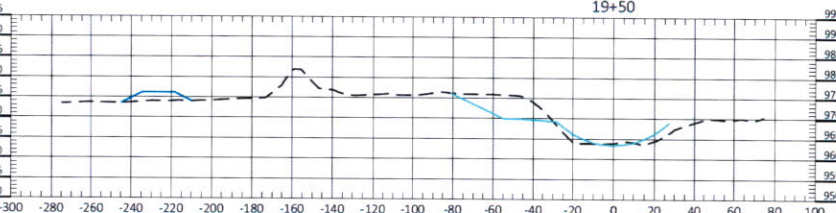
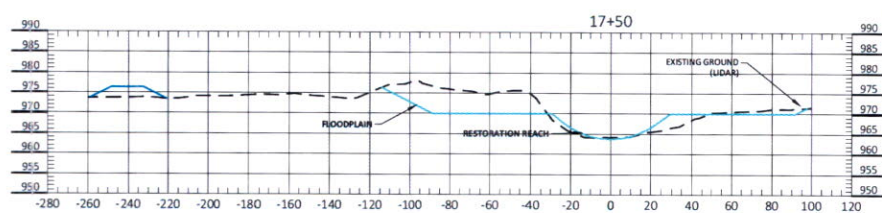
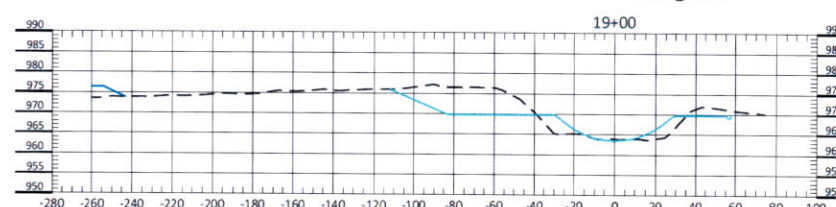

Husker Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-32

No.	Revision	Date	By

FEB 05 2026



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS



Maple Grove

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AM7

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DDM

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DATE _____

3-9-2021

PROJECT NUMBER

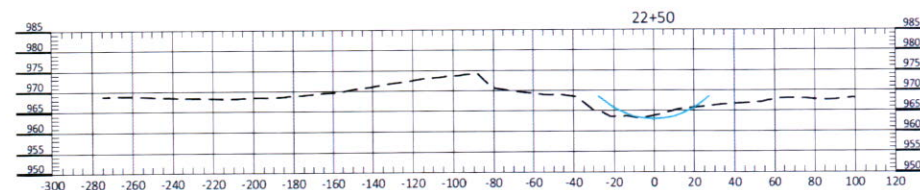
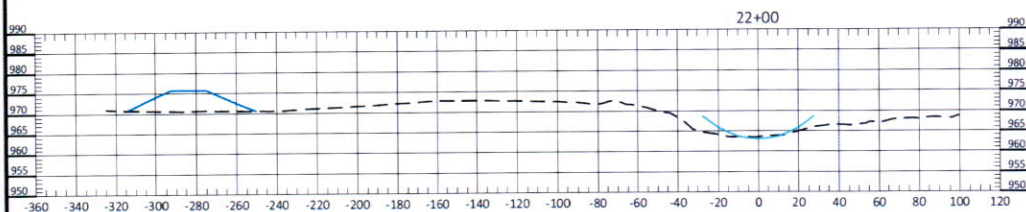
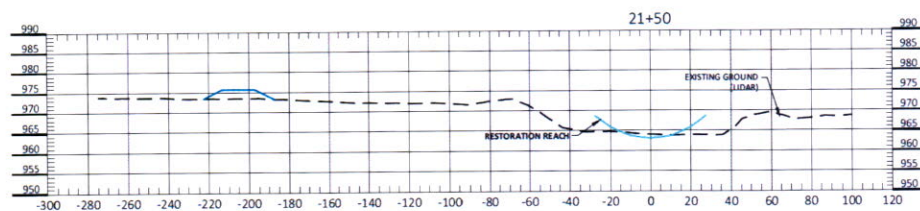
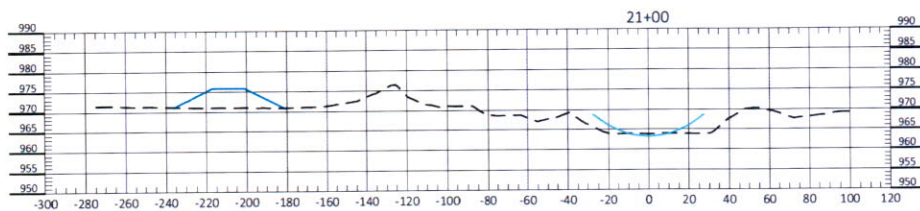
5304-0022

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WHESTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		No.	Revision	Date	By
WHESTONE RESTORATION REACH X-SECTIONS					



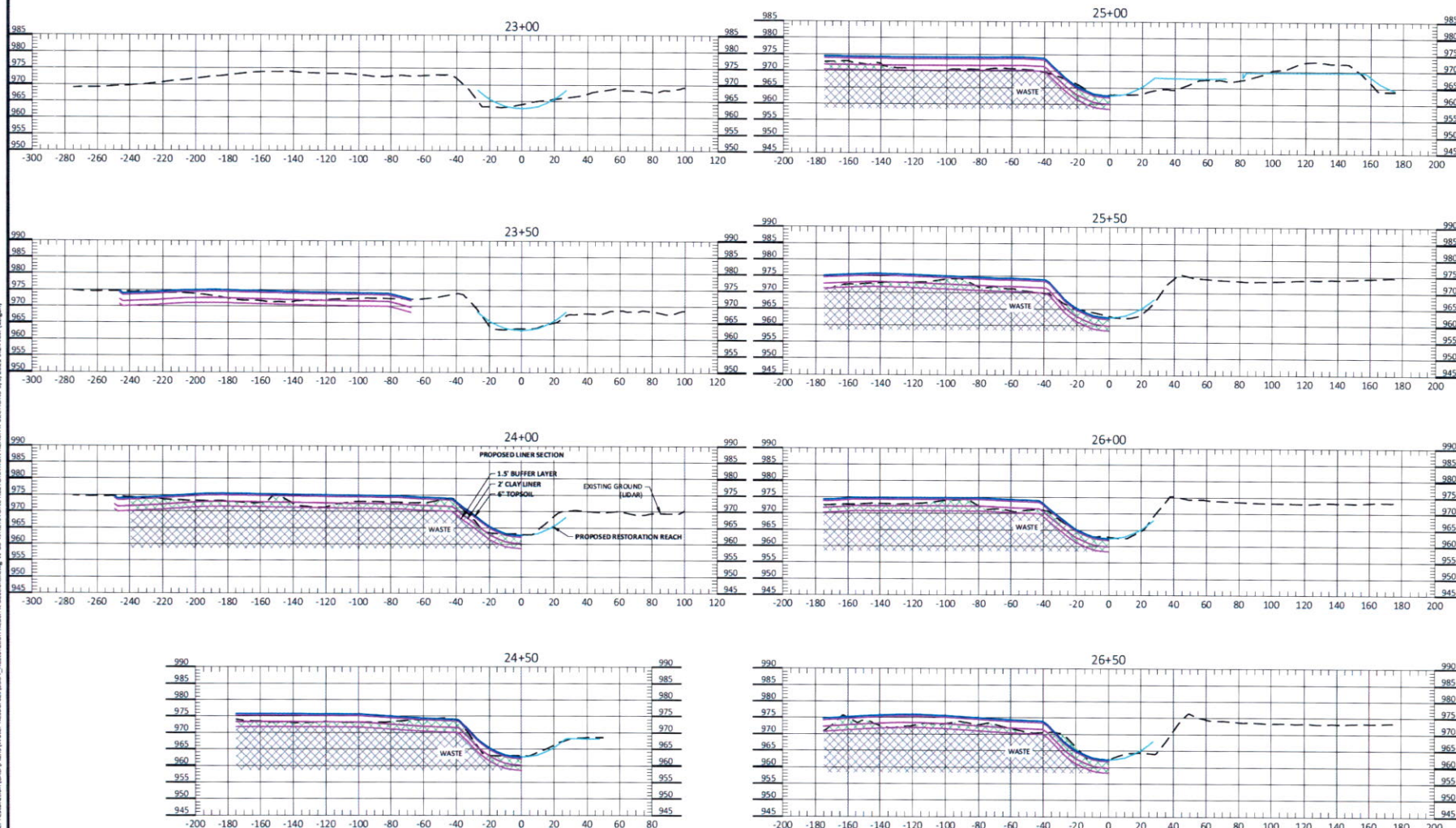
Hess Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

DRAFTED BY AMZ	
REVIEWED BY DDM	
DATE 3-9-2021	
PROJECT NUMBER 5304-0022	
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS

Maple Grove
P: 763.493.4522
F: 763.493.5573

DRAFTED BY
AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

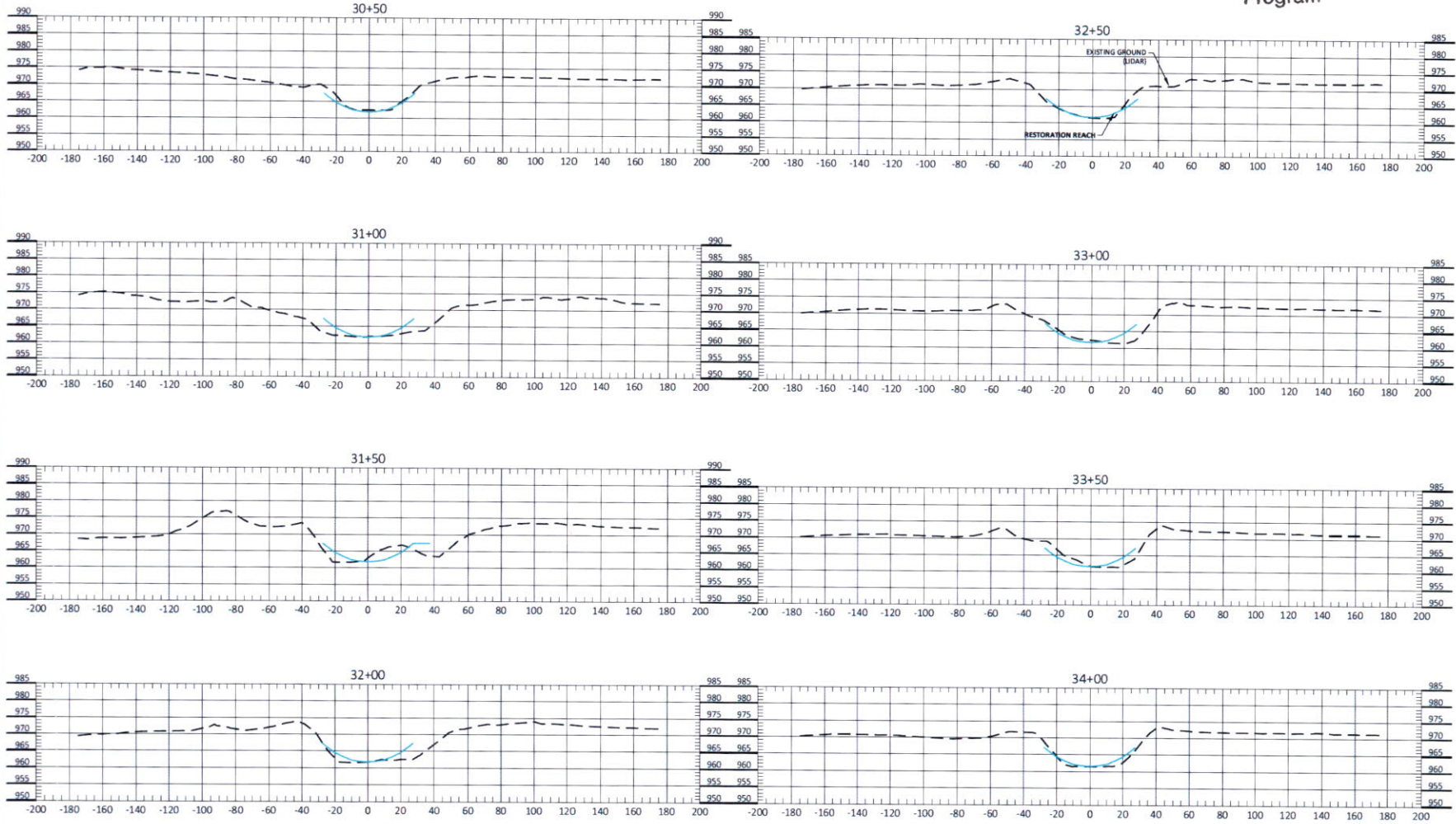
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Program

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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

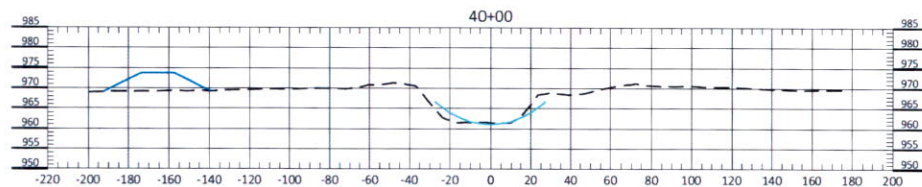
WHETSTONE RESTORATION REACH X-SECTIONS



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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

W-37

**Water Rights
Program**



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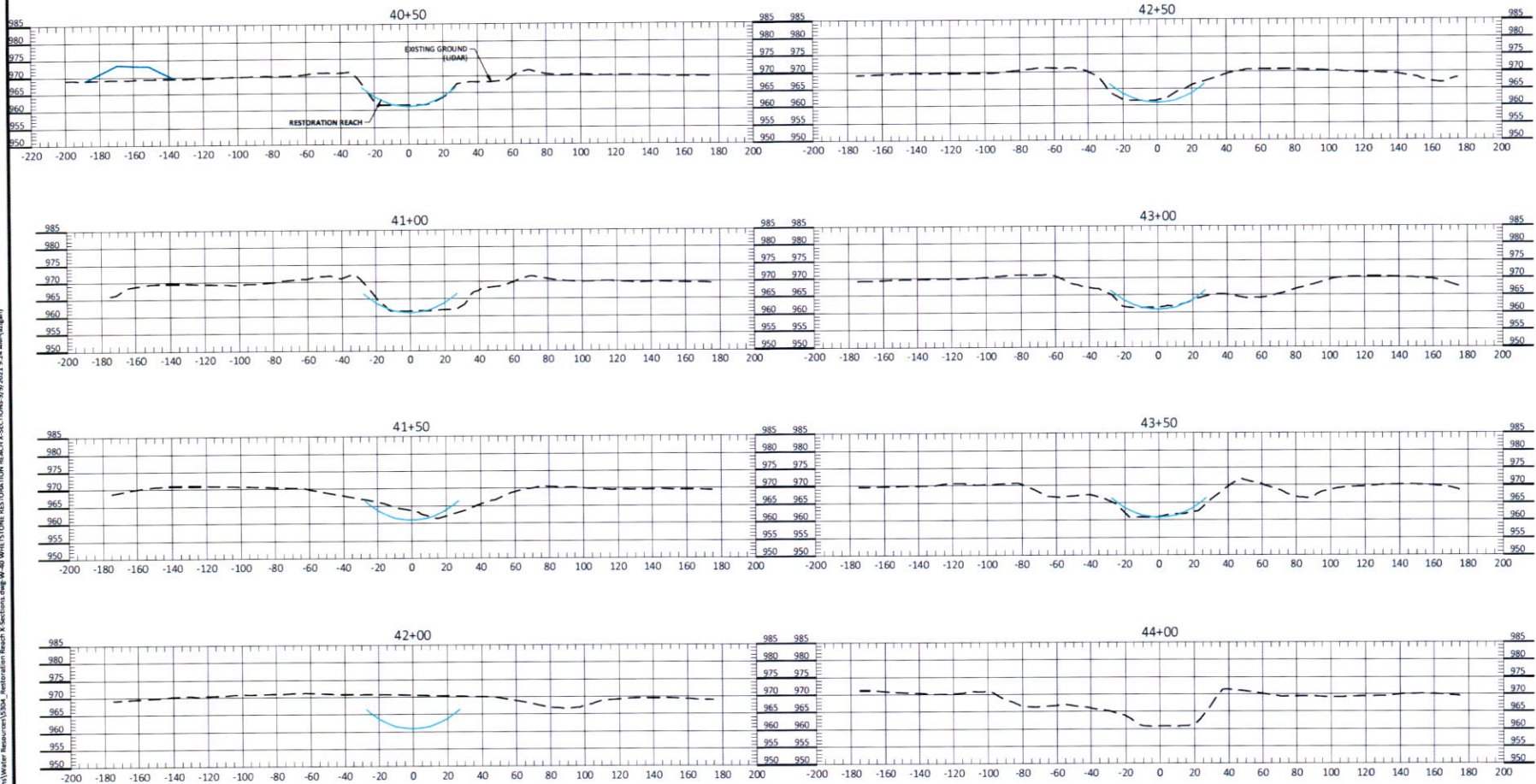
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA



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REVIEWED BY DDM
DATE 3-9-2021
PROJECT NUMBER 5304-0022

W-39

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

WHETSTONE RESTORATION REACH X-SECTIONS

JEI
Hewlett Engineering Inc.
Maple Grove
P: 763.493.5522
F: 763.493.5572

DRAFTED BY
AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

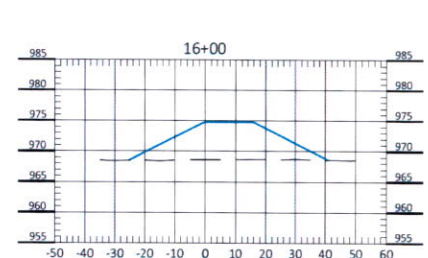
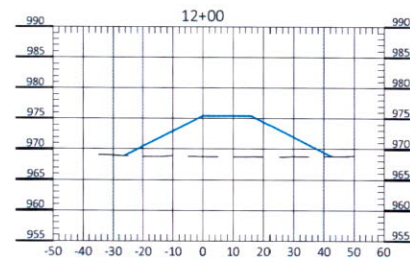
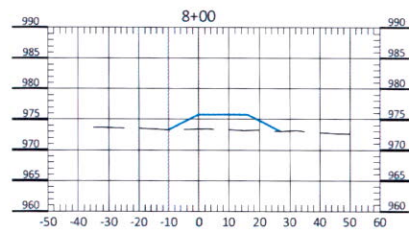
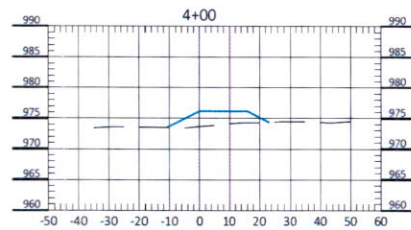
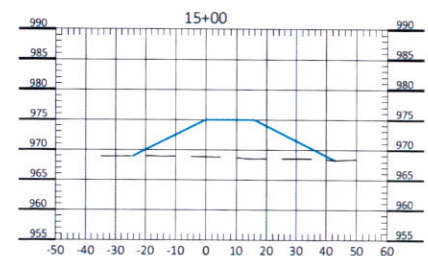
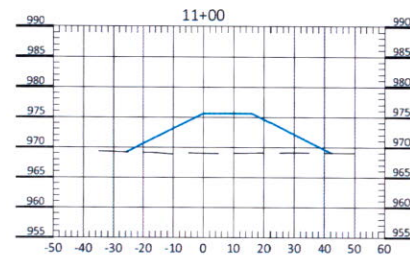
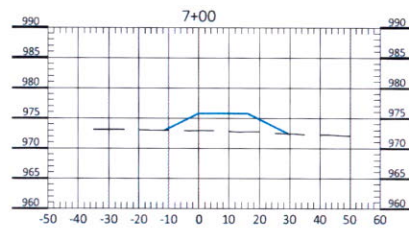
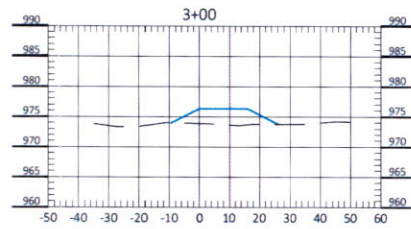
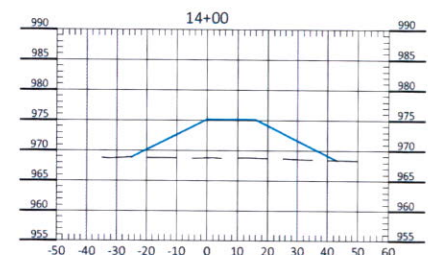
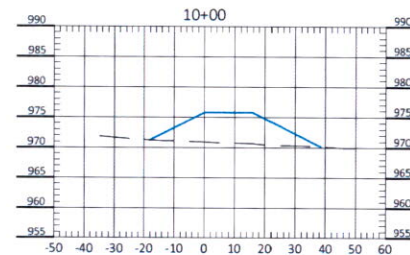
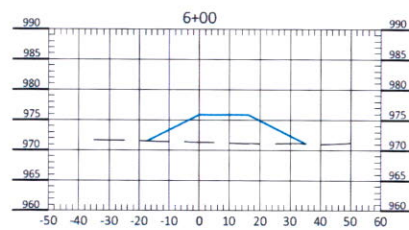
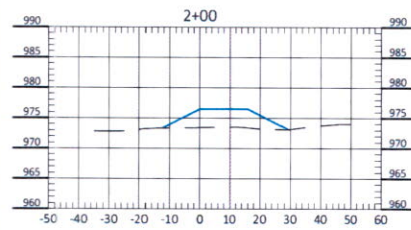
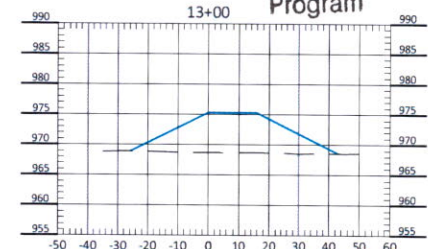
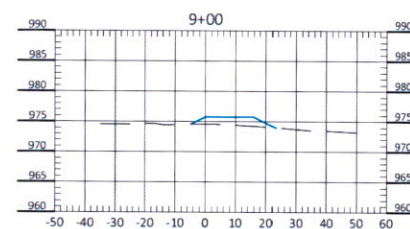
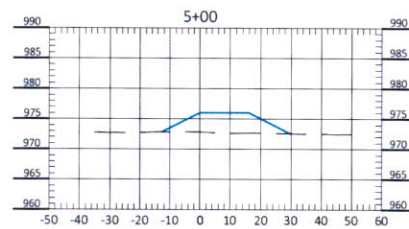
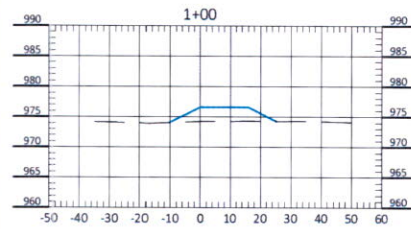
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No. Revision
Date By

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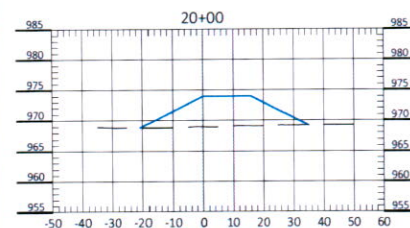
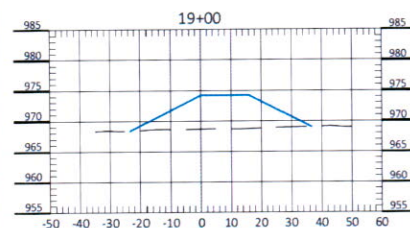
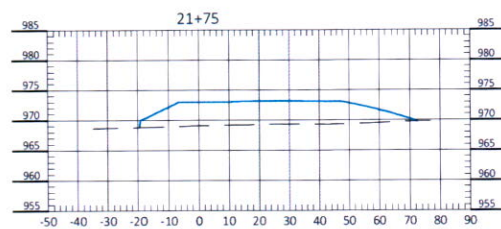
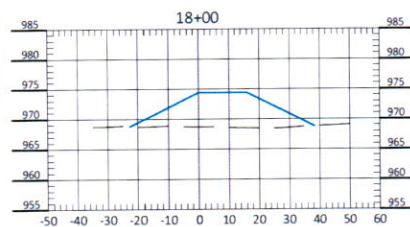
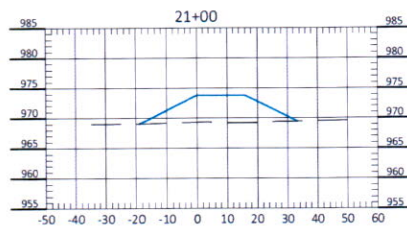
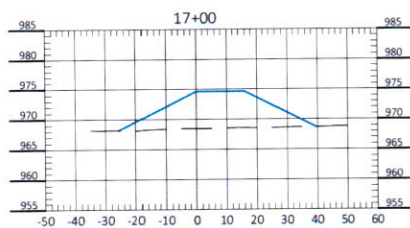
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

BUSINESS AND RESIDENTIAL LEVEL X-SECTIONS



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DDM
DATE
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Water Rights
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\\JBM053005.5304\5.304 00372 whetstone river restoration\CAD\Plans\Water Resources\5.304 Levee X Sections.dwg-W-42 BUSINESS AND RESIDENTIAL LEVEE X-SECTIONS-3/9/2021 9:25 AM (azigan)

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

BUSINESS AND RESIDENTIAL LEVEE X-SECTIONS



Maple Grove

P: 763.493.4522

F. 763.493.5572

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AMZ

REVIEWED BY

DDM

DATE _____

3-9-2021

PROJECT NUMBER

5304-0022

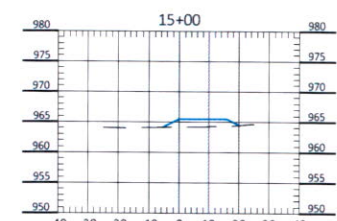
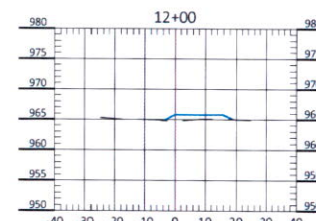
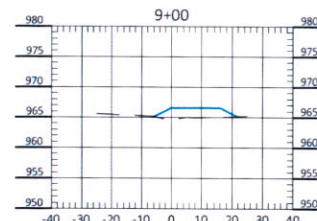
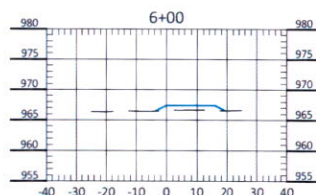
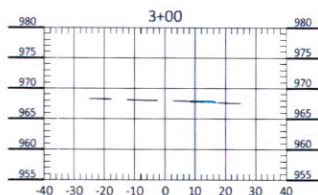
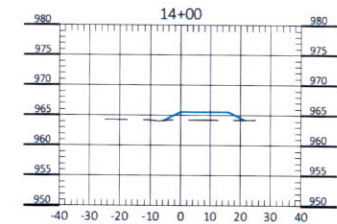
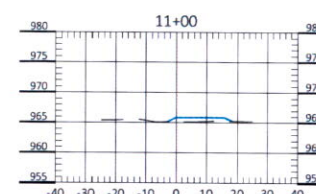
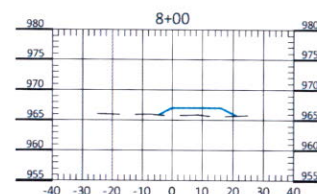
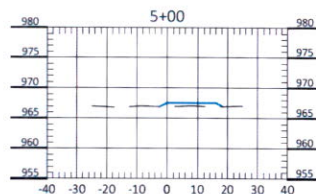
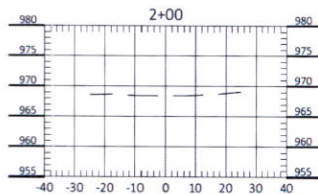
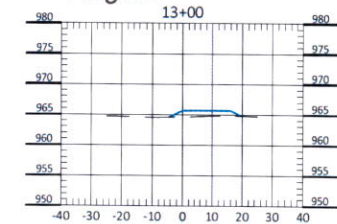
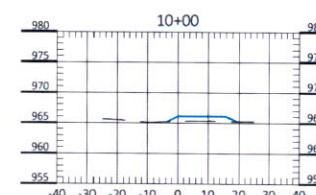
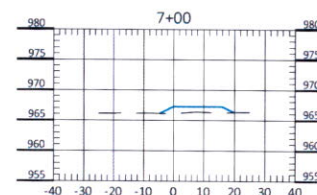
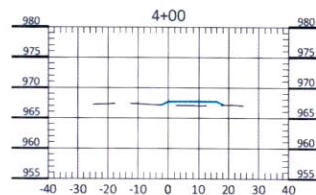
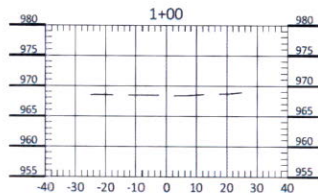
W-42

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

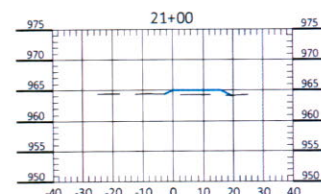
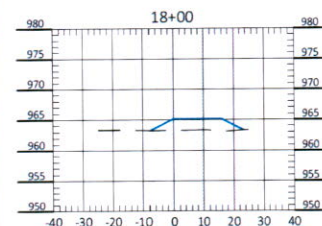
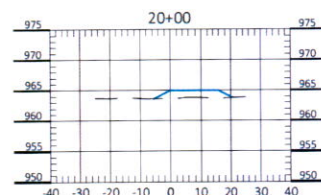
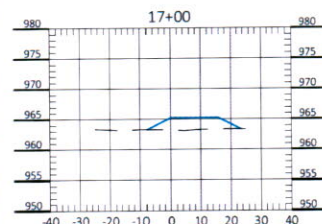
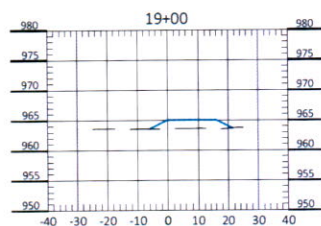
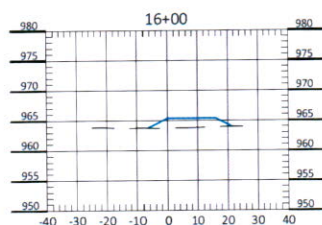
AGRICULTURAL LEVEE NORTH X-SECTIONS



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AMZ
REVIEWED BY
DDM
DATE
3-9-2021
PROJECT NUMBER
5304-0022

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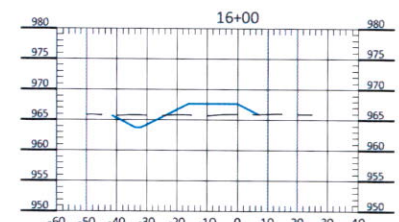
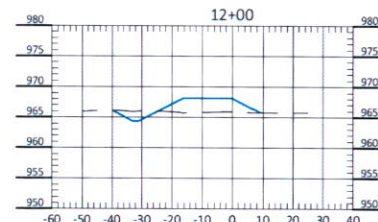
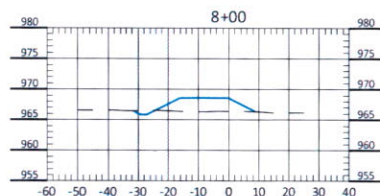
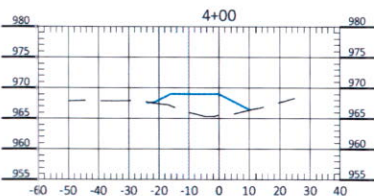
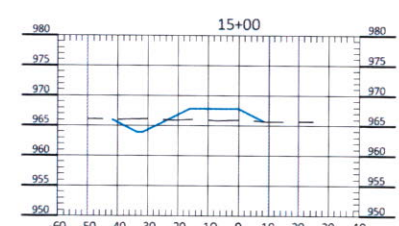
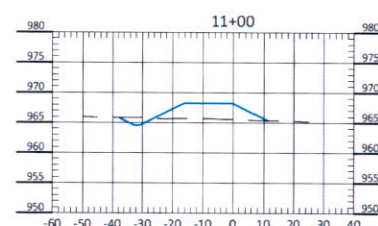
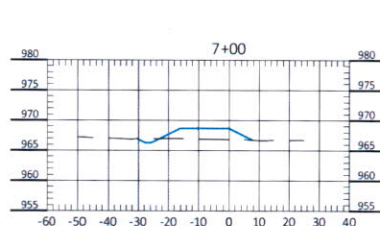
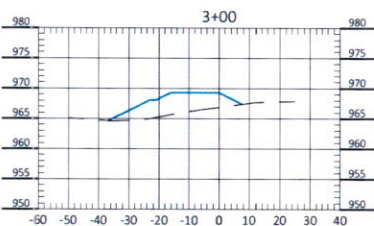
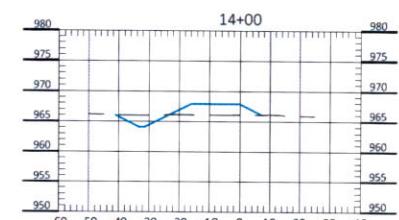
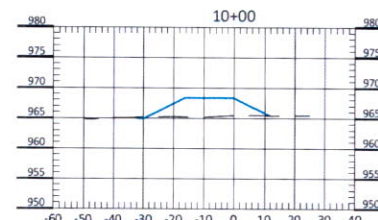
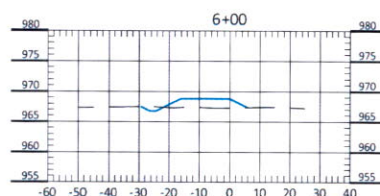
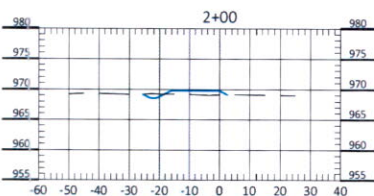
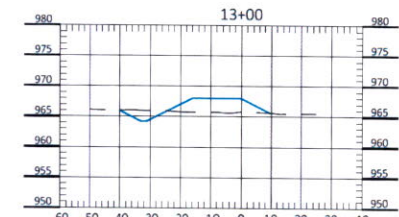
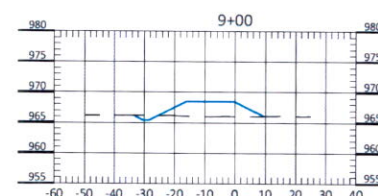
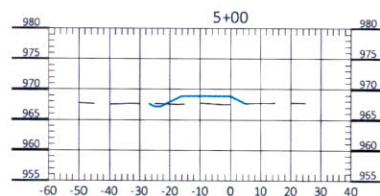
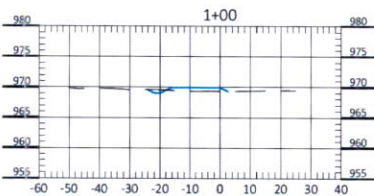
Water Rights
Program

WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA	AGRICULTURAL LEVEE NORTH X-SECTIONS
 Maple Grove P: 763.493.4522 F: 763.493.5572	
DRAFTED BY AMZ	
REVIEWED BY DDM	
DATE 3-9-2021	
PROJECT NUMBER 5304-0022	
W-44	

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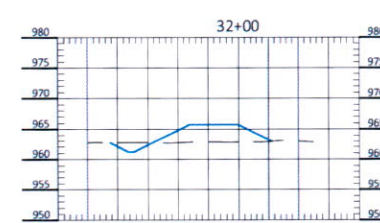
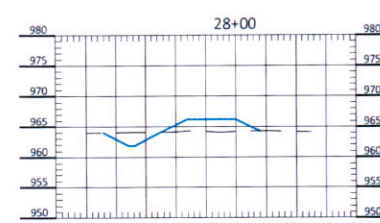
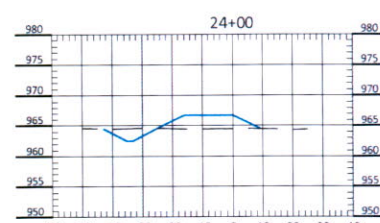
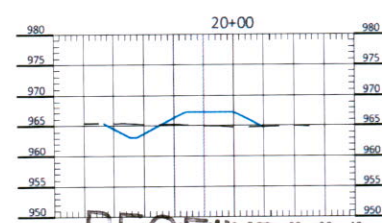
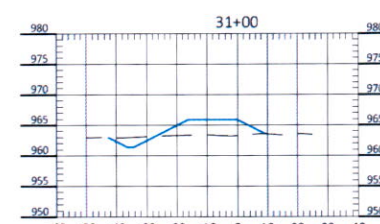
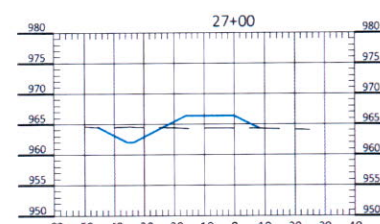
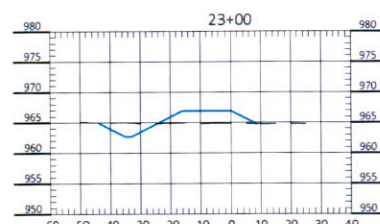
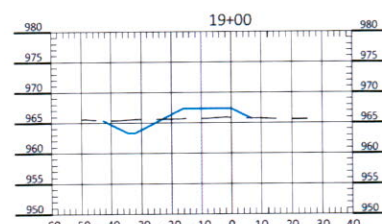
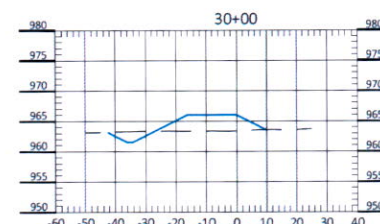
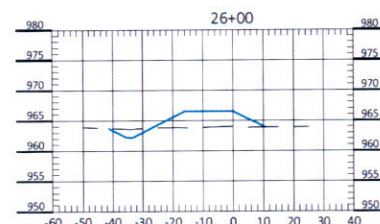
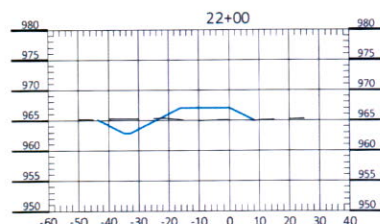
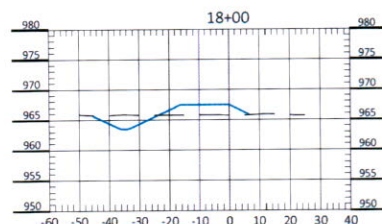
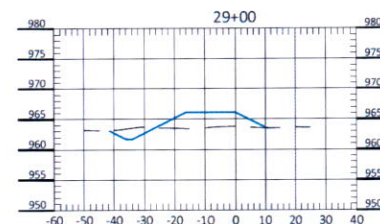
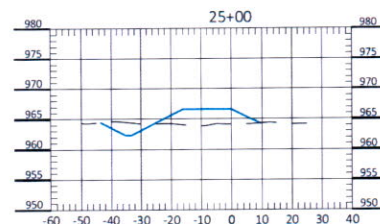
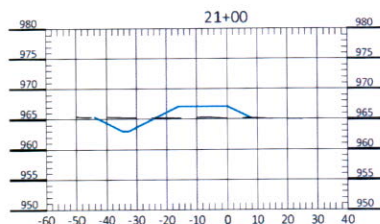
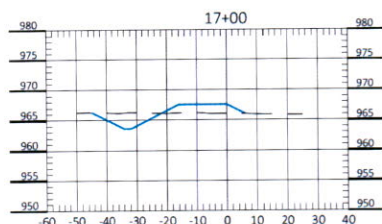
WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
AGRICULTURAL LEVEE SOUTH X-SECTIONS



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
AGRICULTURAL LEVEE SOUTH X-SECTIONS


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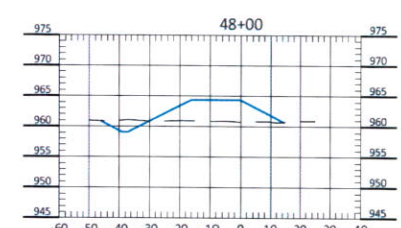
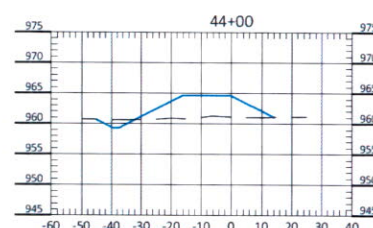
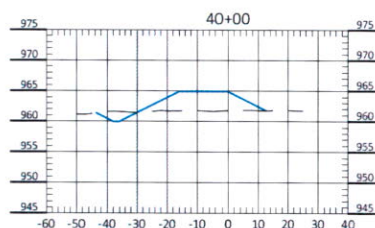
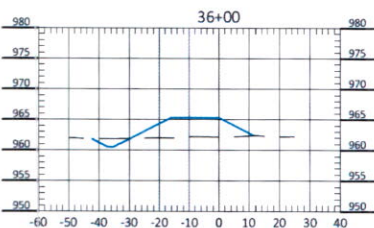
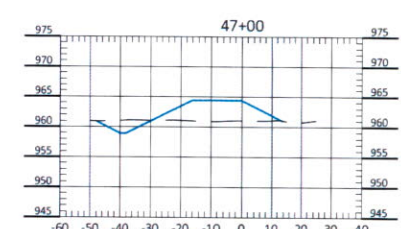
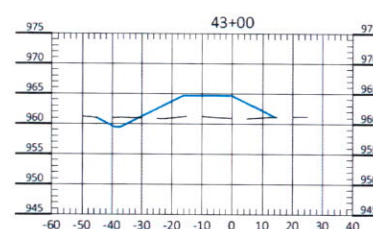
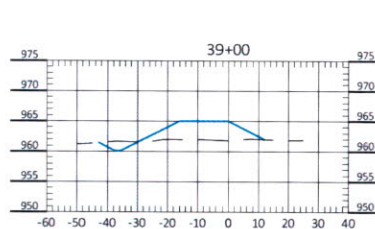
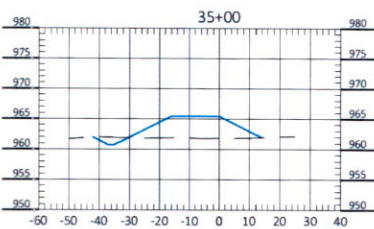
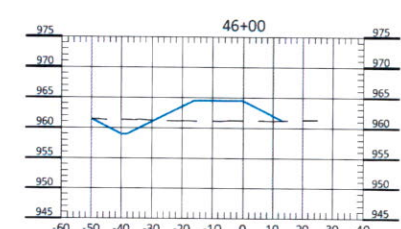
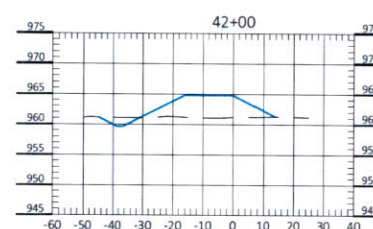
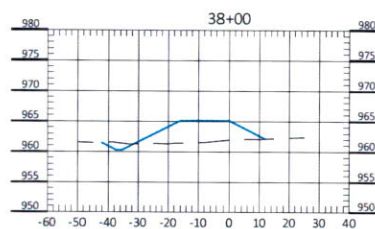
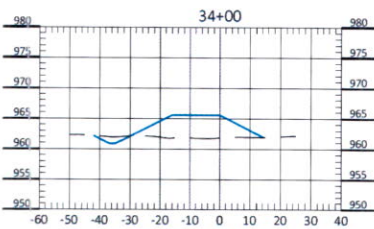
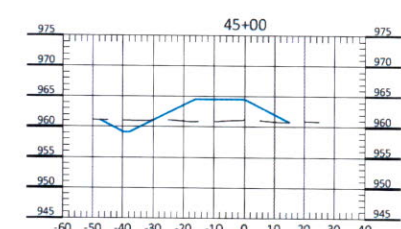
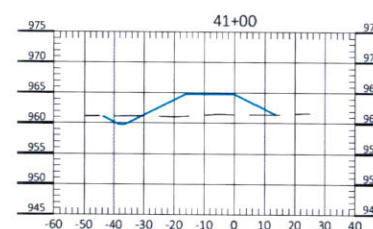
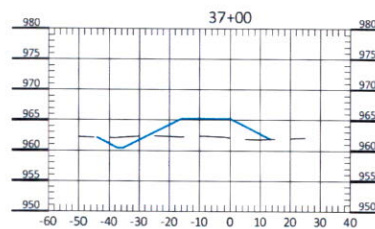
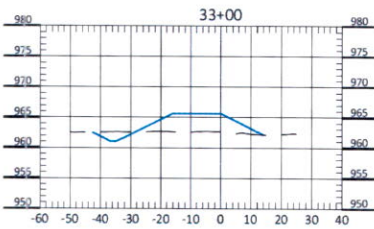
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

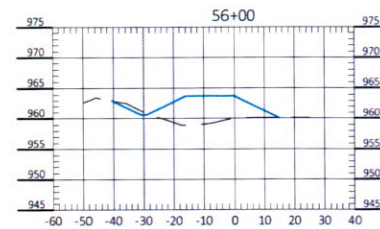
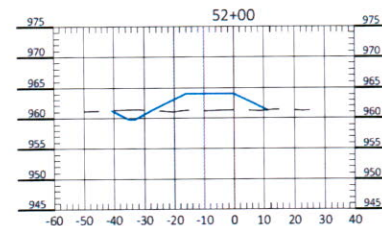
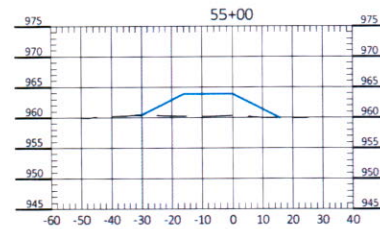
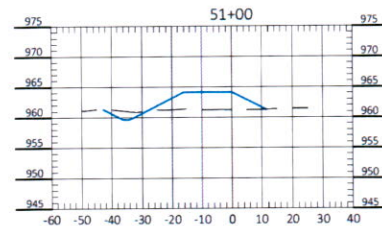
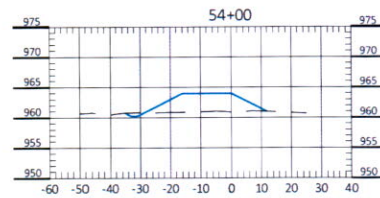
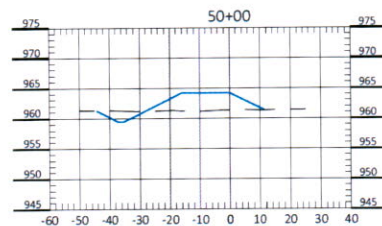
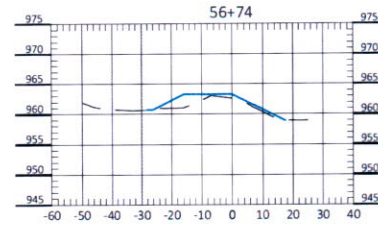
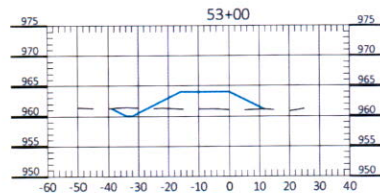
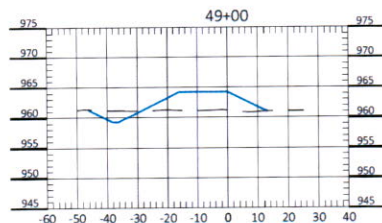
AGRICULTURAL LEVEE SOUTH X-SECTIONS



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W-47

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
AGRICULTURAL LEVEL SOUTH X-SECTIONS


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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
MIN - STORM WATER POLLUTION PREVENTION PLAN (SWPPP)



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
MN - STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

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UPPER MINNESOTA RIVER WATERSHED DISTRICT
CANTONVILLE, MINNESOTA

SD - STORM WATER POLLUTION PREVENTION PLAN (SWPPP)



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W-51

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CONSTRUCTION PLANS

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA



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WHEATSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
ROCK WEIR DETAILS



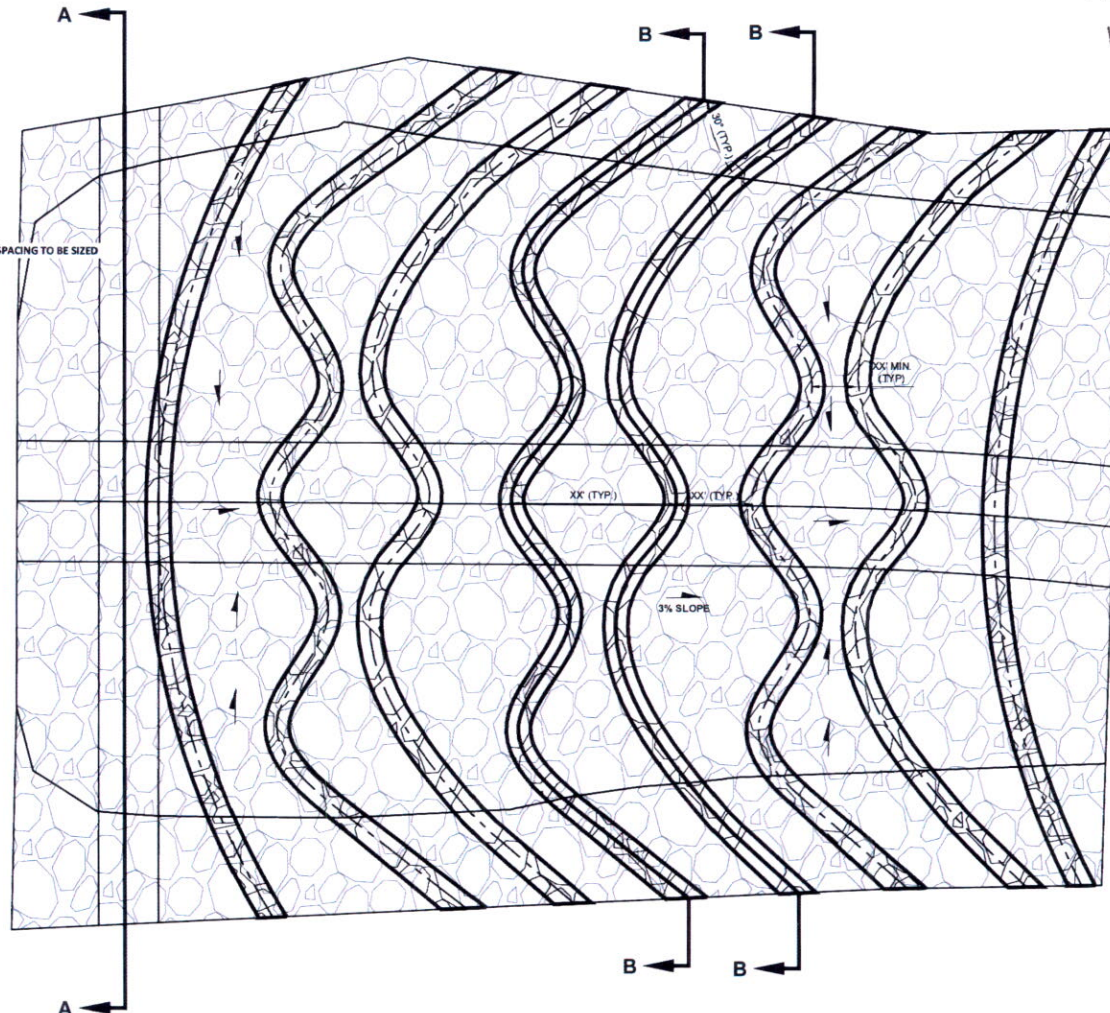
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DATE
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PROJECT NUMBER
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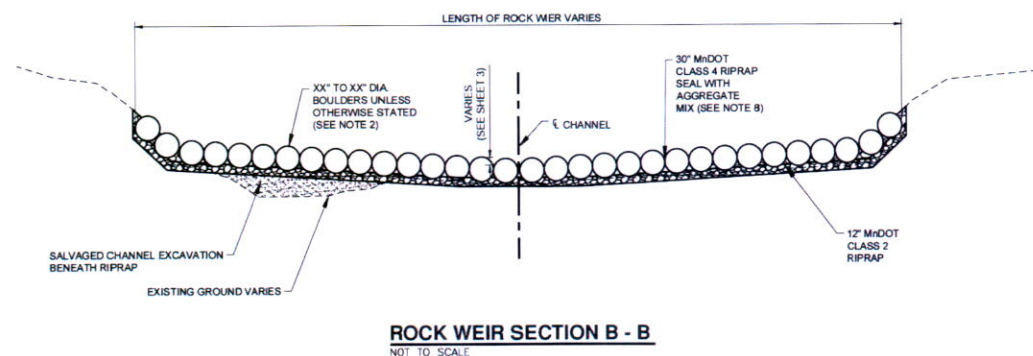
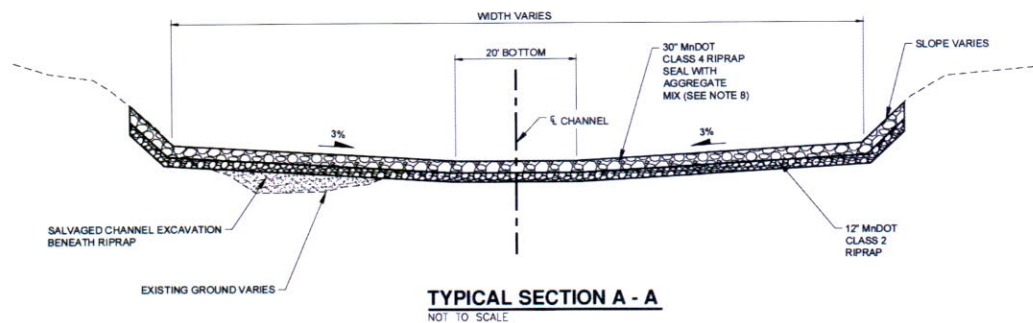
D-1

NOTES:

1. NUMBER OF BOULDERS FOR EACH ROCK-ARCH IS DEPENDENT ON SIZE AND SPACING OF BOULDERS.
2. ROCK WEIRS SHALL CONSIST OF XX"XX" BOULDERS. TOP OF BOULDERS SHALL BE SET ABOVE MNDOT CL 4 RIPRAP AS SHOWN ON THE PROFILE TO RESULT IN WEIRS SPACED AT APPROXIMATELY XX' OR XX' INTERVALS AT THE CENTERLINE.
3. BOULDER WEIRS ARE TO BE FILLED WITH SMALLER STONE (MNDOT CL 2 ROCK RIPRAP) TO REDUCE LEAKAGE AND CREATE POOLS.
4. ADDITIONAL BOULDERS WILL BE ADDED RANDOMLY TO ADD TO AESTHETICS AS DIRECTED BY THE ENGINEER OR REPRESENTATIVE IN THE FIELD (ESTIMATED AT XX' ADDITIONAL BOULDERS). THE LINEAR FOOTAGE OF THE ADDITIONAL BOULDERS SHALL BE MEASURED AS THE AVERAGE OF THE CENTERLINE LENGTH IN ALL 3 AXIS PLANES AND PAID FOR UNDER THE BID ITEM "ROCK WEIR (XX" TO XX" DIAMETER BOULDERS)".
5. THE WEIRS FUNCTION TO PROVIDE ADDED STABILITY TO THE RAPIDS, RESTING AREA FOR THE MIGRATION OF FISH, DIRECTING FLOW TOWARDS MID-CHANNEL (REDUCING STRESS ON BANKS) AND INCREASING SAFETY BY CREATING LOW VELOCITIES NEAR BANKS.
6. WEIRS ARE TO BE INTEGRATED INTO THE CONSTRUCTED BANKS. THE GAPS BETWEEN BOULDERS SHALL TYPICALLY RANGE FROM 0 TO 6 INCHES.
7. ALL FILL MATERIAL UNDER RIPRAP RAMP TO BE EITHER GRANULAR FILL OR EXCAVATED CHANNEL MATERIAL.
8. VOIDS IN THE PLACED RIPRAP SHALL BE FILLED WITH A WELL GRADED MIX OF AGGREGATE VARYING FROM THE NO. 40 SIEVE UP TO 3 INCH STONES. THE MIX OF AGGREGATE SHOULD BE SUCH THAT IT IS NOT BLOWN OUT OF THE RIPRAP BY THE RIVERS CURRENT BUT INSTEAD FORCES FLOW OVER THE RIPRAP. EXCESS CHANNEL EXCAVATION CAN BE USED FOR FILLING VOIDS WITH ENGINEERS APPROVAL.

BOULDERS AND SPACING TO BE SIZED





- BOULDERS AND
-
- SPACING TO BE
-
- SIZED

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4. ADDITIONAL BOULDERS WILL BE ADDED RANDOMLY TO ADD TO AESTHETICS AS DIRECTED BY THE ENGINEER OR REPRESENTATIVE. THE FIELD ESTIMATED AT XX ADDITIONAL BOULDERS. THE LINEAR FOOTAGE OF THE ADDITIONAL BOULDERS SHALL BE MEASURED AS THE AVERAGE OF THE CENTERLINE LENGTH IN ALL 3 AXIS PLANES AND PAID FOR UNDER THE BID ITEM "ROCK WEIR (XX" TO XX" DIAMETER BOULDER)".
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

ROCK WEIR DETAILS



Maple Grove

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DATE 2.2.2024

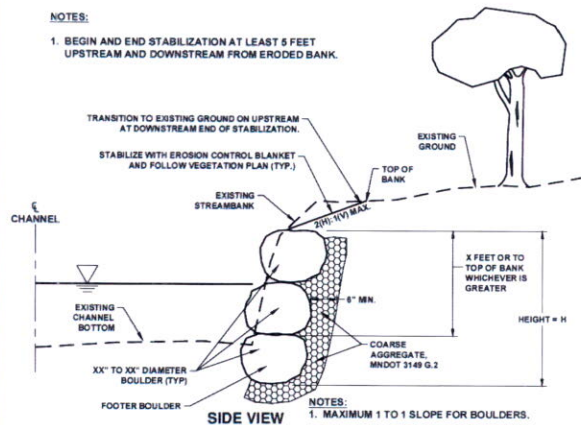
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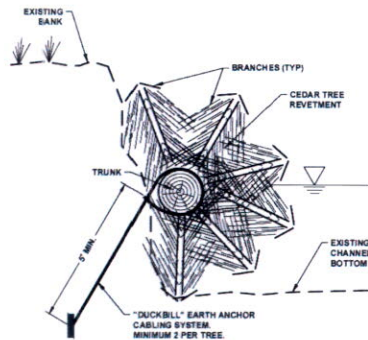
NOTES:

1. BEGIN AND END STABILIZATION AT LEAST 5 FEET UPSTREAM AND DOWNSTREAM FROM ERODED BANK.



BOULDER REVETMENT DETAIL

NOT TO SCALE



TYPICAL SECTION

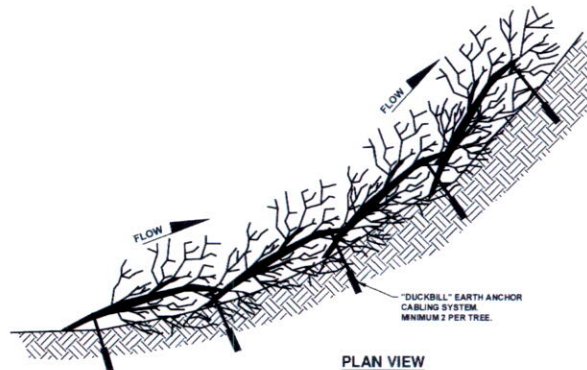
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NOTES:

1. USE FRESH, BRUSHY, CEDAR TREES CONTAINING MANY BRANCHES OR ENGINEER APPROVED EQUAL. LENGTH OF TREE SHALL BE 10 TO 15 FEET.
2. REMOVE BRANCHES FROM ONE SIDE OF TREE TO ALLOW TRUNK TO SIT TIGHT AGAINST BANK.
3. BEGIN INSTALL ON THE DOWNSTREAM END AND MOVE UPSTREAM WITH THE TOP OF THE TREES POINTING DOWNSTREAM.
4. THE FIRST TREE IS ANCHORED BY INSTALLING "DUCKBILL" EARTH ANCHORS TWO FEET FROM TOP OF TREE.
5. THE ANCHOR IS DRIVEN INTO THE BANK AT A 45 DEGREE ANGLE FAR ENOUGH SO THAT THE CABLE IS TIGHT AND THE TREE WILL NOT MOVE. BIND CABLE OVER TRUNK. EACH ANCHOR BAR SHOULD PROVIDE A MINIMUM PULL OUT RESISTANCE OF 150 LBS OR INSTALL ANCHORS AT PROPORTIONATELY CLOSER SPACING.
6. PLACE SECOND TREE UPSTREAM SO THAT THE TOP OF THE UPSTREAM TREE OVERLAPS THE BASE OF THE DOWNSTREAM TREE BY 3 FEET.
7. A SECOND EARTH ANCHOR IS CABLED AROUND THE TWO TREES AND DRIVEN INTO THE GROUND. CONTINUE WORKING UPSTREAM.
8. BEGIN AND END REVETMENTS AT LEAST ONE TREE LENGTH BEYOND ERODING PORTIONS OF THE BANK.
9. WEAVE THE REMOVED BRANCHES INTO THE BRANCHES ON THE BACKSIDE OF THE REVETMENT TO CREATE A DENSE MATRIX OF BRUSH.
10. IN AREAS OF HIGHER BANK CUTS, REVETMENTS SHALL BE STACKED UP MULTIPLE LAYERS HIGH TO TOP OF BANK.

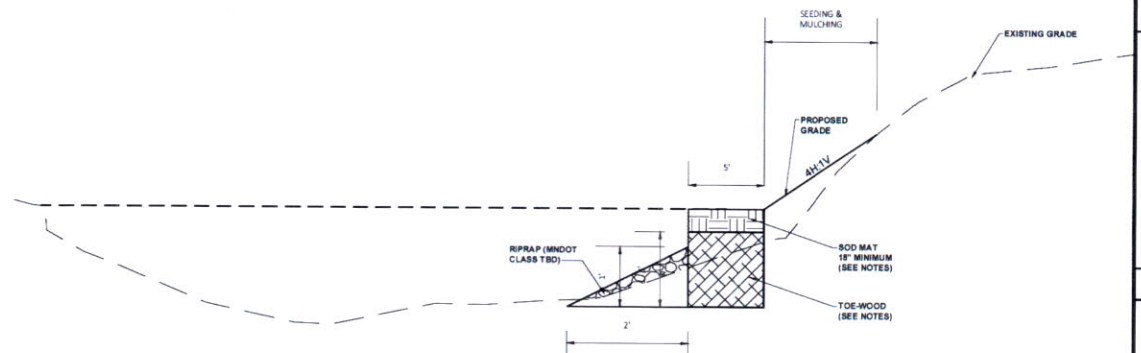
CEDAR TREE REVETMENT DETAIL

NOT TO SCALE



PLAN VIEW

NOT TO SCALE



TOE WOOD TYPICAL SECTION

NOT TO SCALE

ESTIMATED BENCH QUANTITIES

1. COMPACTED TOE-WOOD DEBRIS = XX C.Y.
2. XX" MIN THICKNESS SOD MAT = XX S.Y.
3. CLASS V RIPRAP = XX C.Y.

NOTES:

1. TOE-WOOD IS TO BE INSTALLED X FT WIDE BY Y FT IN DEPTH BELOW XX" OF SOD MAT.
2. TOE-WOOD DEBRIS SHALL CONSIST OF TREE ROOT SYSTEMS WITH A MINIMUM XX FT PORTION OF THE TRUNK STILL ATTACHED. THE ROOT SYSTEMS SHALL BE PLACED A MAXIMUM OF XX FT APART WHEN MEASURED FROM CENTER TO CENTER.
3. ADDITIONAL WOOD DEBRIS REQUIRED TO RAISE BENCH TO SPECIFIED ELEVATION. ACCEPTABLE DEBRIS CONSISTS OF ANY WOOD MATERIAL THAT HAS SUFFICIENT LIMBS TO LINK TO TREE ROOTS/OTHER DEBRIS.
4. ACCEPTABLE WOOD DEBRIS SHALL BE DETERMINED BY THE ENGINEER OR FIELD REPRESENTATIVE.
5. COMPACTION OF WOOD DEBRIS IS REQUIRED. SUFFICIENT COMPACTION SHALL BE DETERMINED BY THE ENGINEER OR FIELD REPRESENTATIVE.
6. SOD MAT SHALL CONSIST OF SUFFICIENT PLANT GROWTH TO BIND THE SOD MAT TOGETHER. SOD MATS CONTAINING WILLOWS AND/OR DENSE STANDS OF GRASSES ARE CONSIDERED IDEAL. ACCEPTABLE SOD MATERIAL SHALL BE DETERMINED BY ENGINEER OR FIELD REPRESENTATIVE.
7. ENGINEER TO STAKE LIMITS OF TOE-WOOD DEBRIS BENCH.

TO BE SIZED

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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

REVETMENT & TOEWOOD DETAIL



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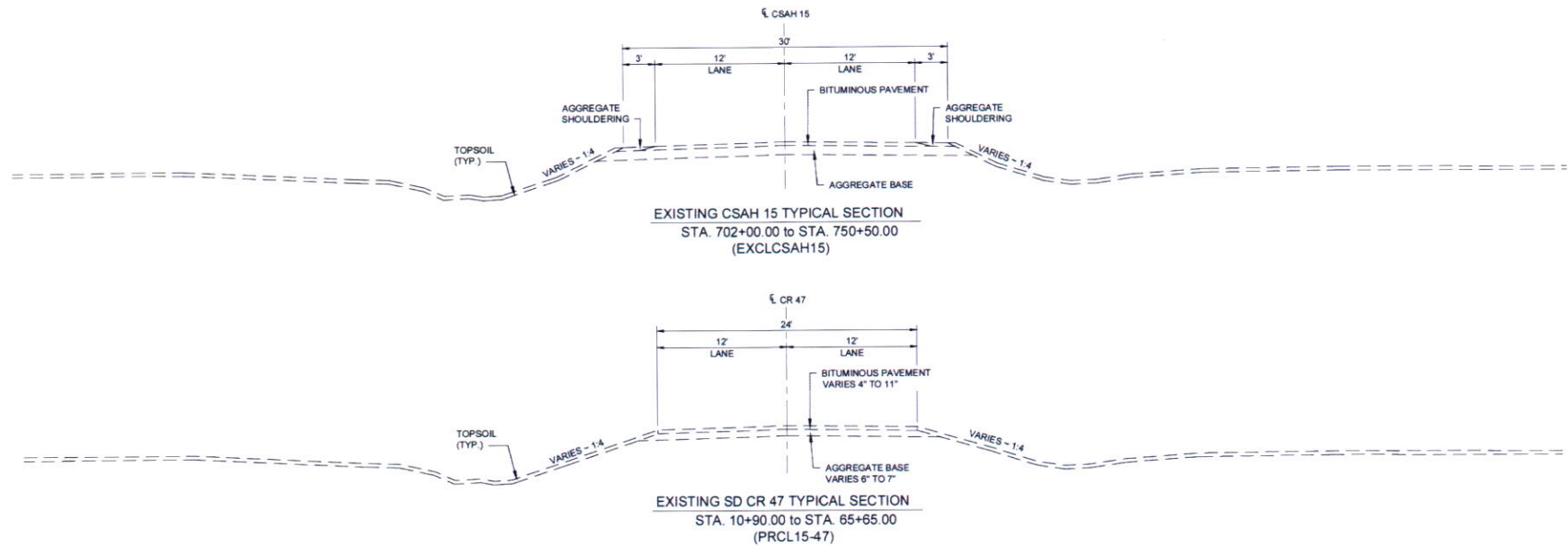
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
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EXISTING TYPICAL SECTIONS


Hewlett-Packard Engineering Inc.
Maple Grove
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1-29-2021
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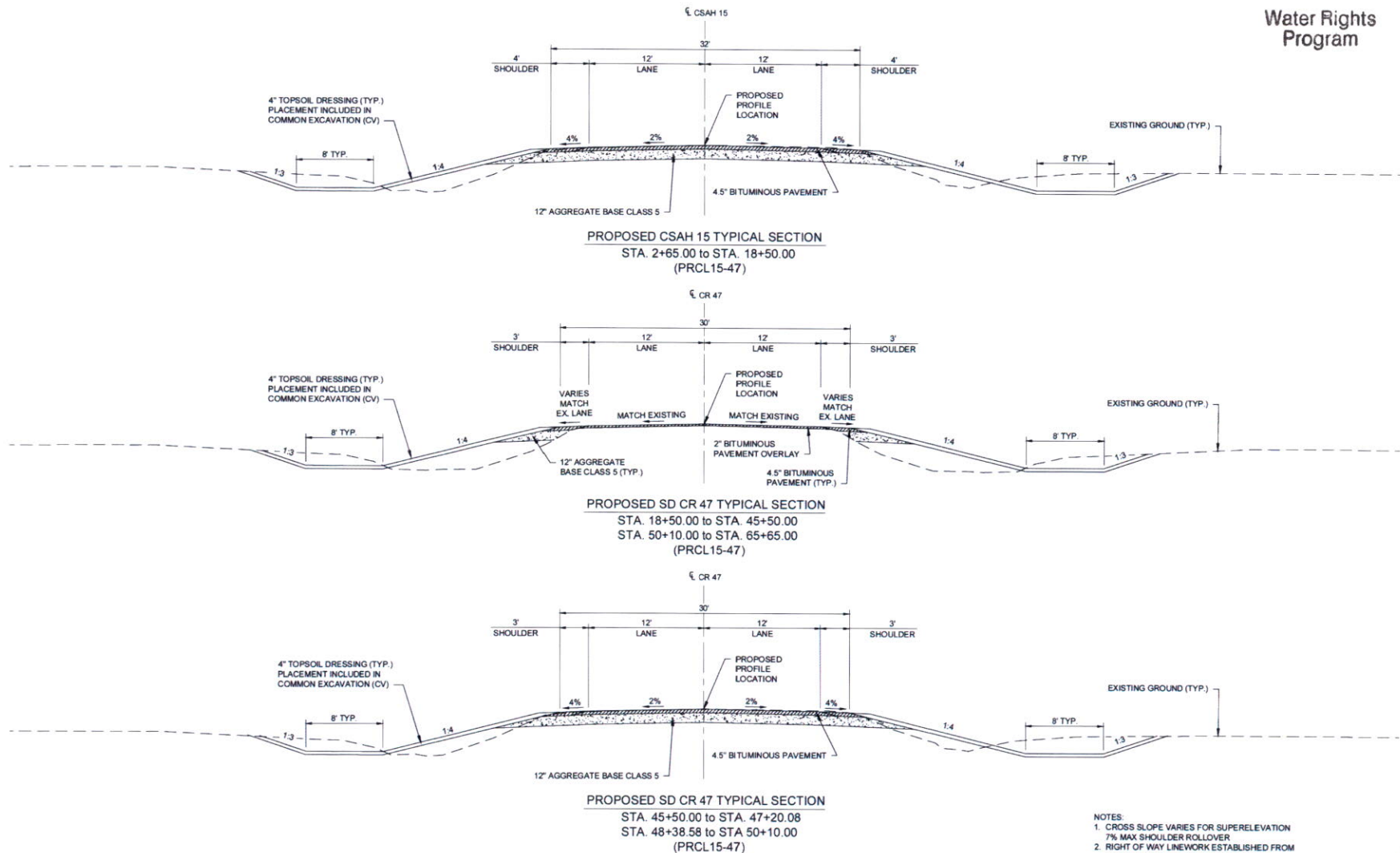
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WHETSTONE RIVER RESTORATION PROJECT
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ORTONVILLE, MINNESOTA
PROPOSED TYPICAL SECTIONS



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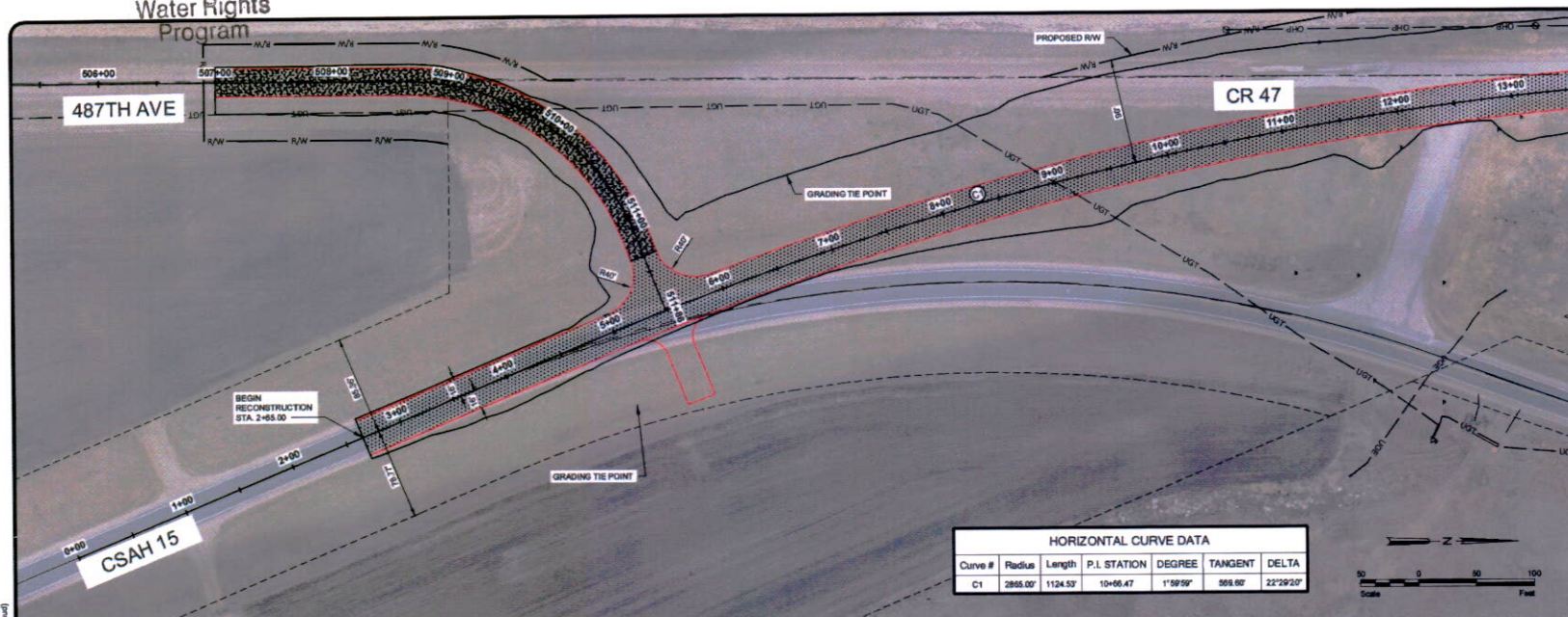
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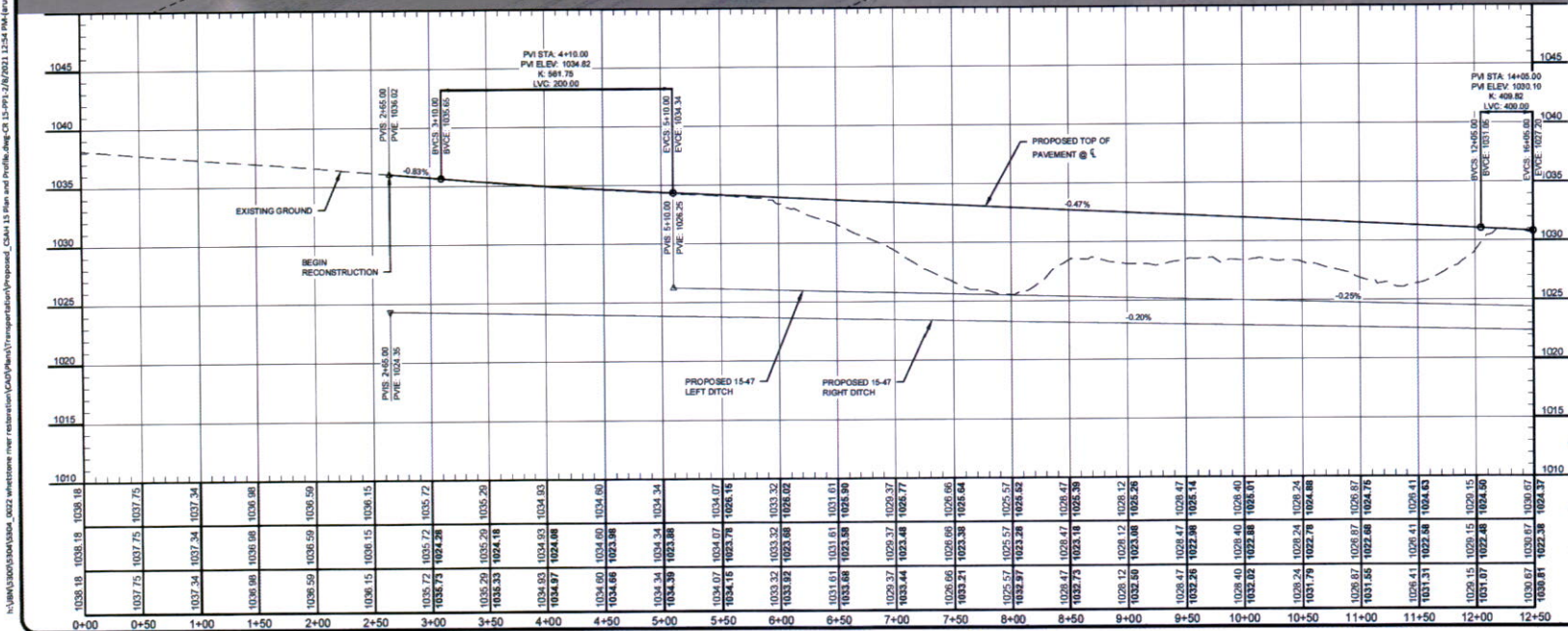
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- NOTES:
1. RIGHT OF WAY LINEWORK ESTABLISHED FROM GIS PARCEL DATA. ESTABLISHMENT OF BOUNDARY LINEWORK IS ONGOING.
 2. 4.0% MAX SUPERELEVATION WITHIN CURVE 1



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EX GROUND ELEV. @ 1'
(LT) PR LT DITCH ELEV.
EX GROUND ELEV. @ 1'
(RT) PR RT DITCH ELEV.
EX GROUND ELEV. @ 1'
PR TOP AGGREGATE ELEV. @ 1'

No.	Revision	Date

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 PLAN AND PROFILE

Maple Grove
P: 763.493.4522
F: 763.493.5572

DRAFTED BY
SMH

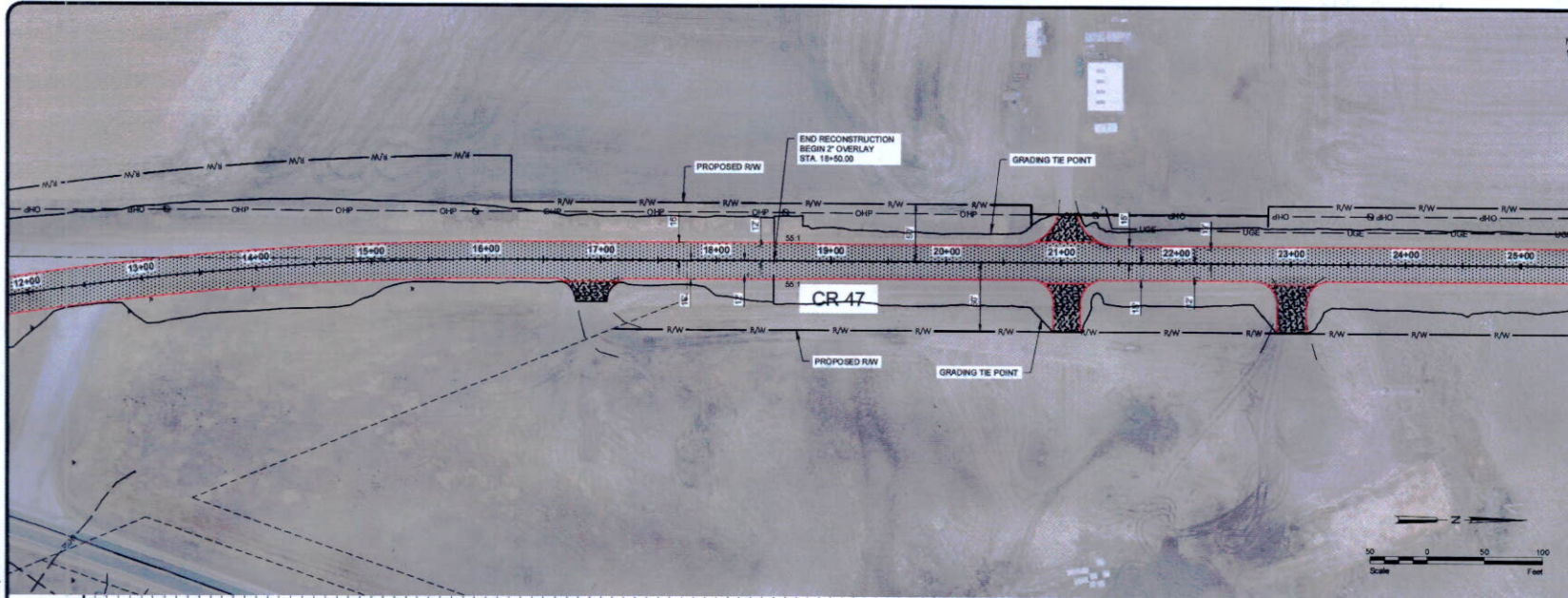
REVIEWED BY
AMR

DATE
1-29-2021

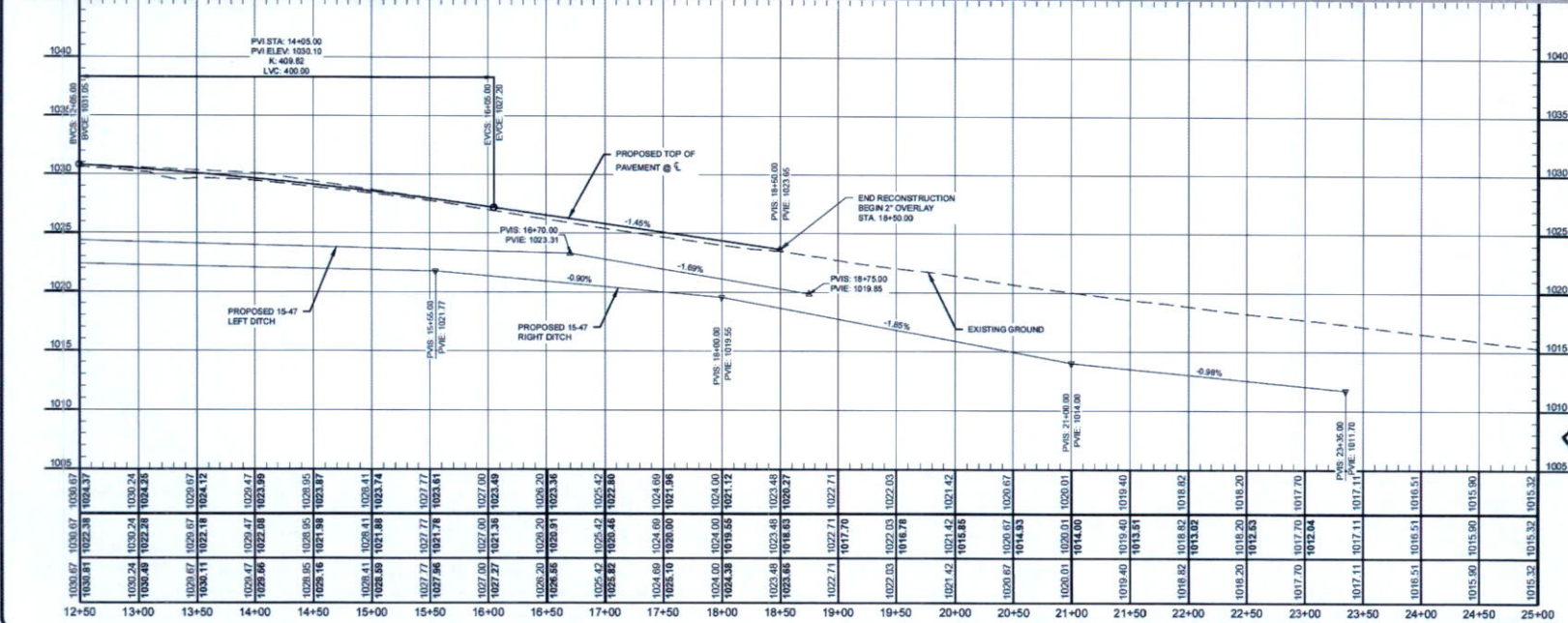
PROJECT NUMBER
5304-0022

T-6

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NOTES:
1. RIGHT OF WAY LINEWORK
ESTABLISHED FROM GIS
PARCEL DATA.
ESTABLISHMENT OF
BOUNDARY LINEWORK IS
ONGOING



PRELIMINARY
NOT FOR CONSTRUCTION

EX GROUND ELEV. @ 1'
(LT) P.R.T. DITCH ELEV.
EX GROUND ELEV. @ 1'
(RT) P.R.T. DITCH ELEV.
EX GROUND ELEV. @ 1'
PR TOP AGGREGATE ELEV. @ 1'

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
CSAH 15 PLAN AND PROFILE

Maple Grove
P: 763.493.4522
F: 763.493.5572

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SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

T-7

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Water Rights
Program

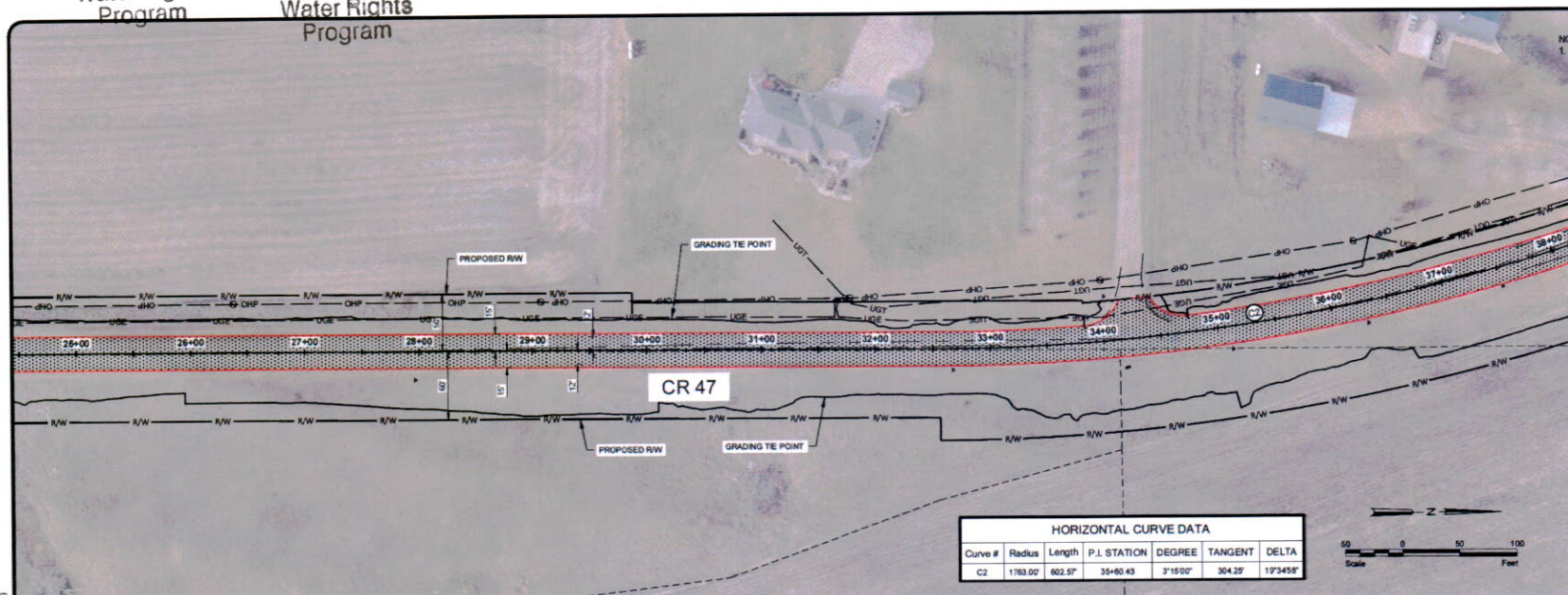
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4-3-2026

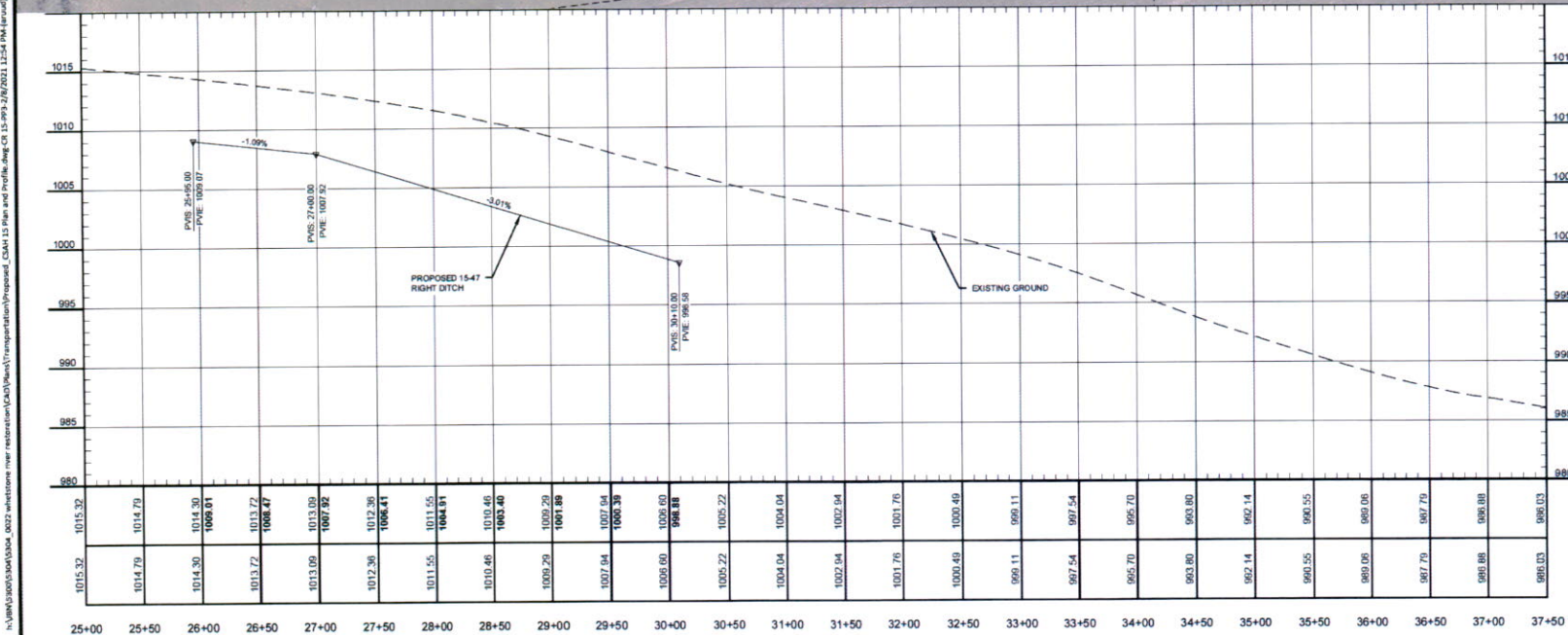
4-3-2026

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Program

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Program



NOTES
1. RIGHT OF WAY LINEWORK
ESTABLISHED FROM GIS
PARCEL DATA.
ESTABLISHMENT OF
BOUNDARY LINEWORK IS
ONGOING



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EX GROUND ELEV. @ 1'
(RT) PR RT DITCH ELEV.

EX GROUND ELEV. @ 1'
PR TOP AGGREGATE ELEV. @ 1'

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

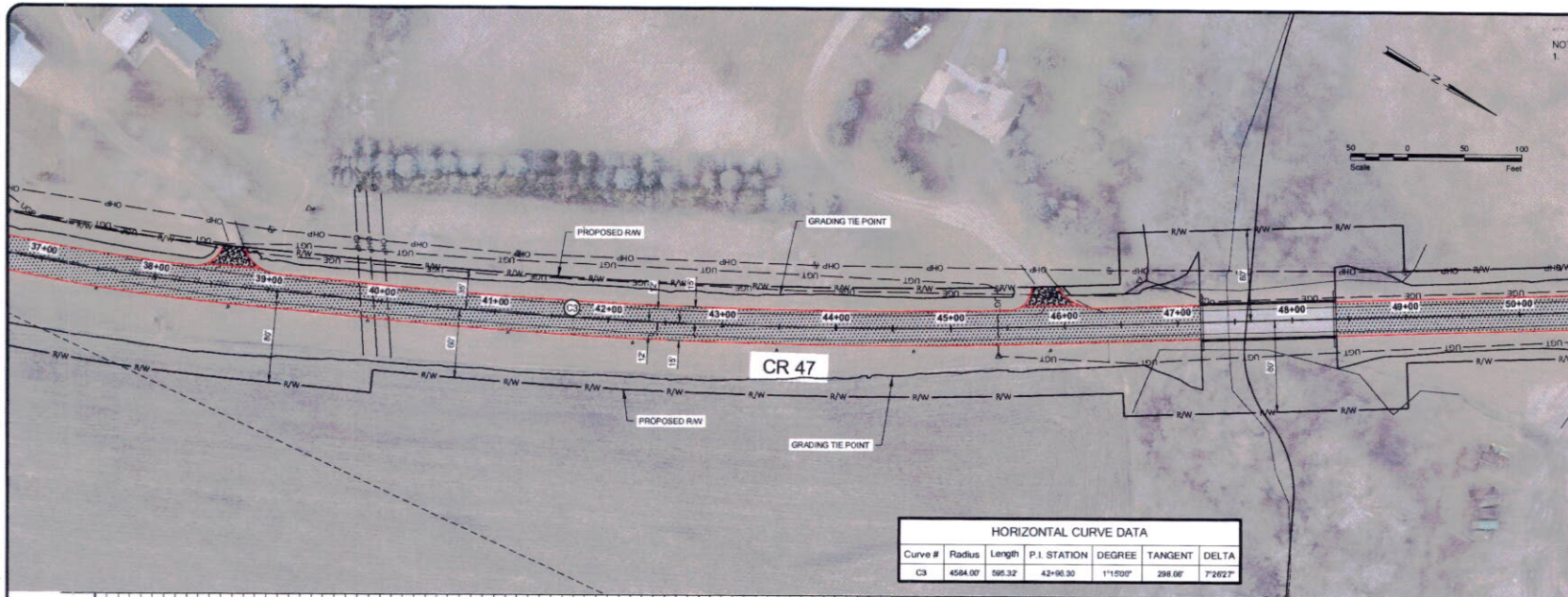
CSAH 15 PLAN AND PROFILE

3i
Hawland Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

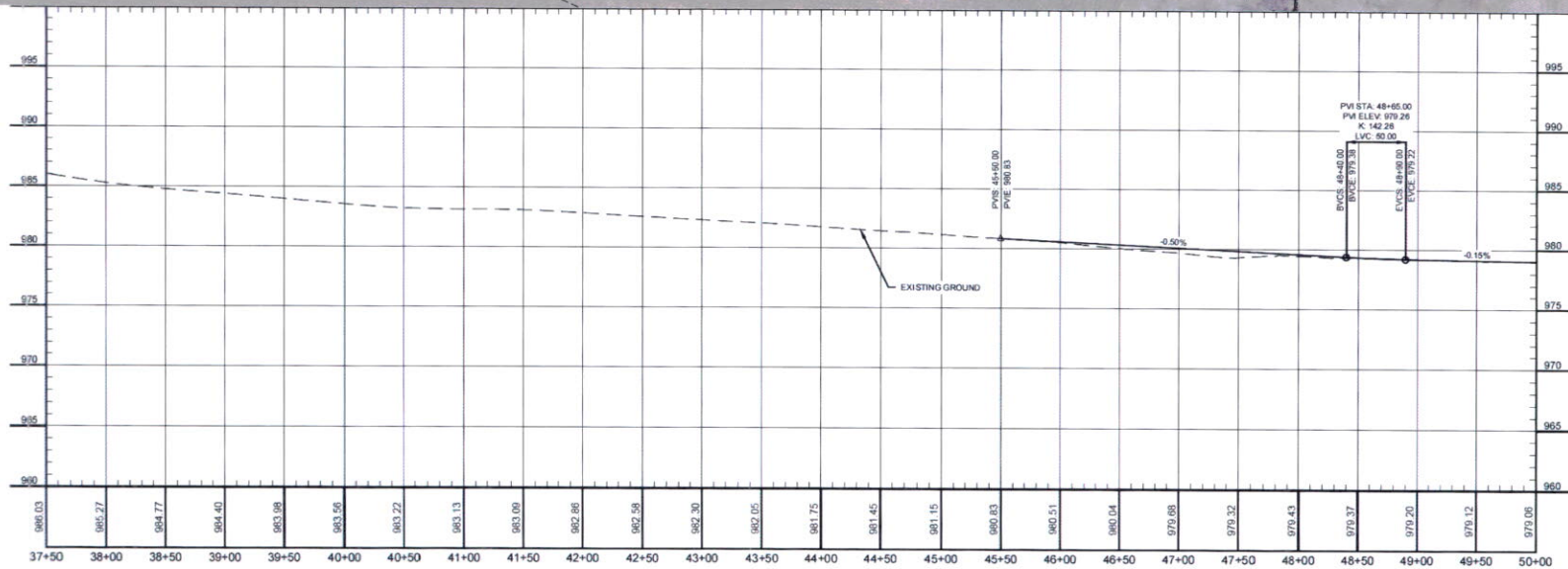
DRAFTED BY
SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

T-8

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HORIZONTAL CURVE DATA						
Curve #	Radius	Length	P.I. STATION	DEGREE	TANGENT	DELTA
C1	4584.00'	595.32'	42+96.30	11°15'00"	296.00'	7°20'27"



NOTES:
1. RIGHT OF WAY LINEWORK ESTABLISHED FROM GIS PARCEL DATA. ESTABLISHMENT OF BOUNDARY LINEWORK IS ONGOING.

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 PLAN AND PROFILE

Maple Grove
P: 763.493.4322
F: 763.493.5572

DRAFTED BY
SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

T-9

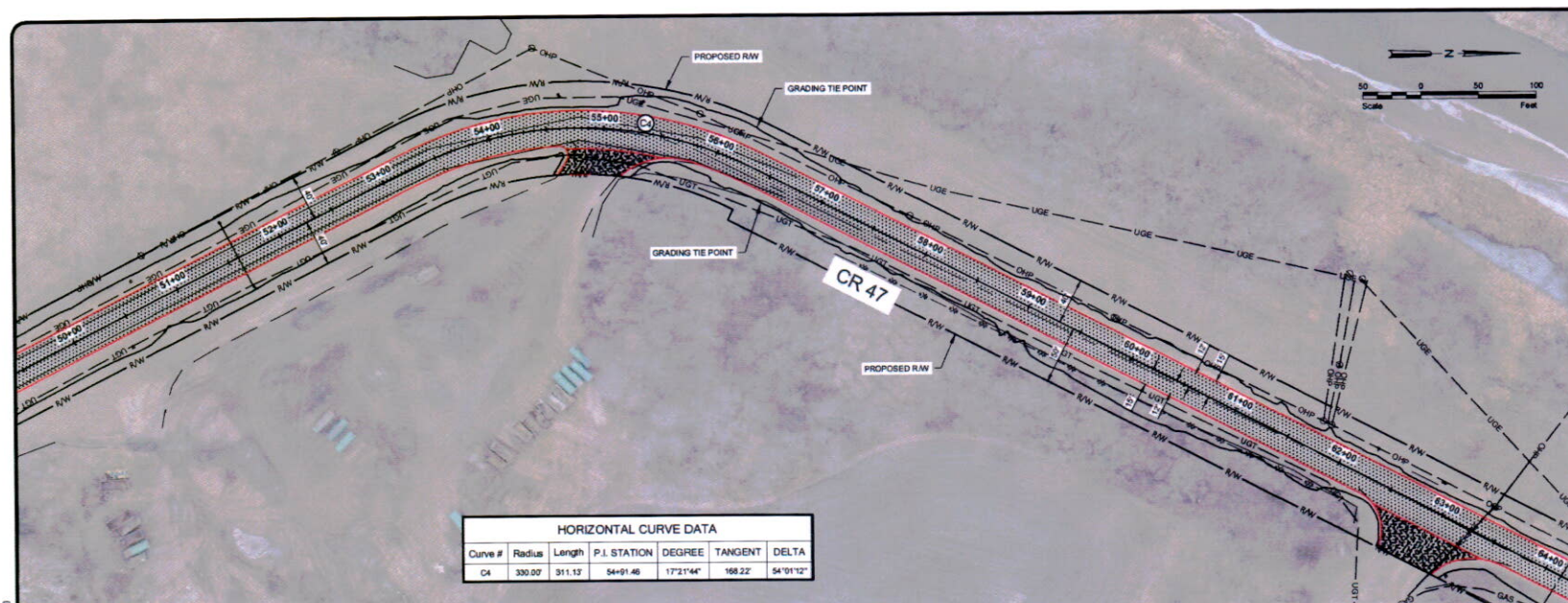
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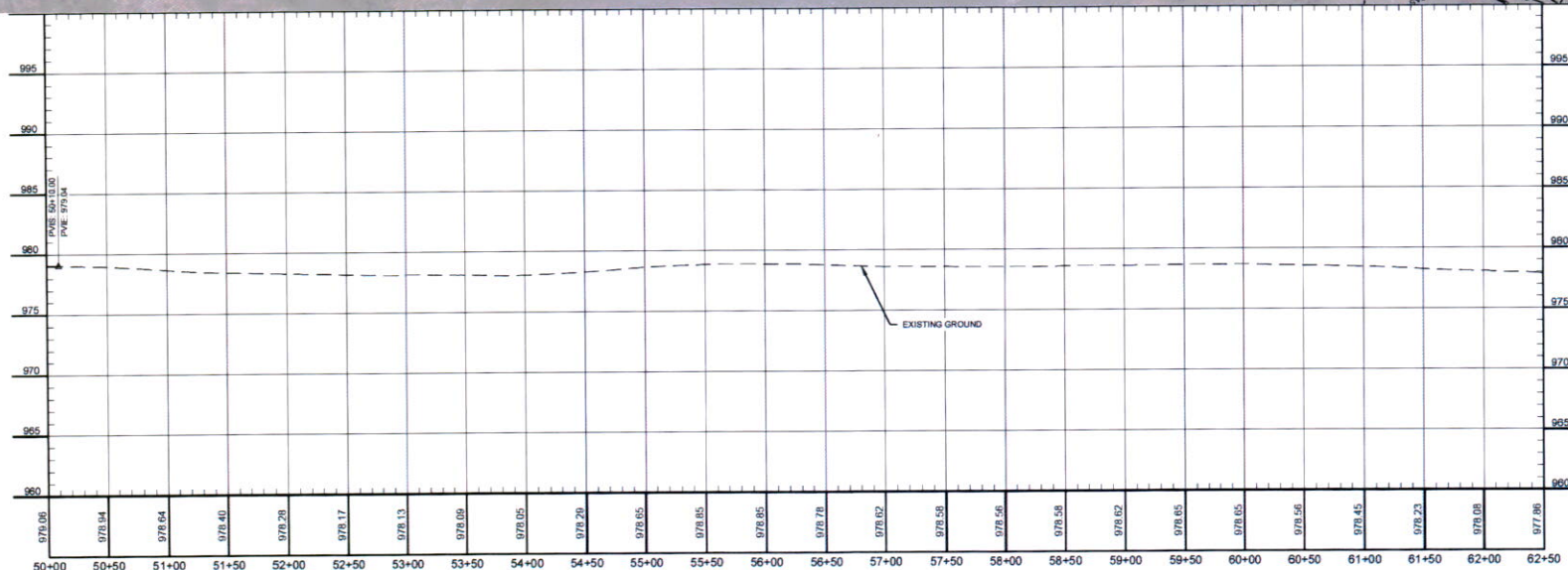
Water Rights
Program

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HORIZONTAL CURVE DATA						
Curve #	Radius	Length	P.I. STATION	DEGREE	TANGENT	DELTA
C4	330.07	311.13	54+91.46	17°21'44"	168.22'	54°01'12"



NOTES
1. RIGHT OF WAY LINEWORK
ESTABLISHED FROM GIS
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 PLAN AND PROFILE

3i
Houshield Engineering Inc.
Maple Grove
P: 763.493.4522
F: 763.493.5572

DRAFTED BY
SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

T-10

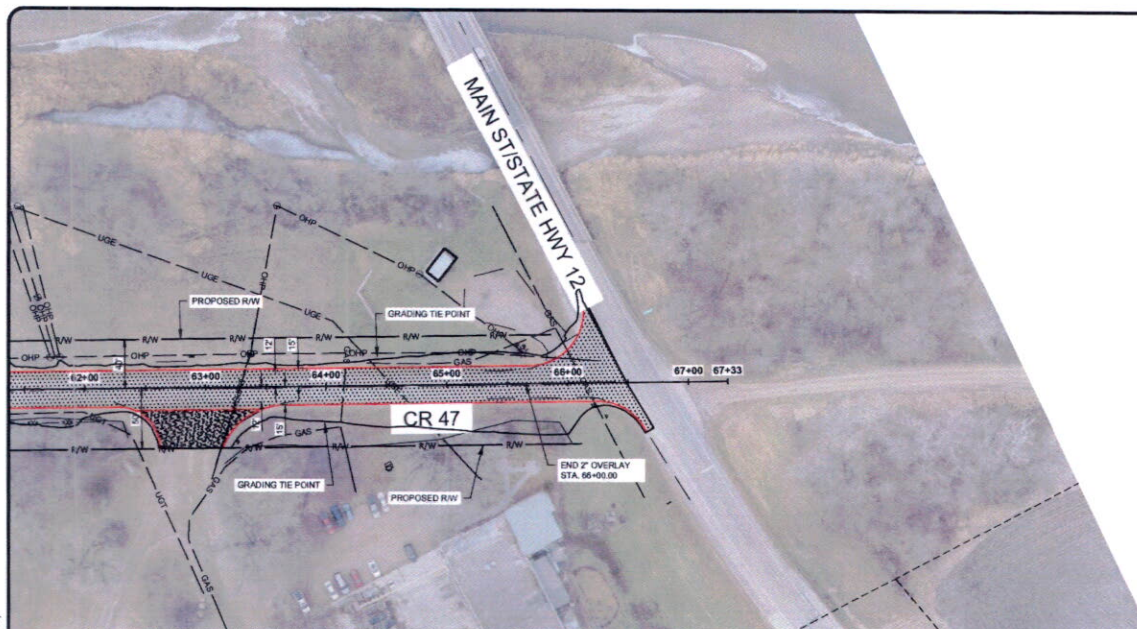
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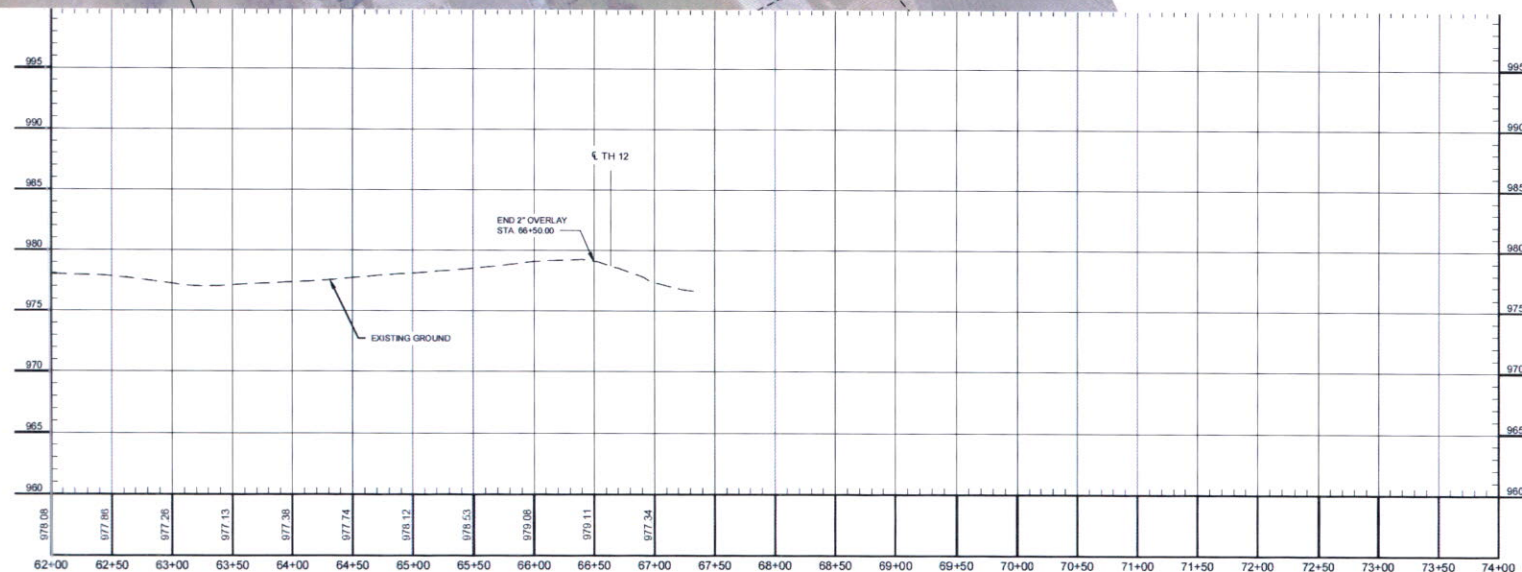
NOTES:
1. RIGHT OF WAY LINEWORK
ESTABLISHED FROM GIS
PARCEL DATA
ESTABLISHMENT OF
BOUNDARY LINEWORK IS
ONGOING



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WHEYSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
CSAH 15 PLAN AND PROFILE

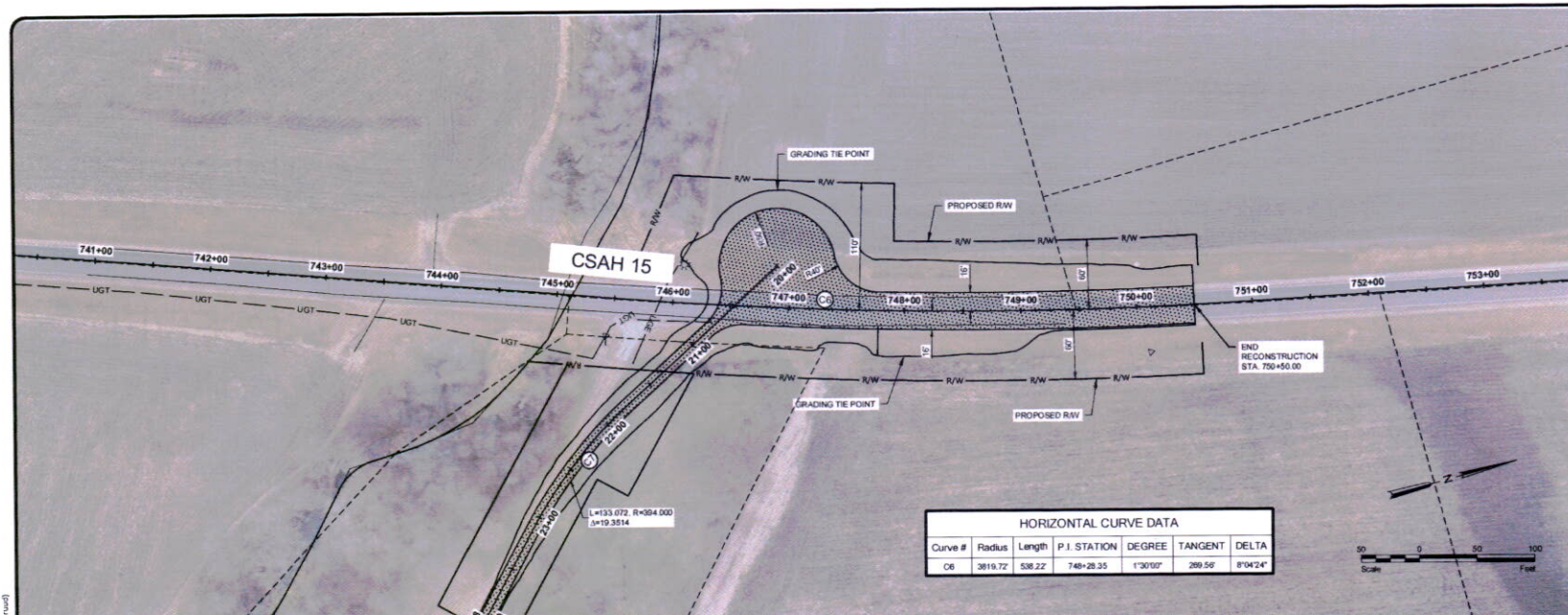


DRAFTED BY
SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

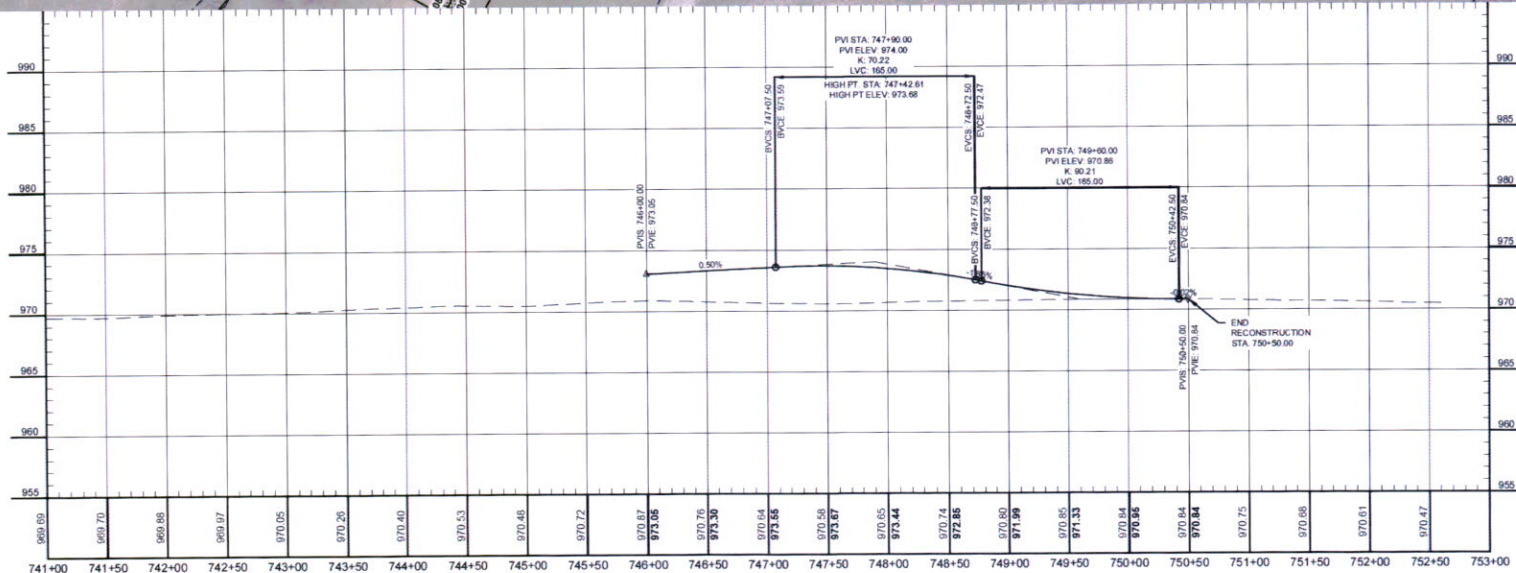
PRELIMINARY
NOT FOR CONSTRUCTION

T-11

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NOTES:
1. RIGHT OF WAY LINEWORK ESTABLISHED FROM GIS PARCEL DATA. ESTABLISHMENT OF BOUNDARY LINEWORK IS ONGOING.



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

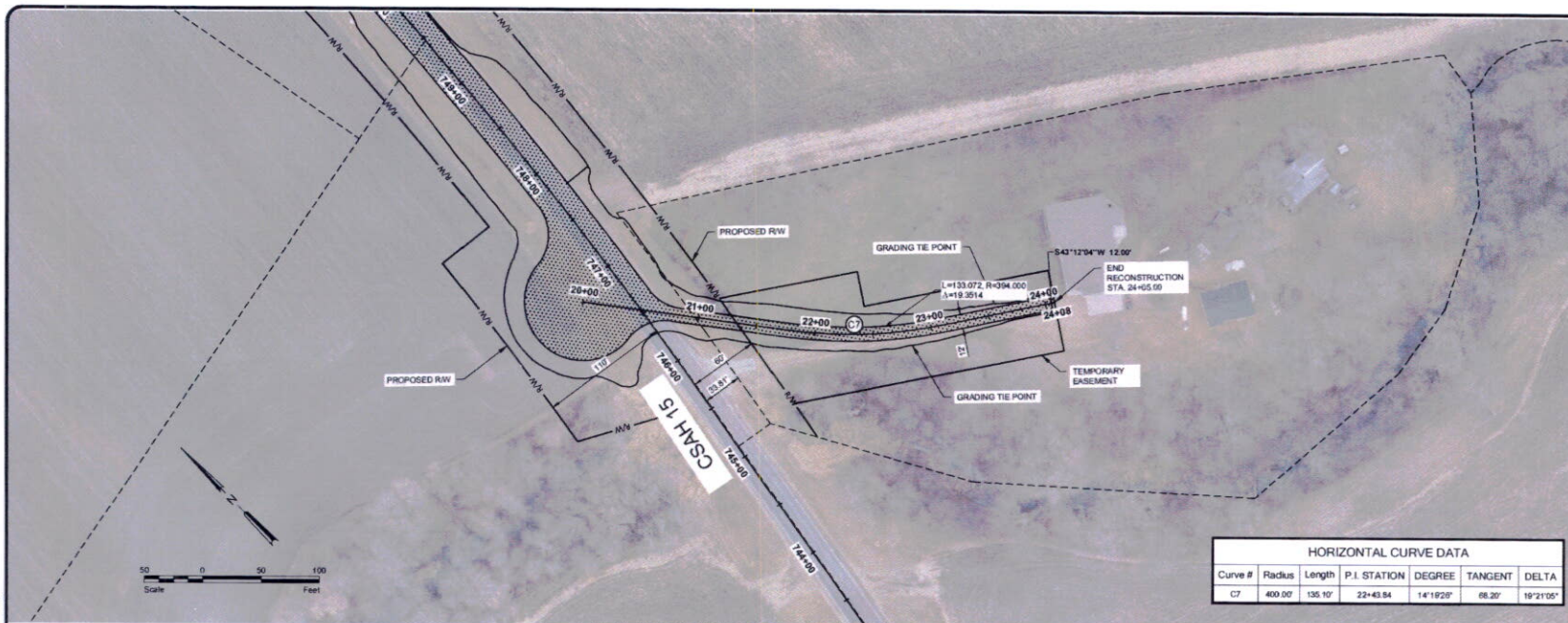
CUL-DE-SAC PLAN & PROFILE

Maple Grove
P: 763.493.4522
F: 763.493.5572

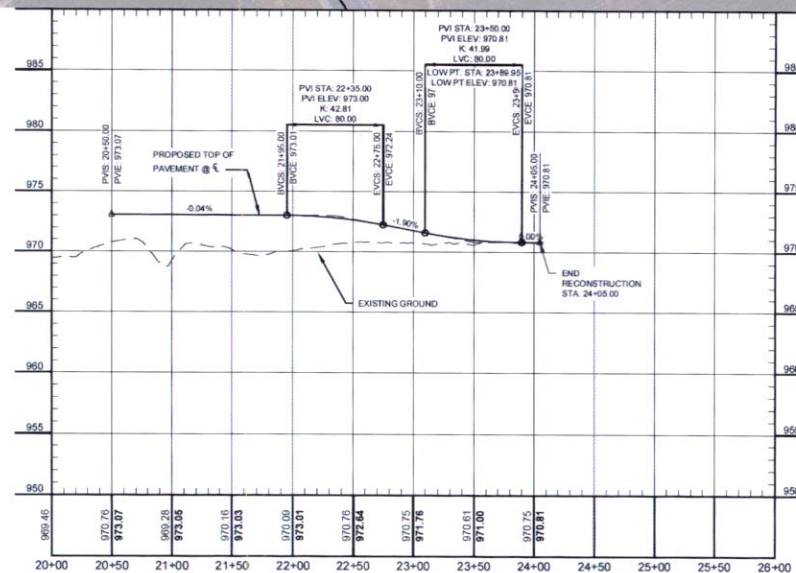
DRAFTED BY
SMH
REVIEWED BY
AMR
DATE
1-29-2021
PROJECT NUMBER
5304-0022

T-12

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HORIZONTAL CURVE DATA					
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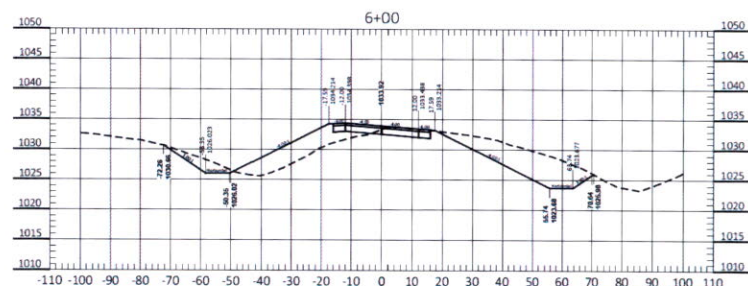
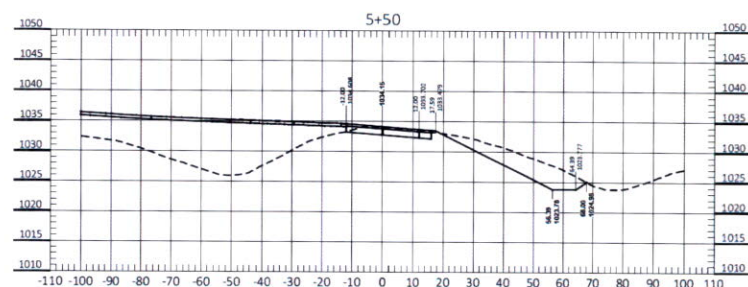
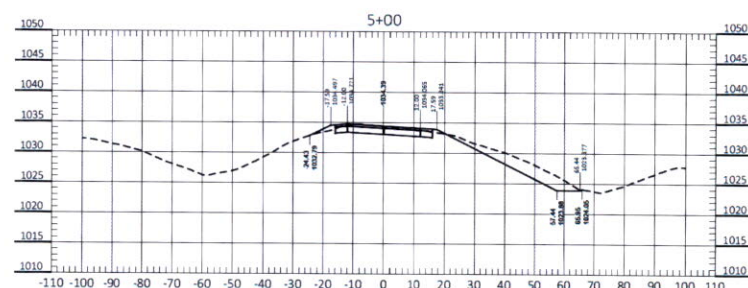
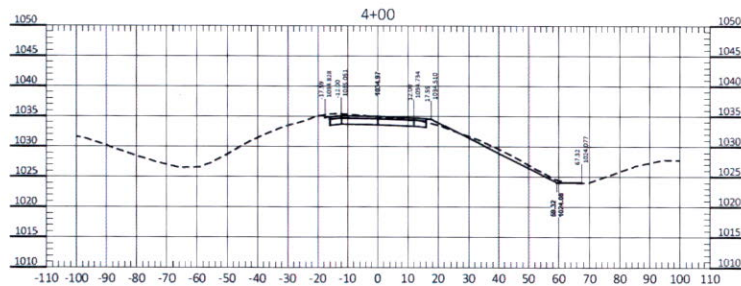
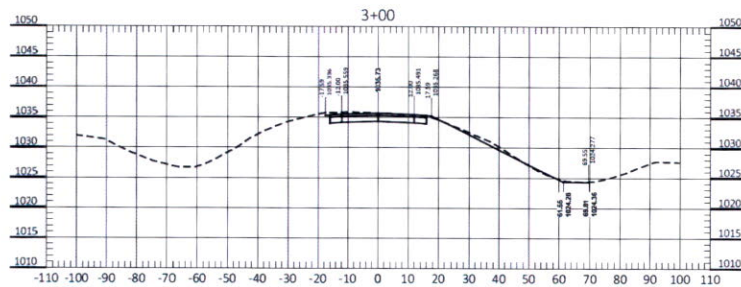
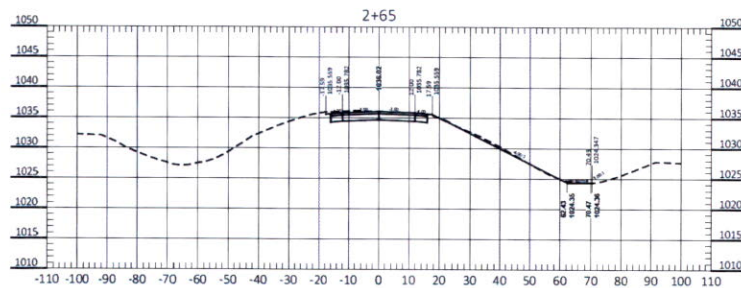
NOTES:
1. RIGHT OF WAY LINEWORK
ESTABLISHED FROM GIS
PARCEL DATA
ESTABLISHMENT OF
BOUNDARY LINEWORK IS
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Program

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WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		Dwyer Driveway Plan & Profile	
Drawn by	Checked by	Date	By
Maple Grove P: 763.493.4022 F: 763.493.5572		DRAFTED BY SMH REVIEWED BY AMR DATE 1-29-2021 PROJECT NUMBER 5304-0022	
T-13			

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
CSAH 15 CROSS SECTIONS

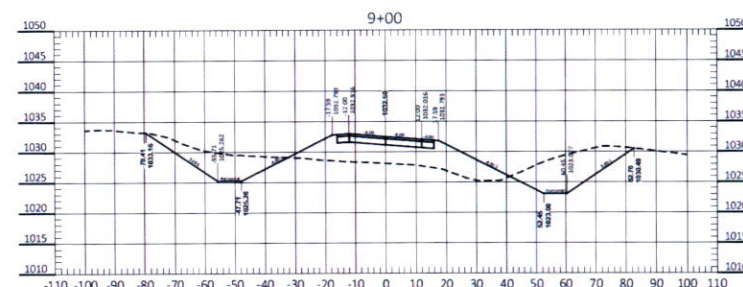
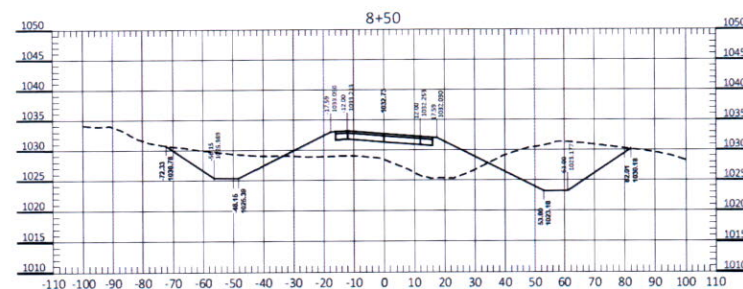
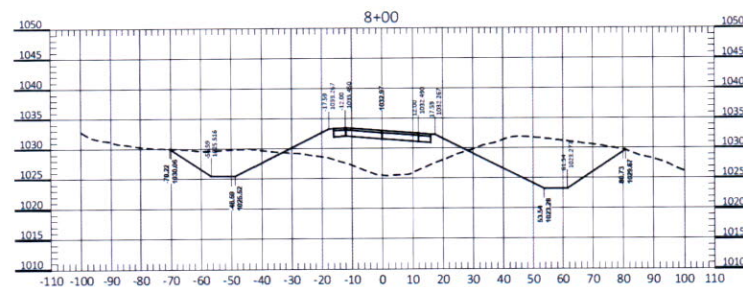
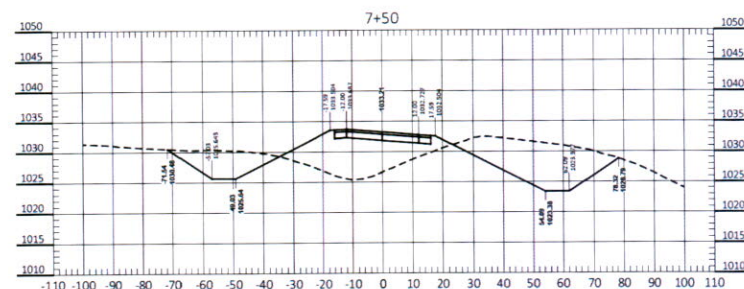
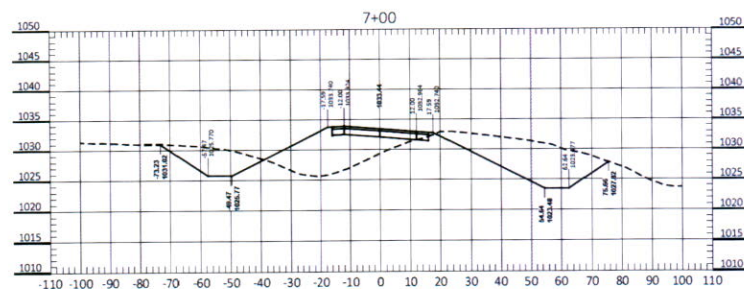
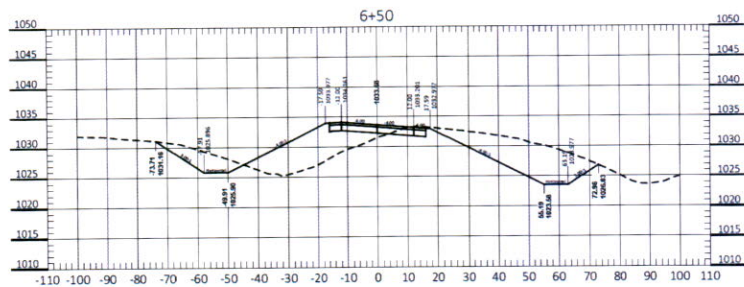


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REVIEWED BY
DATE
PROJECT NUMBER

5304-0022

T-15

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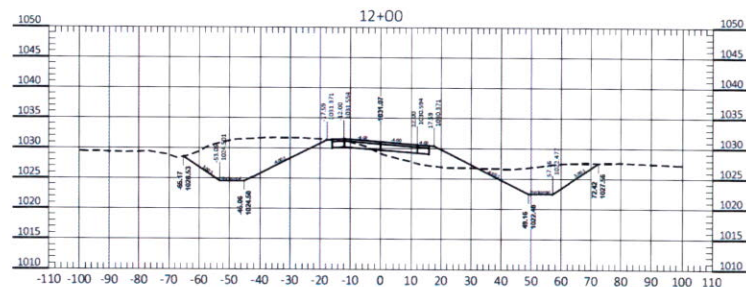
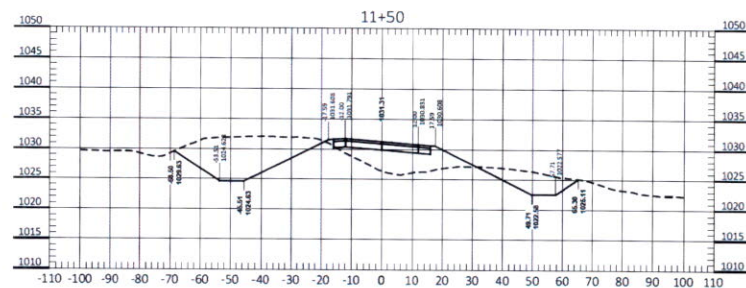
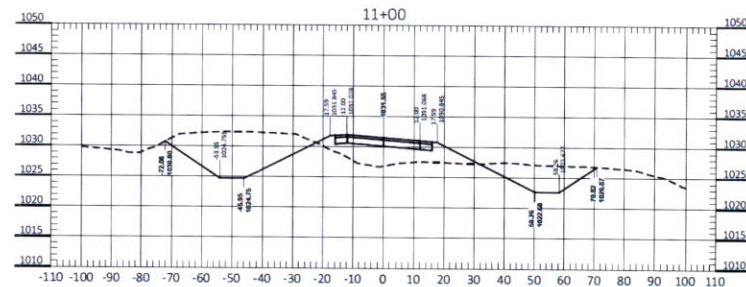
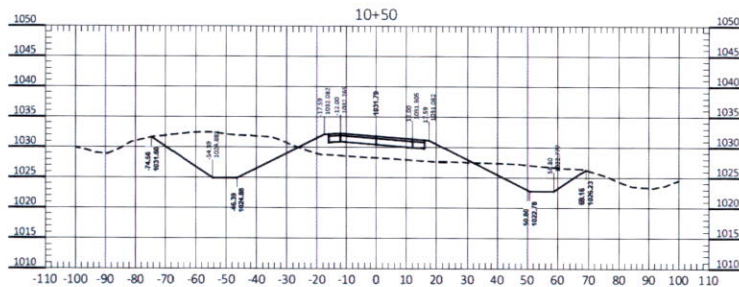
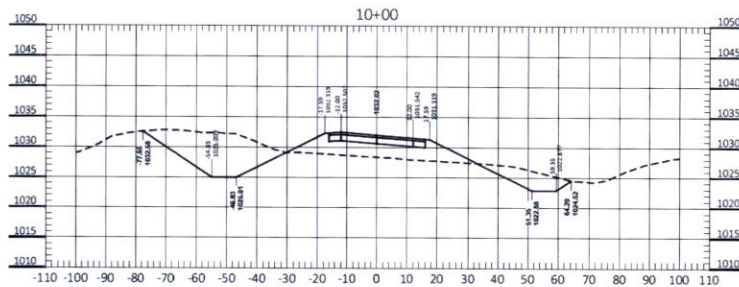
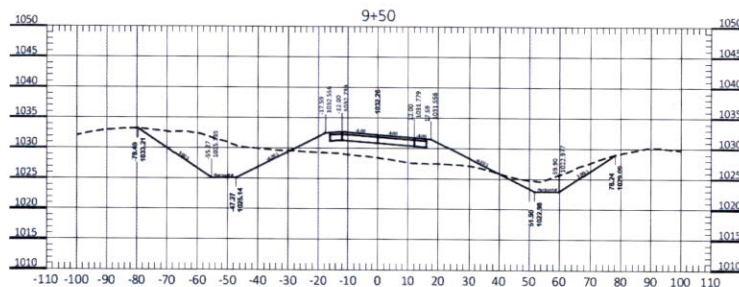
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Program

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By	
Date	
No.	
Revision	
WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA	
CSAH 15 CROSS SECTIONS	
 Maple Grove P: 763.493.4522 F: 763.493.5572	
DRAFTED BY	
REVIEWED BY	DDM
DATE	1-29-2021
PROJECT NUMBER	5304-0022
T-16	

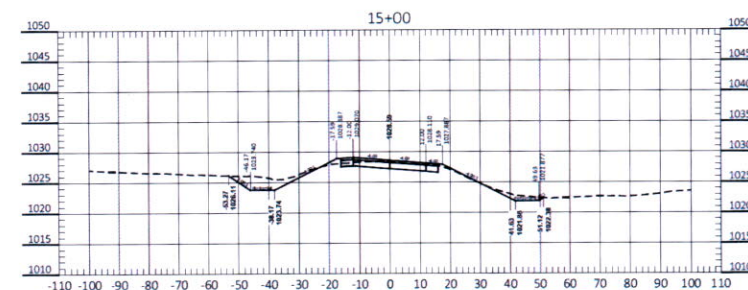
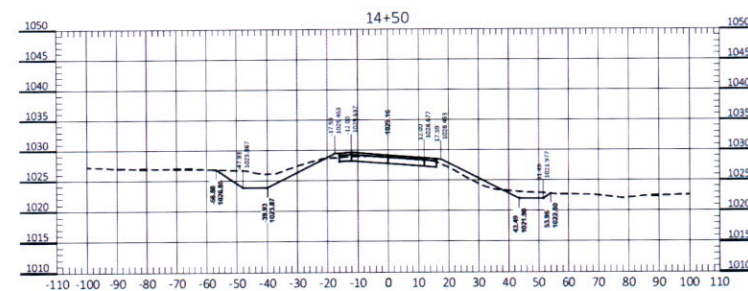
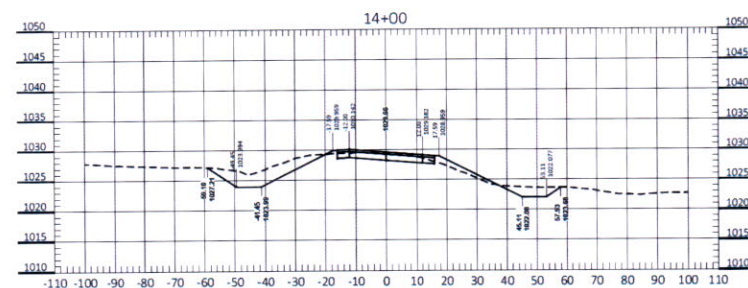
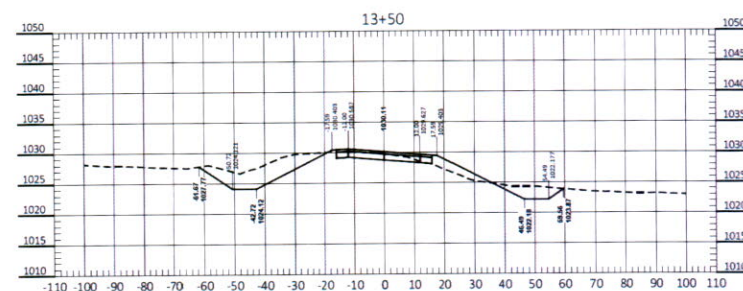
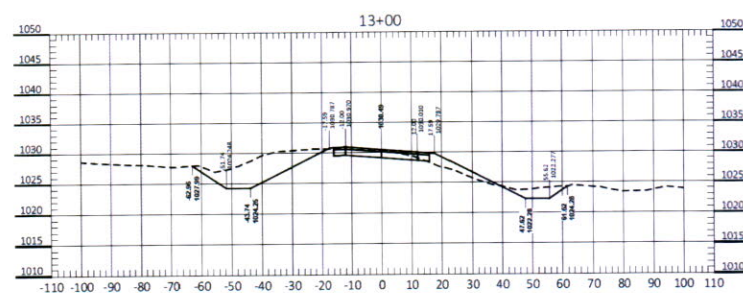
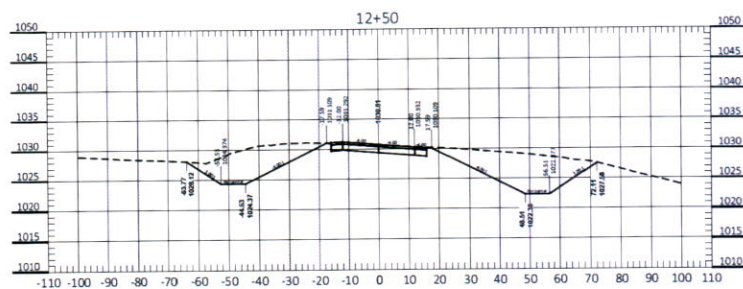
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WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		CSAH 15 CROSS SECTIONS	
No.	Revision	Date	By
 Maple Grove Engineering Inc. P: 763.493.4522 F: 763.493.5572			
DRAFTED BY			
REVIEWED BY DDM			
DATE 1-29-2021			
PROJECT NUMBER 5304-0022			
T-17			



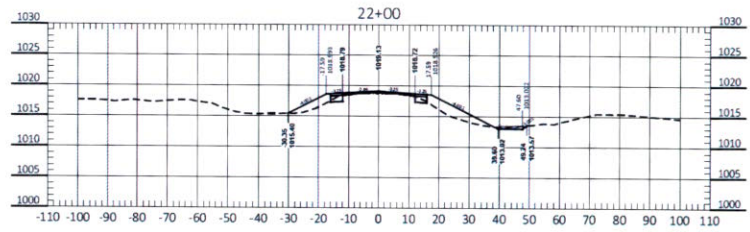
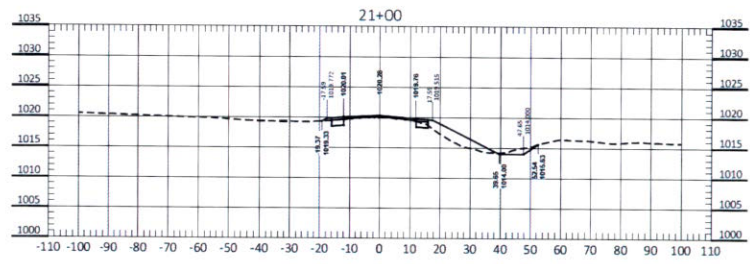
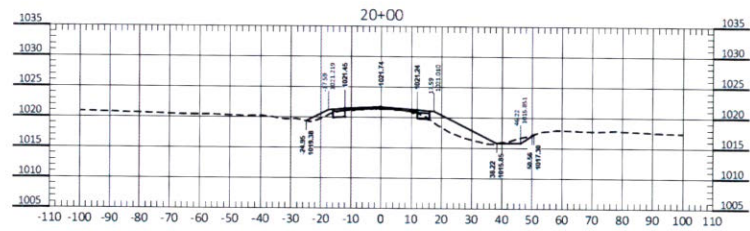
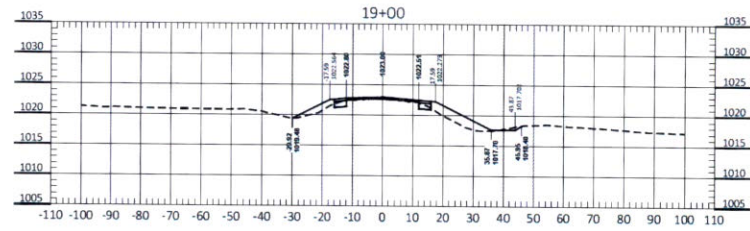
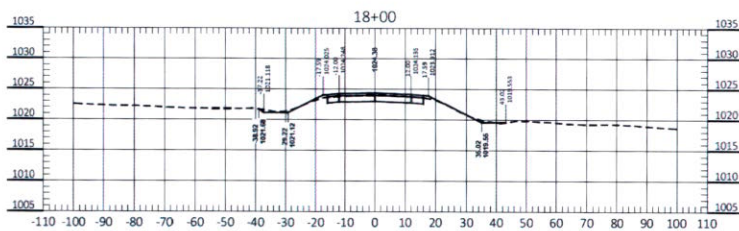
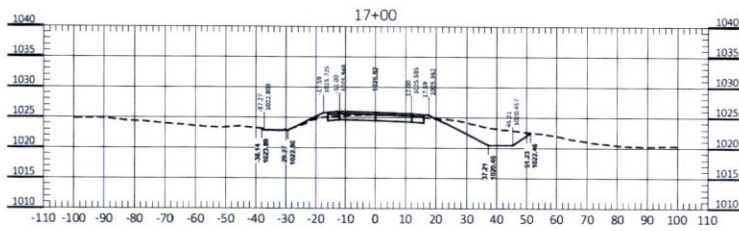
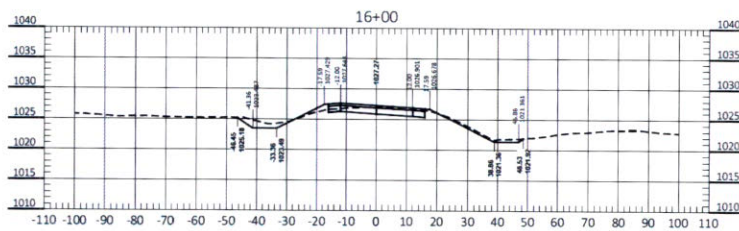
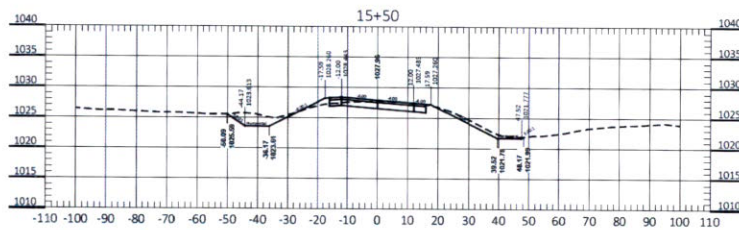
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 CROSS SECTIONS



Whetstone Engineering Inc.

Maple Grove

P: 763.493.4522

F: 763.493.5577

DRAFTED BY

REVIEWED BY

DDM

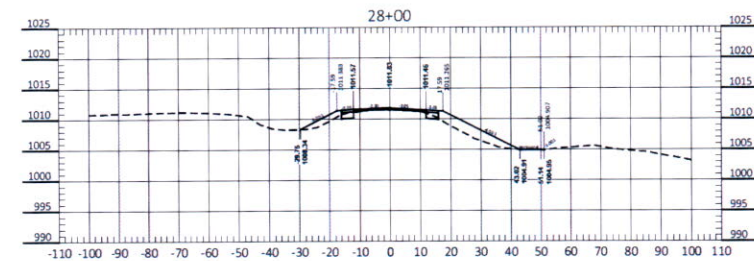
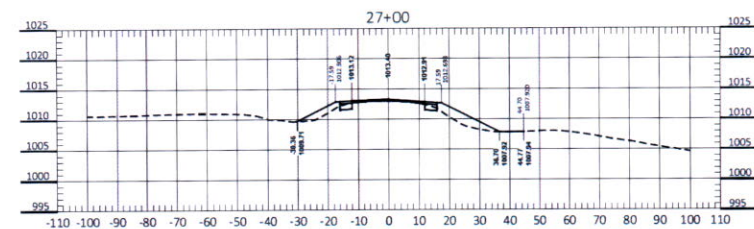
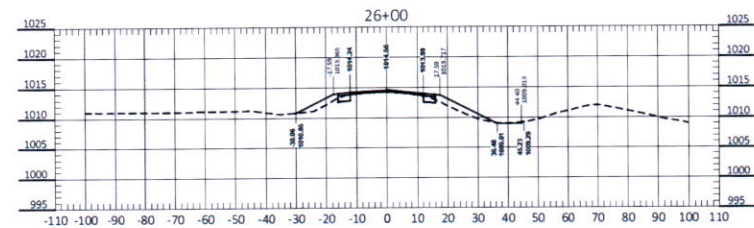
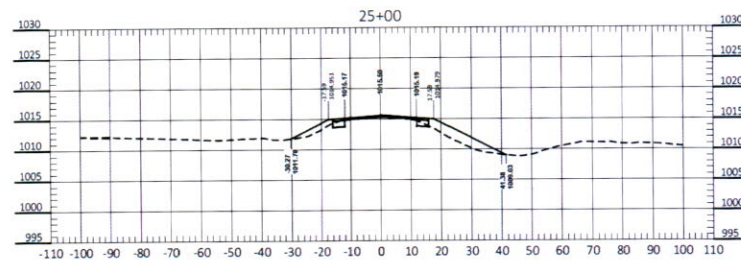
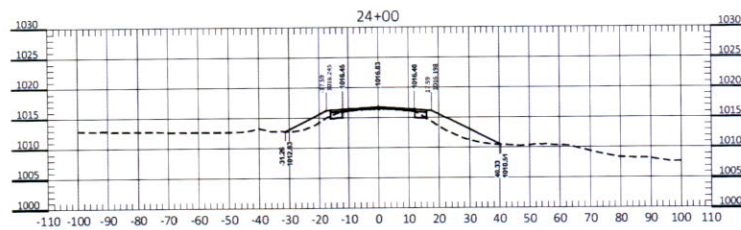
DATE

1-29-2021

PROJECT NUMBER

5304-0022

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 CROSS SECTIONS



763.493.4522

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DDM

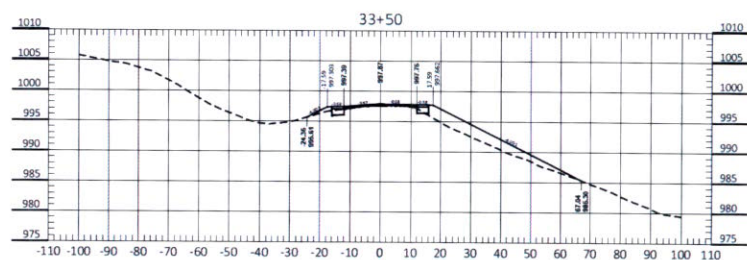
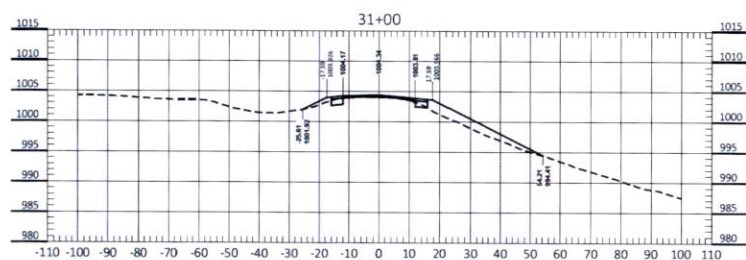
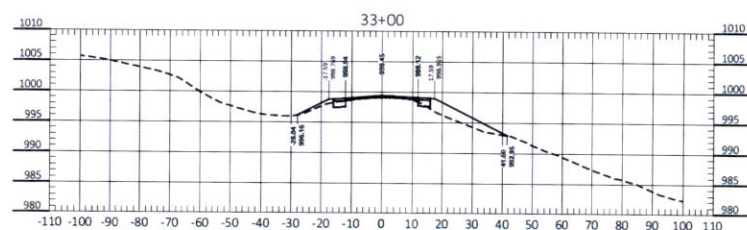
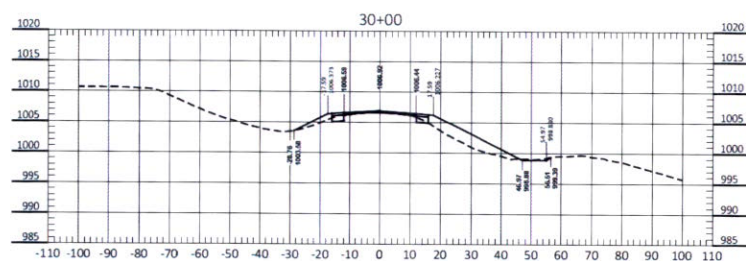
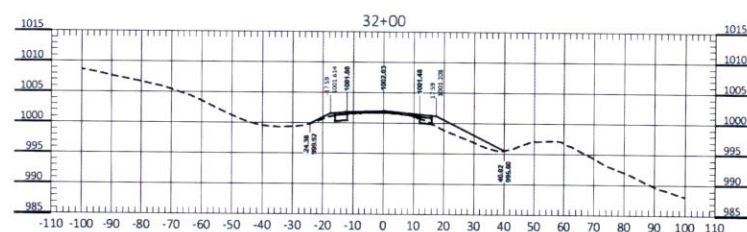
DATE
29-2021

PROJECT NUMBER
5304-0022

T-20

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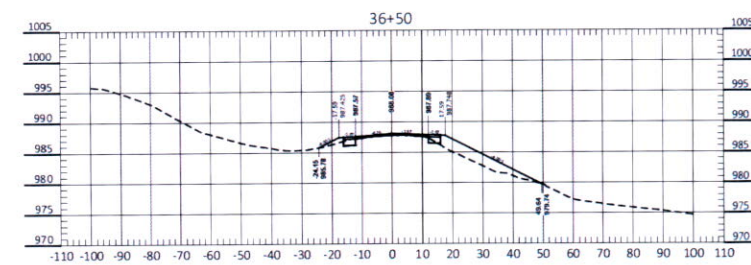
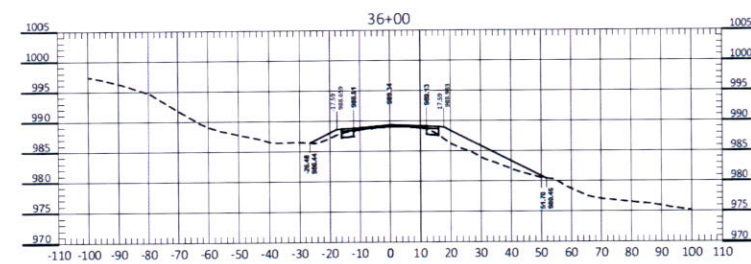
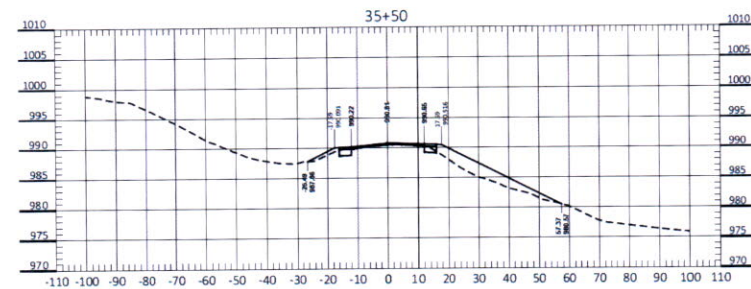
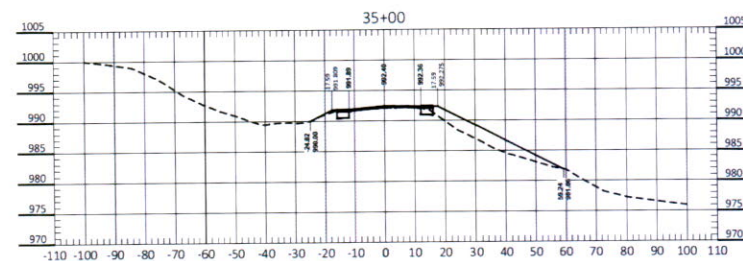
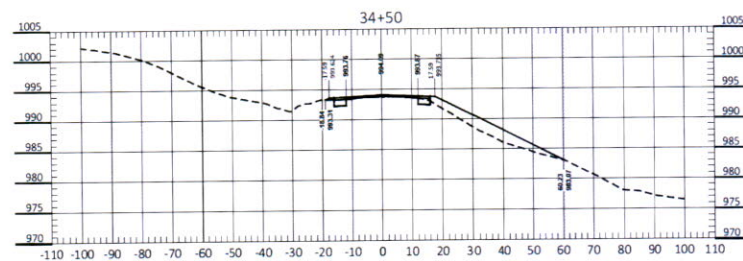
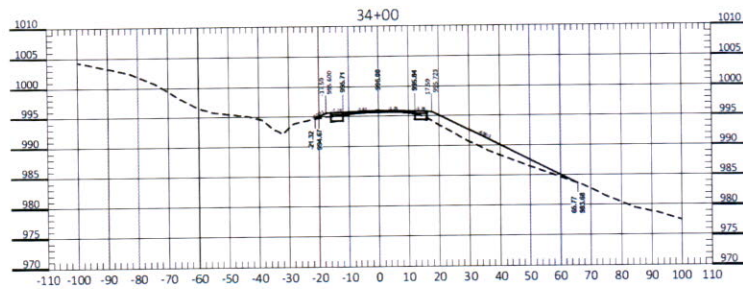


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WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		CSAH 15 CROSS SECTIONS	
 Maple Grove P: 763.493.4522 F: 763.493.5573		DRAFTED BY REVIEWED BY DATE PROJECT NUMBER	
T-21		1-29-2021 5304-0022	
Revision No.		Date	

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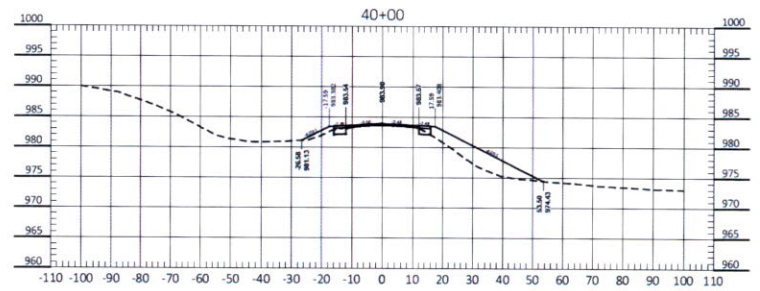
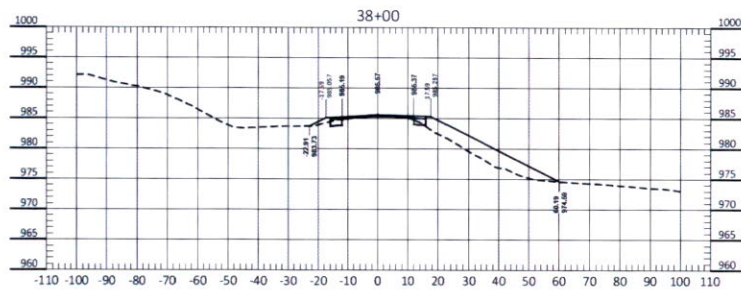
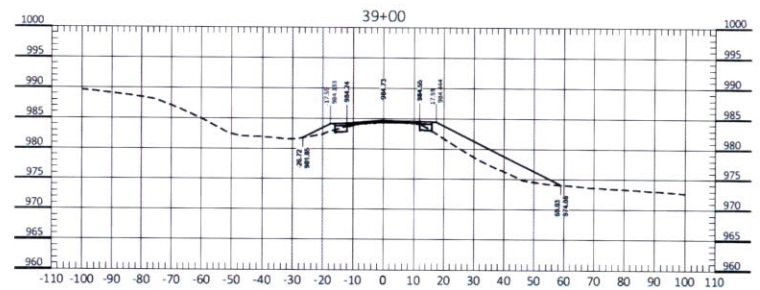
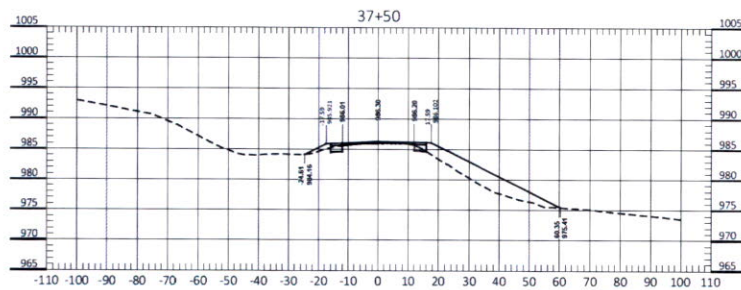
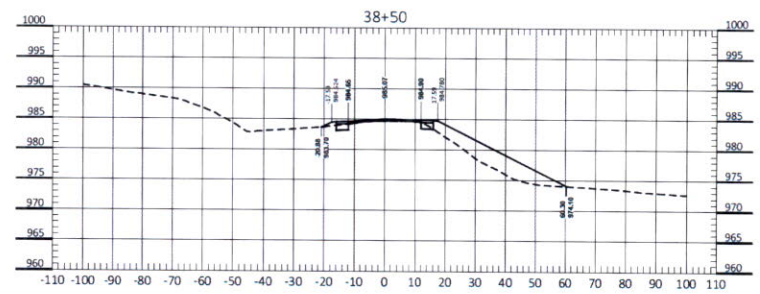
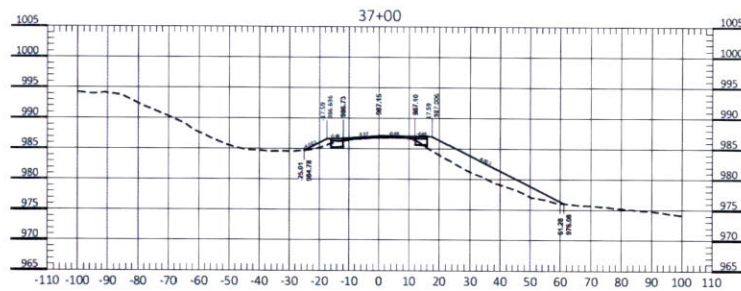


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WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA		CSAH 15 CROSS SECTIONS	
No.	Revision	Date	By
 Maple Grove Engineering, Inc. P: 763.493.4522 F: 763.493.5571		DRAFTED BY REVIEWED BY DOM DATE 1-29-2021 PROJECT NUMBER 5304-0022	
T-22			

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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
CSAH 15 CROSS SECTIONS



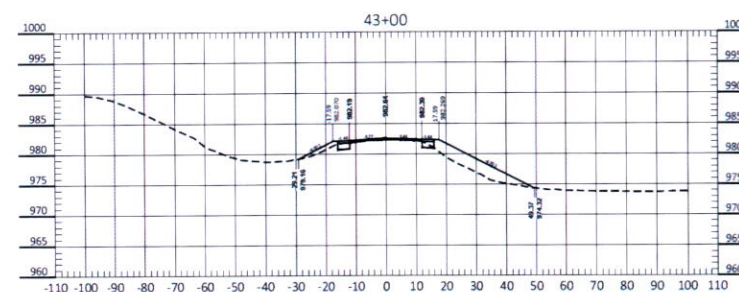
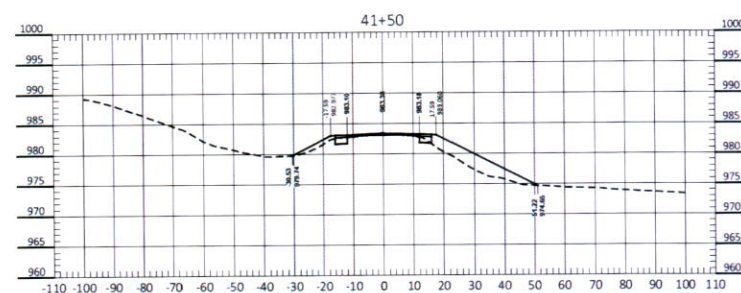
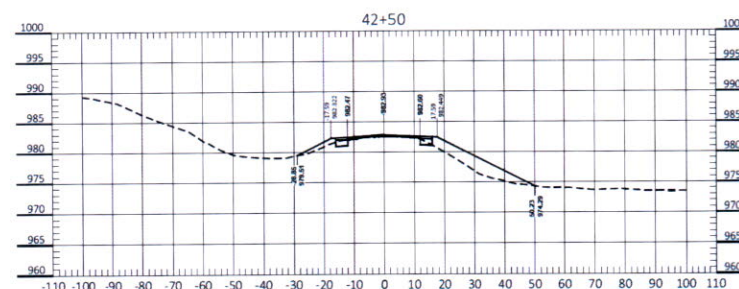
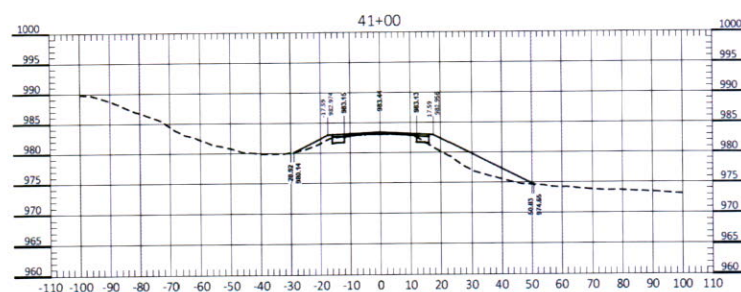
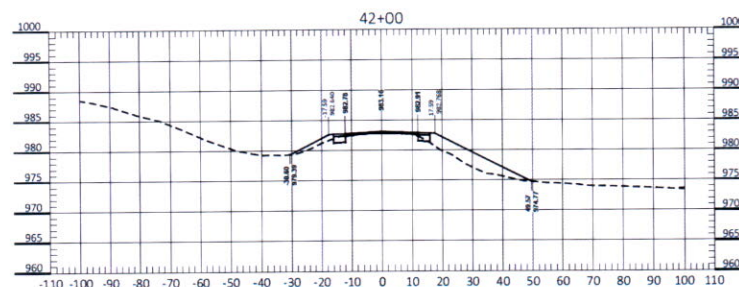
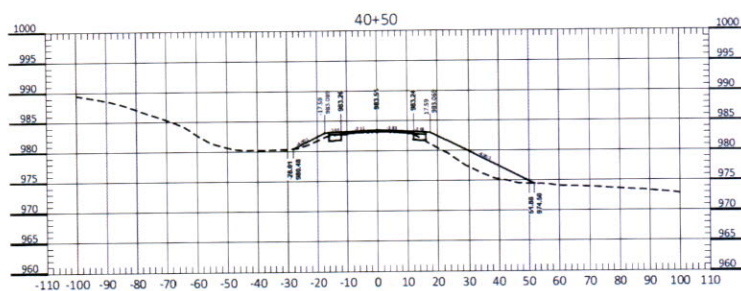
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PROJECT NUMBER
5304-0022

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 CROSS SECTIONS



P: 763.493.4522
C: 763.493.5573

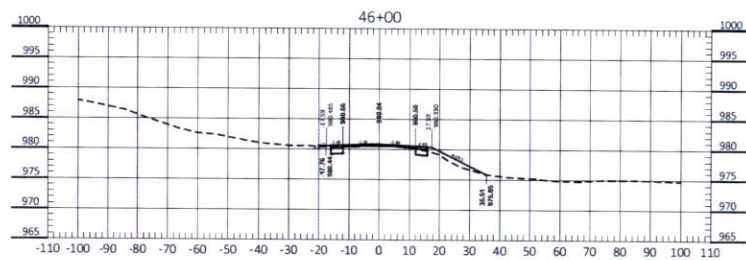
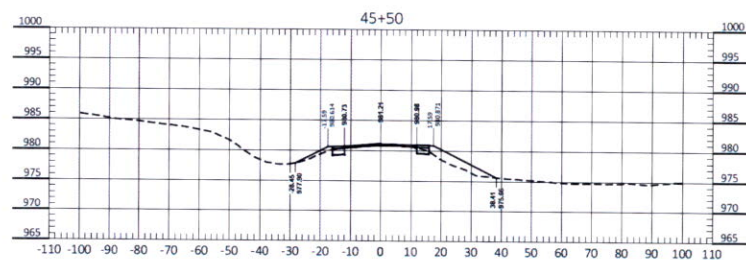
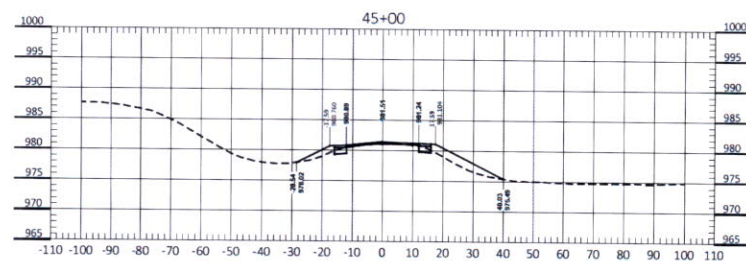
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1-29-2021

PROJECT NUMBER
5304-0022

T-24



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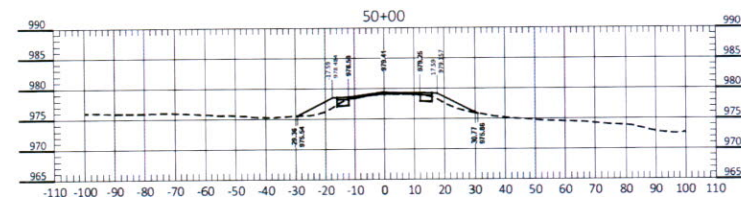
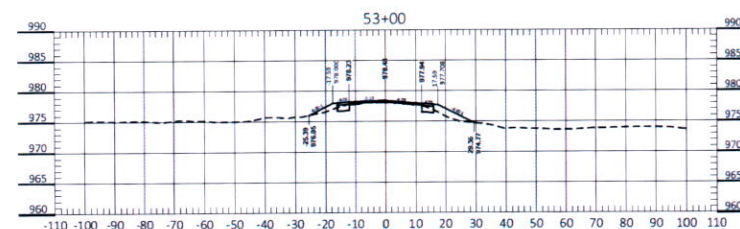
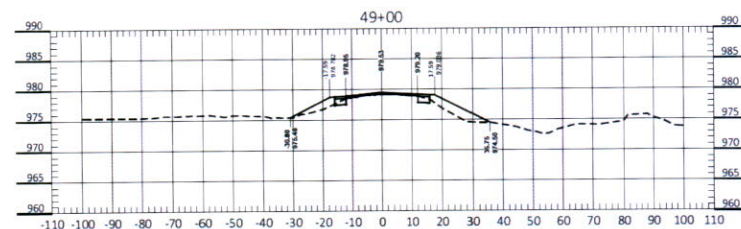
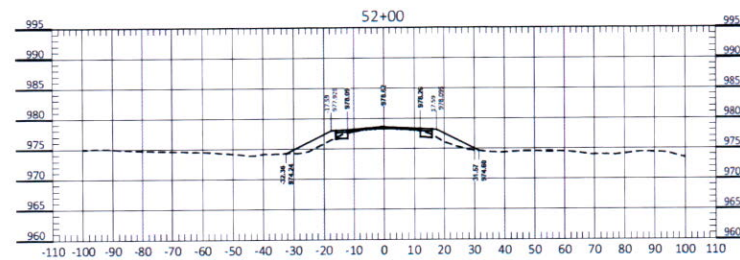
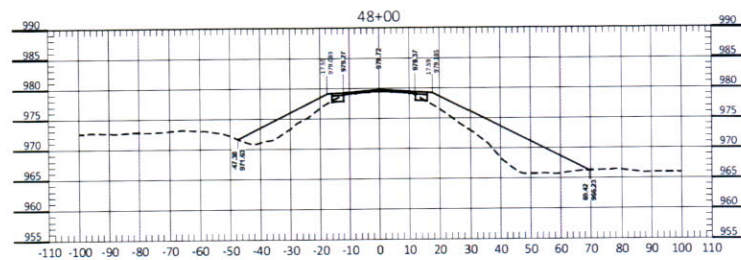
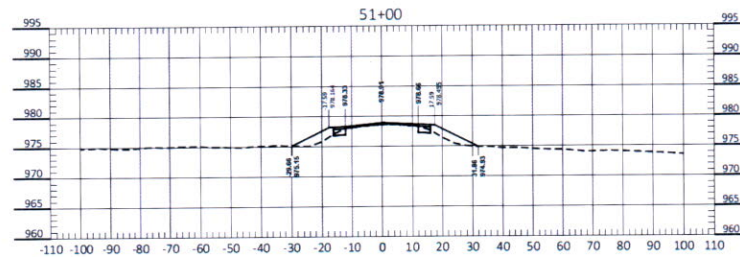
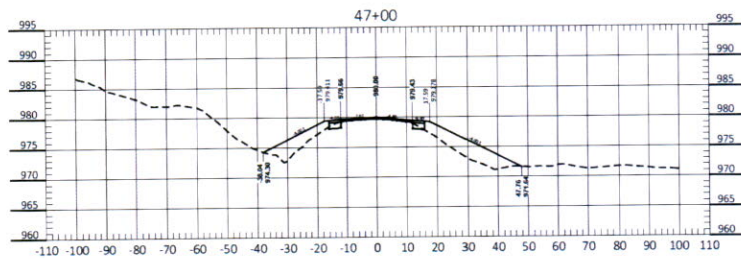


Houston Engineering & Construction
Maple Grove
P: 763.493.452
F: 763.493.557

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PROJECT NUMBER 5304-0022

T-25

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Engineering Inc.

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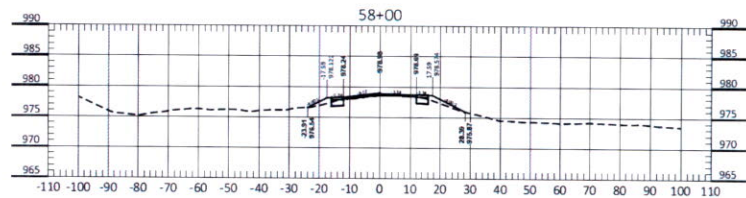
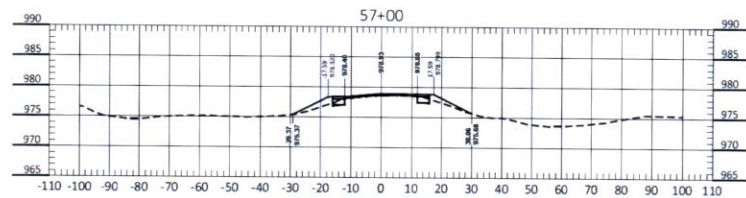
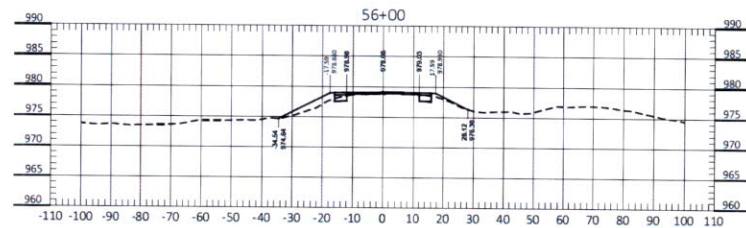
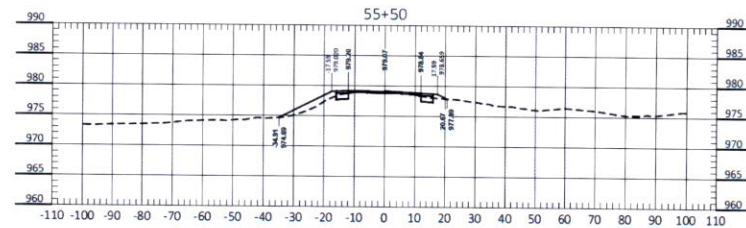
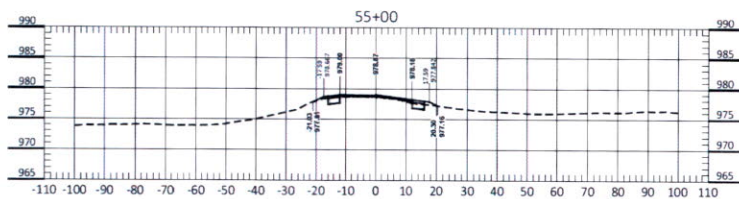
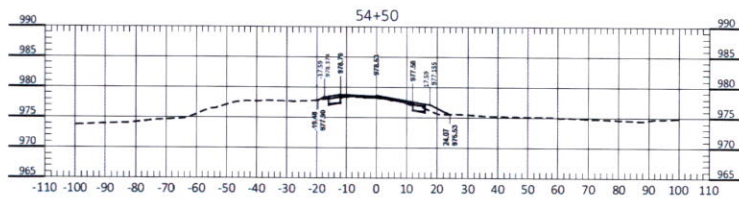
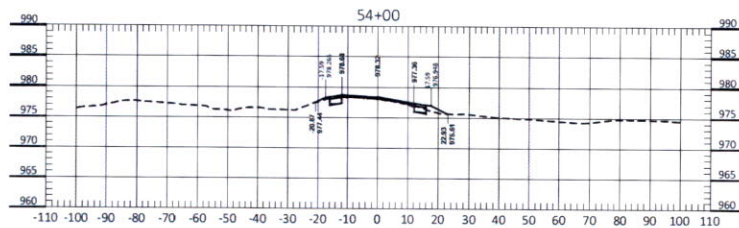
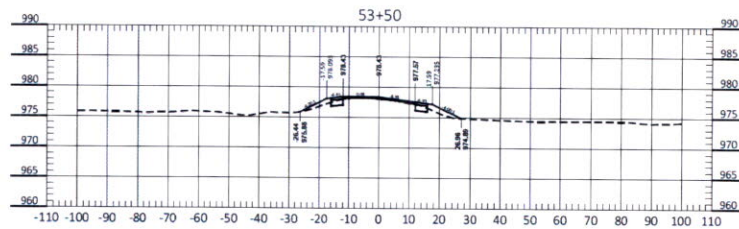
PROJECT NUMBER
5304-0022

T-26

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 CROSS SECTIONS

No.	Revision	Date	By



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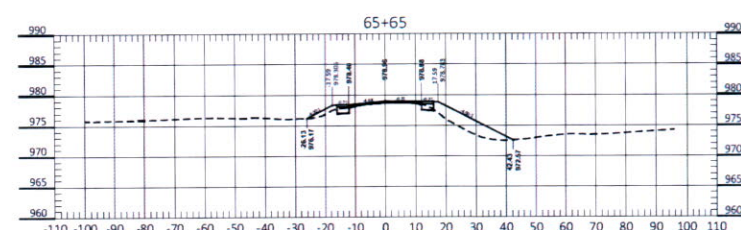
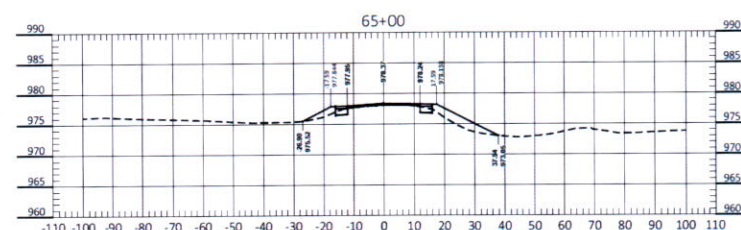
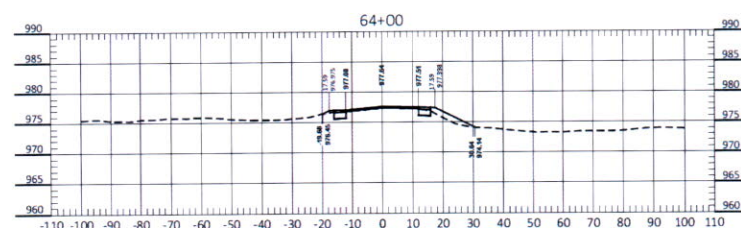
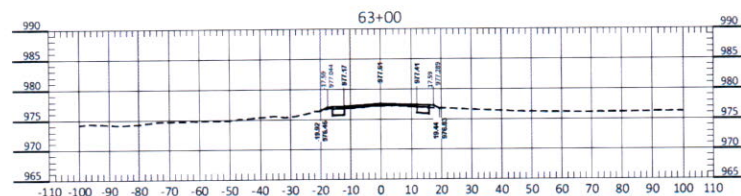
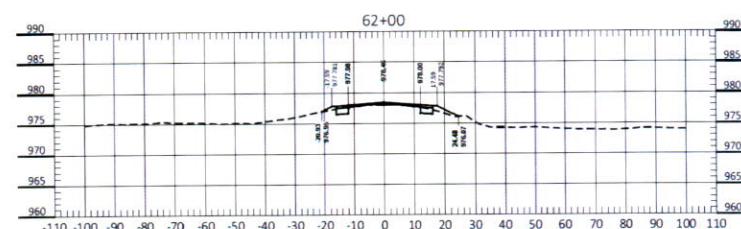
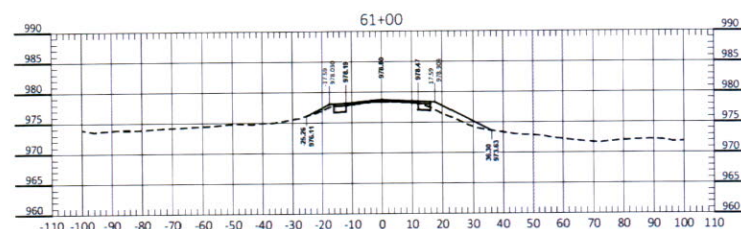
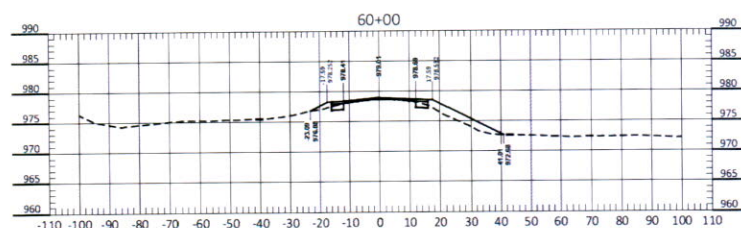
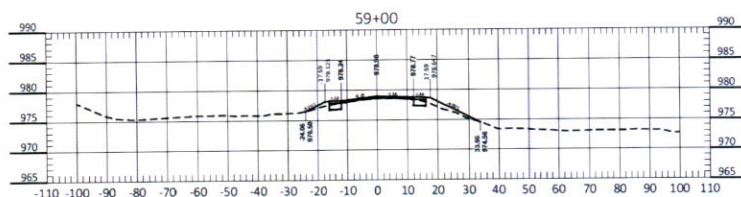
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By		Date	
No.		Revision	
WHETSTONE RIVER RESTORATION PROJECT UPPER MINNESOTA RIVER WATERSHED DISTRICT ORTONVILLE, MINNESOTA CSAH 15 CROSS SECTIONS			
 Maple Grove P: 763.493.4522 F: 763.493.5077			
DRAFTED BY			
REVIEWED BY DDM			
DATE 1-29-2021			
PROJECT NUMBER 5304-0022			
T-27			

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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CSAH 15 CROSS SECTIONS



Maples & Associates, Inc.

P 763.493.4522
F 763.493.5572

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DDM

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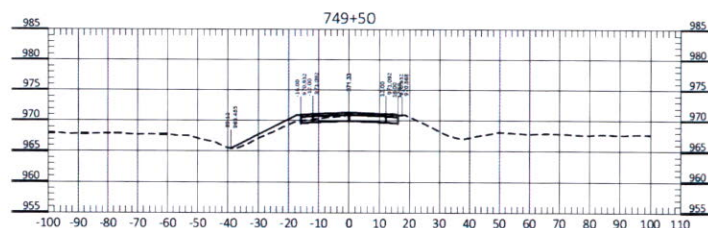
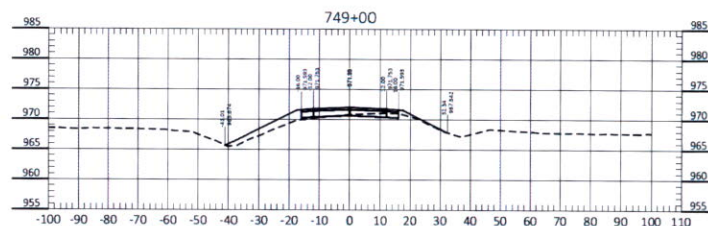
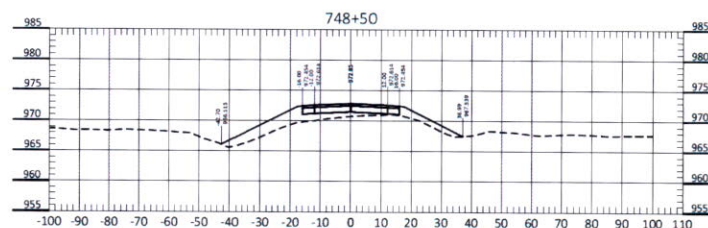
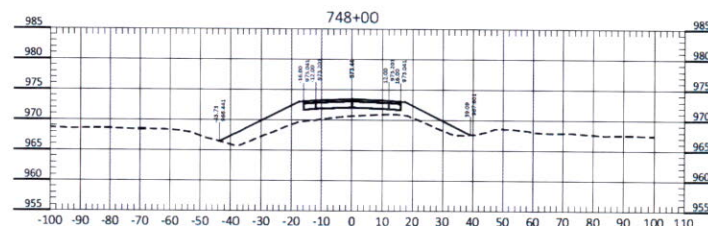
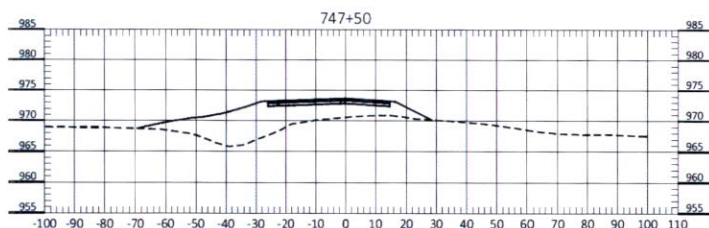
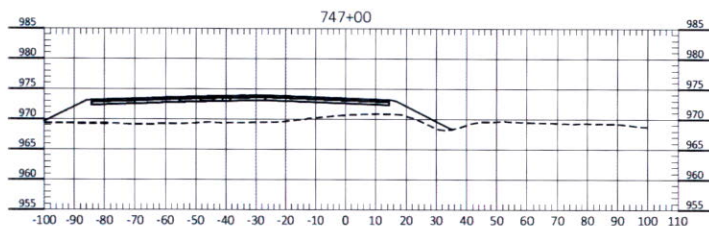
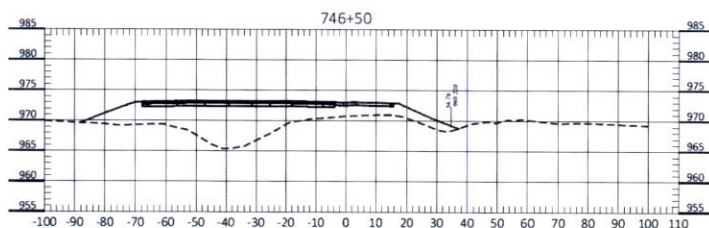
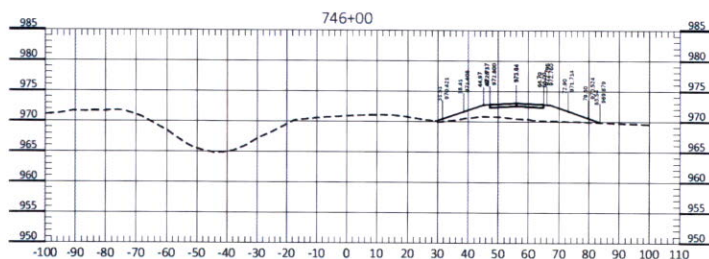
1-29-2021

PROJECT NUMBER

5304-0022

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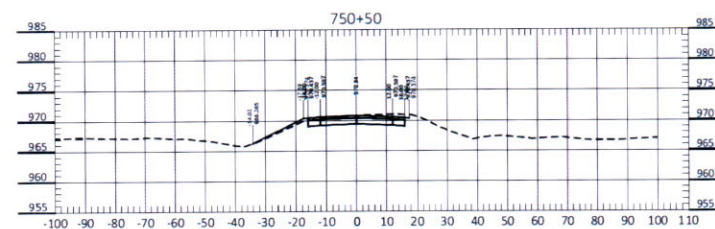
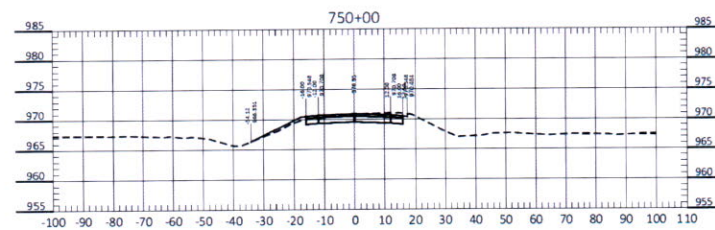
No.		Revision	Date	By
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 Maple Grove P: 763.493.4522 F: 763.493.5572				
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DDM				
DATE				
1-29-2021				
PROJECT NUMBER				
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UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

CUL-DE-SAC CROSS SECTIONS

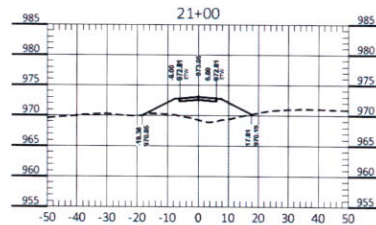
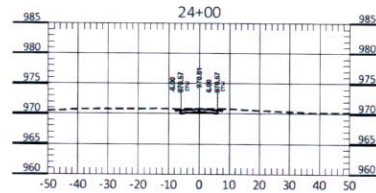
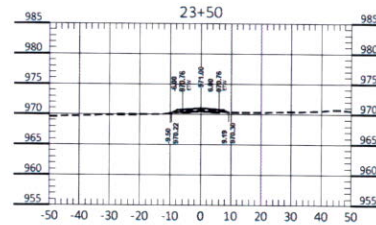
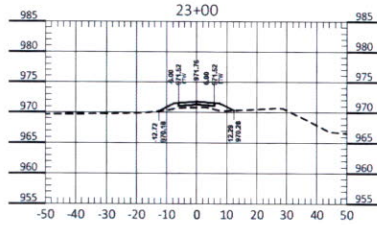
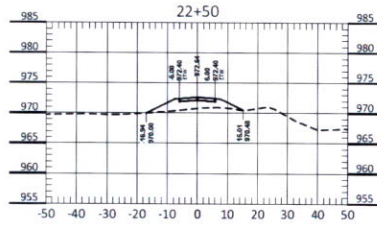
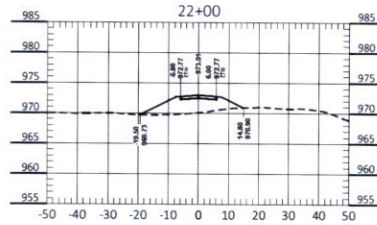
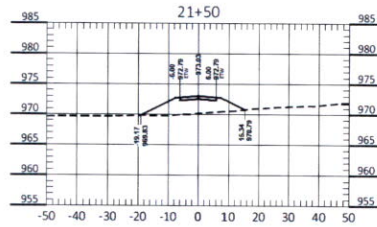


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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
DRIVEWAY CROSS SECTIONS



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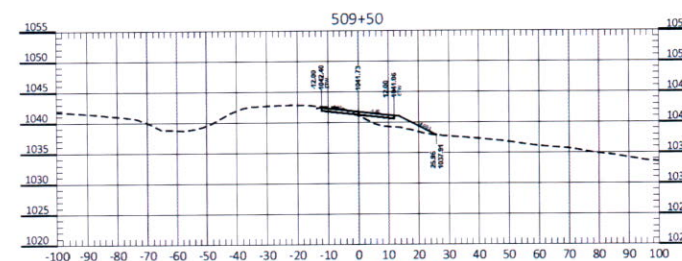
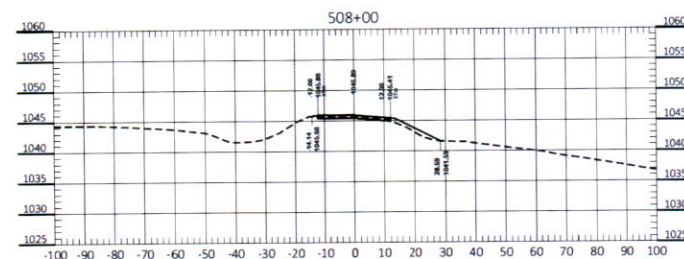
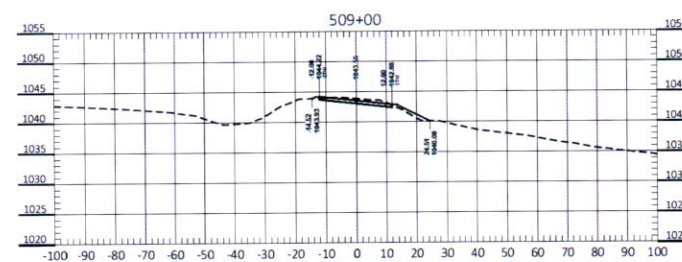
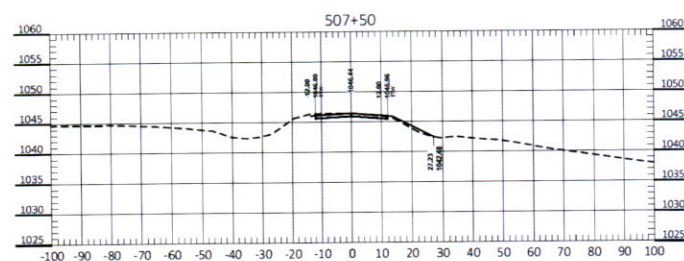
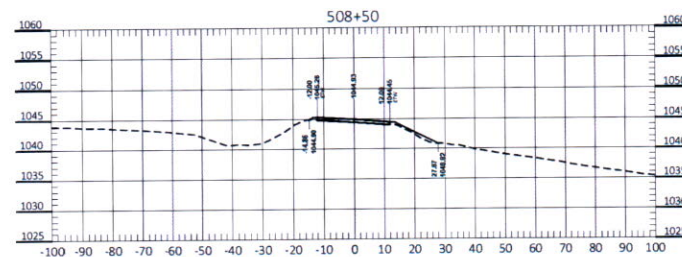
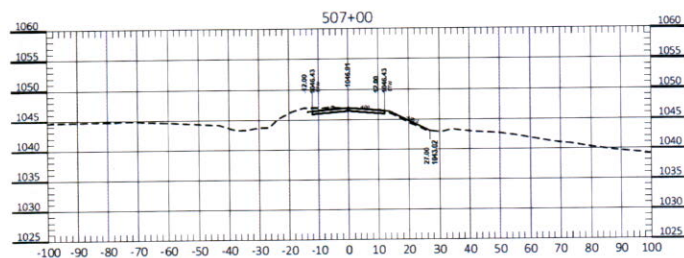
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT

TOWNSHIP ROAD CROSS SECTIONS
ORTONVILLE, MINNESOTA

P: 763.493.452

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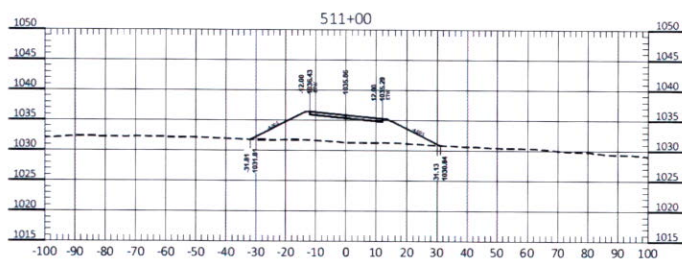
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PROJECT NUMBER
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA



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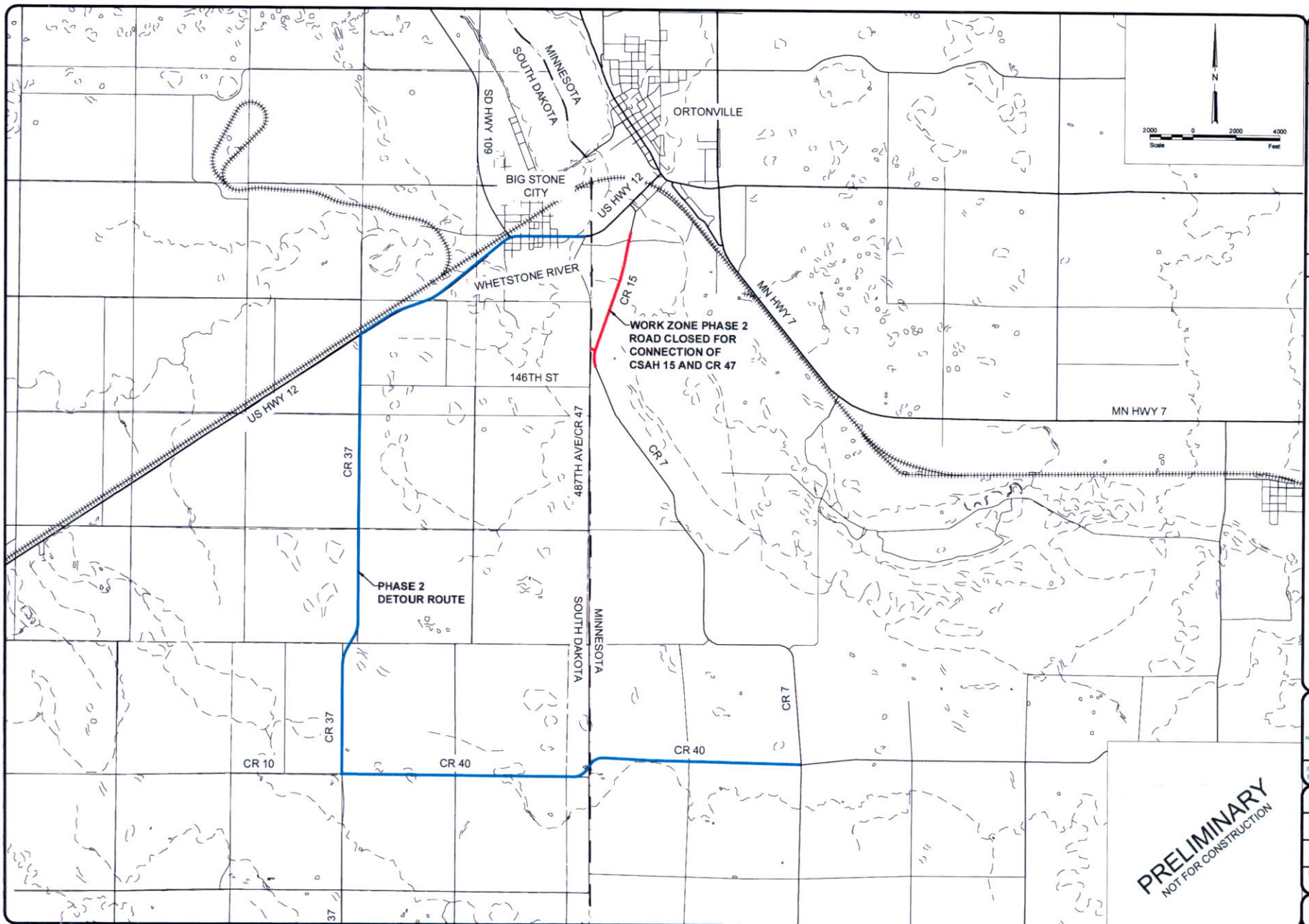
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PROJECT NUMBER
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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA



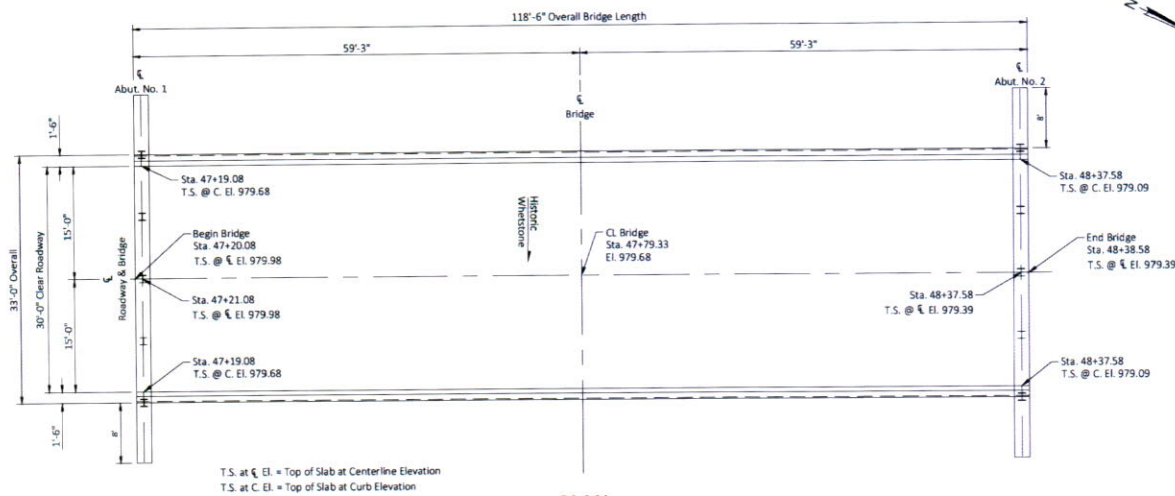
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REVIEWED BY
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DATE
1-29-2021
PROJECT NUMBER
5304-0022

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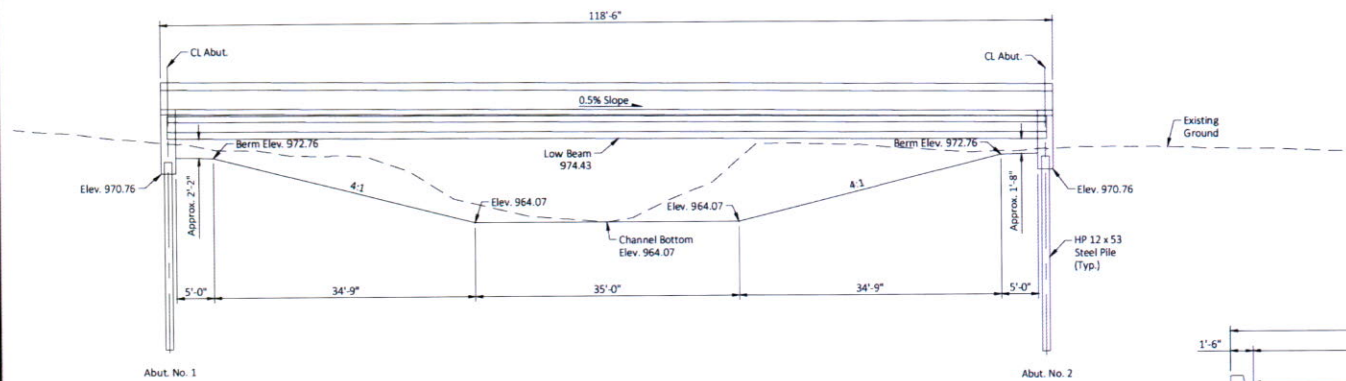
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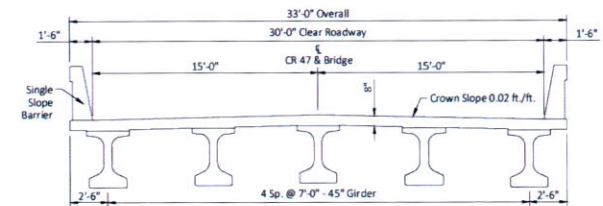
PLAN

**-X000-
INDEX OF BRIDGE SHEETS -**

Sheet No. 1 - General Plan and Elevation
Sheet No. 2 - Estimate of Structure Quantities and Notes
Sheet No. 3 - Piling Layout
Sheet No. 4 - ST-1 & ST-2 Soil Boring Logs
Sheet No. 5 - ST-3 Soil Boring Logs
Sheet No. 6 - ST-4 Soil Boring Logs
Sheet No. 7 - Superstructure Details



ELEVATION



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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA
GENERAL PLAN AND ELEVATION

Maple Grove
P: 763.493.4522
F: 763.493.5572

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REVIEWED BY
DDM

DATE
1-29-2021

PROJECT NUMBER
5304-0022

S-1

ESTIMATE OF STRUCTURE QUANTITIES

ESTIMATE OF STRUCTURE QUANTITIES				
BID ITEM NUMBER	ITEM	QUANTITY	UNIT	REMARKS
009E5000	Concrete Penetrating Sealer		SqYd	
410E0030	Structural Steel, Miscellaneous		LS	
420E0030	Structure Excavation, Bridge		CuYd	
430E0300	Granular Bridge End Backfill		CuYd	
430E0700	Precast Concrete Headwall for Drain		Each	
460E0030	Class A45 Concrete, Bridge Deck		CuYd	
460E0060	Class A45 Concrete, Bridge		CuYd	
480E0100	Reinforcing Steel		Lb	
480E0200	Epoxy Coated Reinforcing Steel		Lb	
510E0300	Preboring Pile		Ft	
510E3401	HP 12x53 Steel Test Pile, Furnish and Drive		Ft	
510E3405	HP 12x53 Steel Bearing Pile, Furnish and Drive		Ft	
560E8045	45" Minnesota Shape Prestressed Concrete Beam		Ft	
680E0040	4" Underdrain Pipe		Ft	
900E7090	Waterproofing Membrane for Structure		SqFt	

BRIDGE SPECIFICATIONS

- Design Specifications: AASHTO LRFD Bridge Design Specifications, 2020 Edition.
- Construction Specifications: South Dakota Standard Specifications for Roads and Bridges, 2015 Edition and required provisions, supplemental specifications, and special provisions as included in the proposal.

BRIDGE DESIGN LOADING

- AASHTO HL-93.
- Dead Load includes 22 psf for future wearing surface on the roadway.

DESIGN MATERIAL STRENGTHS*

Concrete	$f_c = 4,500$ psi
Reinforcing Steel	$f_y = 60,000$ psi
Piling (ASTM A572 Grade 50)	$f_y = 50,000$ psi

GENERAL CONSTRUCTION

- All mild reinforcing steel will conform to ASTM A615, Grade 60.
- All exposed concrete corners and edges will be chamfered 3/4-inch unless noted otherwise.
- Use 2-inch clear cover on all reinforcing steel except as shown otherwise on plans.
- Contractor will imprint on the structure the date of new construction as specified and detailed on Standard Plate No. 460.02.
- Barrier Curbs and End blocks will be built perpendicular to the roadway grade line.
- Request for construction joints or reinforcing steel splices at points other than those shown, must be submitted to the Engineer for prior approval. If additional splices are approved, no payment will be allowed for the added quantity of reinforcing steel.
- Bridge berms will be constructed to the plans template prior to any pile driving or construction of abutment footings. See Standard Plate 120.10 or 120.11. Berm slopes will not be disturbed after construction. Any alterations to the berm or slopes after berm construction will be submitted to the Bridge Construction Engineer for approval. Allow 30 days for review of proposals.

DESIGN MIX OF CONCRETE

- All structural concrete will be Class A45 unless otherwise indicated.
- Type II cement conforming to Section 750 is required, except Type III cement may be used for the prestressed beams.
- Grout design mix will be as specified in Section 460.2 K of the Construction Specifications. A compressive strength of 2000 psi will be attained by the grout prior to erection of any beams. Chamfer edges of grout pads 3/4-inch. The quantity of grout is included in and will be paid for at the contract unit price per cubic yard for Class A45 Concrete, Bridge.

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

ESTIMATE OF STRUCTURE QUANTITIES AND NOTES



Riverland Engineering, Inc.
Maple Grove

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DDM

DATE
1-29-2021

PROJECT NUMBER
5304-0022

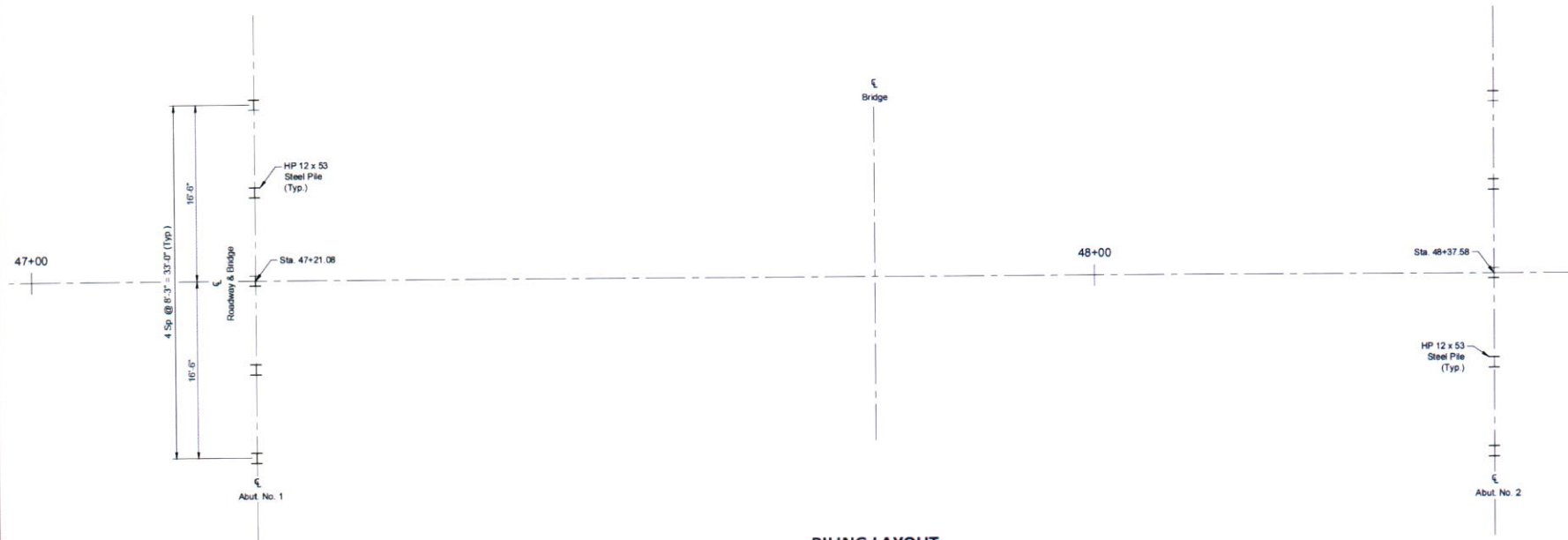
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1-29-2021

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5304-0022

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

BORING: ST-01
LOCATION: See attached sketch

LATITUDE: 45.38711 LONGITUDE: -96.45896
START DATE: 10/26/20 END DATE: 10/26/20

DRILLER: G.Beane LOGGED BY: T.Bryant
METHOD: 3 1/4" HSA SURFACING: G-Base WEATHER: Sunny, 20°

Elev./Depth	Description of Materials (Soil-ASTM D2486 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	% bl	MC %	Tests or Remarks
873.7 1.0	FILL, WELL-GRADED SAND (SW), fine to coarse-grained, brown, moist	AU			
869.2 4.5	SILTY SAND (SM), fine to medium-grained, brown, moist, loose (ALLUVIUM)	2-2.1 (3) 18"			
865.2 8.5	SILTY SAND (SM), fine to coarse-grained, some organic, 4 inch coarse-grained sand and silty sand lenses, gray to brown, wet, very loose (ALLUVIUM)	2-2.1 (3) 18"		15	P200=31%
861.2 12.5	SILTY SAND (SM), fine to coarse-grained, some organic, 4 inch coarse-grained sand and silty sand lenses, gray to brown, wet, very loose (ALLUVIUM)	1-1.1 (2) 18"			
857.2 17.5	SILTY SAND (SM), fine to medium-grained, trace fine gravel, brown, wet, medium dense (GLACIAL OUTWASH)	2-2.2 (4) 18"			
853.2 21.5	SILTY SAND (SM), fine to medium-grained, trace fine gravel, brown, wet, medium dense (GLACIAL OUTWASH)	2-2.2 (4) 18"			
849.2 25.5	POORLY GRADED SAND (SP), fine to coarse-grained, brown, wet, medium dense (GLACIAL OUTWASH)	6-15.12 (27) 18"		10	P200=8%
845.2 29.5	SILTY SAND (SM), fine to coarse-grained, gray, wet, very dense (GLACIAL OUTWASH)	5-14.14 (28) 18"			

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

BORING: ST-01
LOCATION: See attached sketch

LATITUDE: 45.38711 LONGITUDE: -96.45896
START DATE: 10/26/20 END DATE: 10/26/20

DRILLER: G.Beane LOGGED BY: T.Bryant
METHOD: 3 1/4" HSA SURFACING: G-Base WEATHER: Sunny, 20°

Elev./Depth	Description of Materials (Soil-ASTM D2486 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	% bl	MC %	Tests or Remarks
873.7 1.0	SILTY SAND (SM), fine to coarse-grained, gray, wet, very dense (GLACIAL OUTWASH)	6-22.21 (43) 14"		15	P200=28%
869.7 5.0	SILTY SAND (SM), fine to medium-grained, gray, wet, very dense (GLACIAL OUTWASH)	504* (REF) 8"			
864.9 9.9	END OF BORING				
860.9 13.9	Boring then backfilled with bentonite grout				
856.9 17.9					
852.9 21.9					
848.9 25.9					
844.9 29.9					

Water observed at 5.0 feet with 9.5 feet of casing in the ground while drilling.

Water observed at 7.0 feet with 38.5 feet of casing in the ground at end of drilling.

Water not observed to cave-in depth of 17.0 feet immediately after withdrawal of auger.

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

BORING: ST-02
LOCATION: See attached sketch

LATITUDE: 45.38711 LONGITUDE: -96.45896
START DATE: 10/26/20 END DATE: 10/26/20

DRILLER: G.Beane LOGGED BY: T.Bryant
METHOD: 3 1/4" HSA SURFACING: G-Base WEATHER: Sunny, 20°

Elev./Depth	Description of Materials (Soil-ASTM D2486 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	% bl	MC %	Tests or Remarks
873.9 1.0	SILTY SAND (SM), fine to medium-grained, trace organic, brown, moist (TOPSOIL)	AU			
869.9 5.0	POORLY GRADED SAND (SP), fine to medium-grained, brown, moist, very loose (ALLUVIUM)	1-1.1 (2) 14"			27
865.9 9.0	SANDY LEAN CLAY (CL), some organic, brown, moist, soft (ALLUVIUM)	2-1.1 (2) 18"			36
861.9 13.0	SILTY SAND (SM), some organic, trace fine gravel, gray to black, wet, loose (ALLUVIUM)	2-3.3 (5) 18"			24
857.9 17.0	POORLY GRADED SAND with GRAVEL (SP), fine to medium-grained, brown, wet, loose to medium dense (GLACIAL OUTWASH)	2-3.1 (4) 18"		15	P200=4%
853.9 21.0		3-5.4 (10) 18"			
849.9 25.0		3-5.4 (11) 18"			
845.9 29.0		3-4.4 (8) 14"			
841.9 33.0		3-5.6 (11) 18"			
837.9 37.0	END OF BORING				
833.9 41.0	Boring then backfilled with bentonite grout				
829.9 45.0					
825.9 49.0					

Water observed at 7.0 feet with 19.5 feet of casing in the ground at end of drilling.

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WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNESOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNESOTA

BORING LOGS



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DATE
1-29-2021

PROJECT NUMBER
5304-0022

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

LOGGING: ST-04
LOCATION: See attached sketch
LATITUDE: 45.28658 LONGITUDE: -96.45476
START DATE: 10/27/20 END DATE: 10/28/20
DRILLER: G. Beers LOGGED BY: T. Bryant
SURFACING: Gravel WEATHER: Cloudy 10.30"

Elev./Depth	Description of Materials (Soil-ASTM D2485 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	MC %	Tests or Remarks
989.9 0.0	BUTYRIOUS, surface to 3 inches	4U		
987.9 1.5	FILL, WELL-GRADED SAND (SP), fine to coarse-grained, brown, moist, medium (ALLUVIAL)	13-9.7 (18) 18"		
977.9 8.5	SILTY SAND (SM), fine-grained, brown, moist, medium (ALLUVIAL)	2-2.2 (4) 18"		
973.9 9.5	SANDY LEAN CLAY (CL), trace fine gravel, brown to black, moist, medium to soft, iron oxide staining (GLACIAL TILL)	2-2.1 (3) 18"	32	
967.9 17.5	POORLY GRADED SAND (SP), fine to coarse-grained, brown, wet, loose (GLACIAL OUTWASH)	3-3.3 (8) 18"		Switched to mud rotary drilling methods at 20 feet
961.9 23.5	SILTY SAND (SM), fine to coarse-grained, gray, wet, loose (GLACIAL OUTWASH)	4-4.5 (9) 18"		
955.9 29.5	Continued on next page	4-5.5 (10) 18"		

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

LOGGING: ST-04
LOCATION: See attached sketch
LATITUDE: 45.28658 LONGITUDE: -96.45476
START DATE: 10/27/20 END DATE: 10/28/20
DRILLER: G. Beers LOGGED BY: T. Bryant
SURFACING: Gravel WEATHER: Cloudy 10.30"

Elev./Depth	Description of Materials (Soil-ASTM D2485 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	MC %	Tests or Remarks
951.0 33.0	SILTY SAND (SM), fine to coarse-grained, gray, wet, loose (GLACIAL OUTWASH)	4-5.8 (13) 18"	24	
945.0 39.0	SANDY LEAN CLAY (CL), gray, wet, stiff (GLACIAL TILL)	4-8.9 (17) 18"		Becomes very stiff below 38 1/2 feet
938.0 46.0	Trace fine to medium-grained Gravel at 45 feet	10-15-15 (20) 18"	17	
932.0 52.0	CLAYSTONE, dark gray, moist, decomposed, very soft, hand disturbed sample classified as "Fat Clay (CH)"	10-12-12 (24) 18"	22	
926.0 58.0	Continued on next page	9-11-13 (24) 18"	31	LL=77, PL=23, Ph=54
920.0 64.0	Continued on next page	8-12-14 (28) 18"		

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LOG OF BORING

Project Number B2009273
Geotechnical Evaluation
Whetstone River Restoration
County Rd 47
Big Stone City, South Dakota

LOGGING: ST-04
LOCATION: See attached sketch
LATITUDE: 45.28658 LONGITUDE: -96.45476
START DATE: 10/27/20 END DATE: 10/28/20
DRILLER: G. Beers LOGGED BY: T. Bryant
SURFACING: Gravel WEATHER: Cloudy 10.30"

Elev./Depth	Description of Materials (Soil-ASTM D2485 or 2487; Rock-USACE EM 1110-1-2508)	Blows (N-Value) Recovery	MC %	Tests or Remarks
911.0 73.0	SANDSTONE, light gray, moist, decomposed, very hard, fine-grained, sample retrieved as non-cemented "Clayey Sand (SC)"	20-30-30 (87) 18"	18	
904.4 79.5	SANDSTONE, gray, wet, very hard, fine-grained, sample retrieved as non-cemented "Poorly Graded Sand with Sil (SP-SM)"	30-50-50 (REF) 18"	19	
898.0 86.0	END OF BORING	100-0 (REF) 18"	15	P200=6%
892.0 92.0	Boring then backfilled with bentonite grout	100-0 (REF) 18"		Water observed at 17.0 feet with 17.5 feet of boring in the ground while drilling. Water not observed at the completion of drilling due to the use of mud rotary drilling tools.

WHETSTONE RIVER RESTORATION PROJECT
UPPER MINNE-SOTA RIVER WATERSHED DISTRICT
ORTONVILLE, MINNE-SOTA

BORING LOGS



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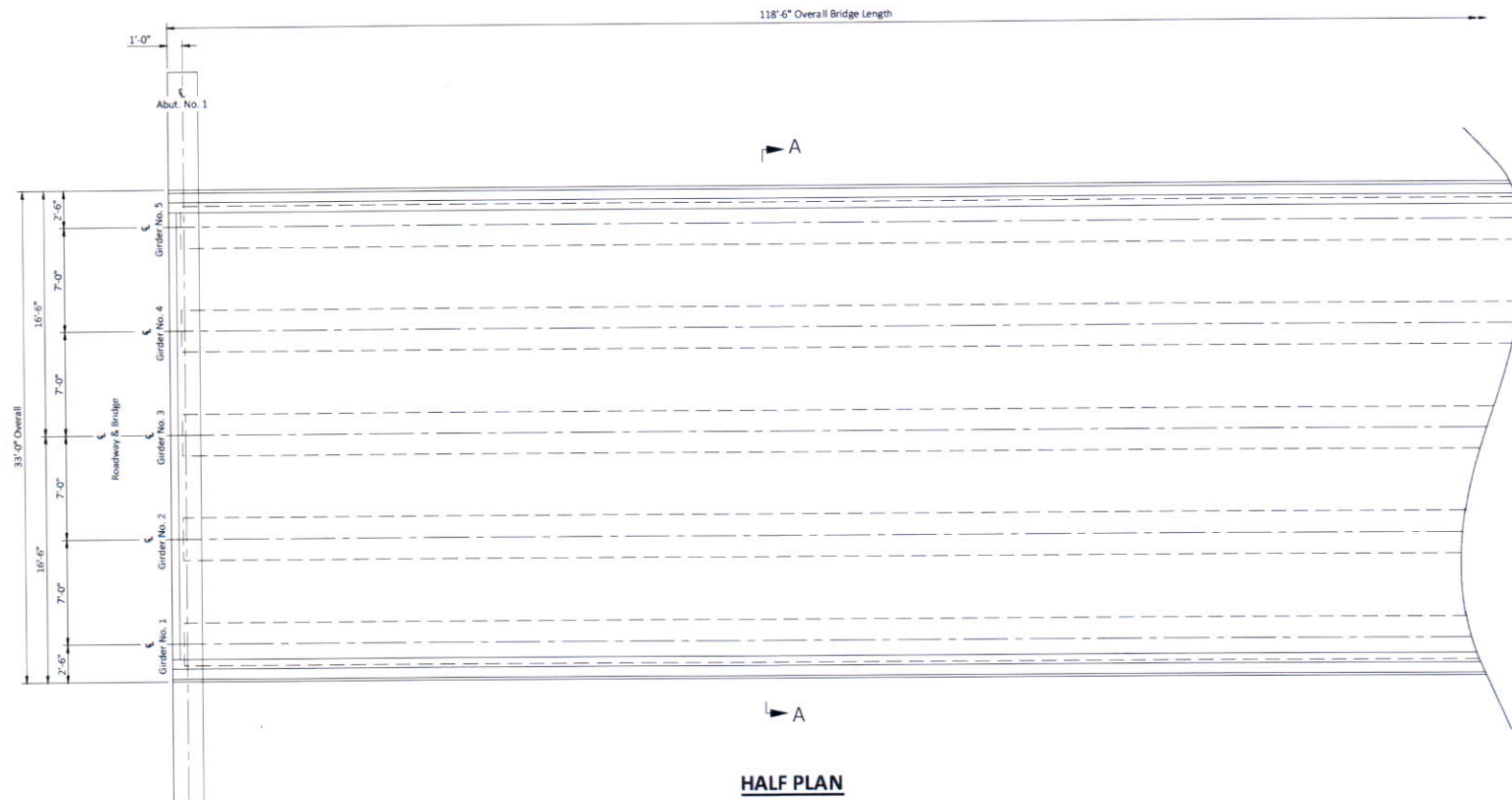
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5304-0022

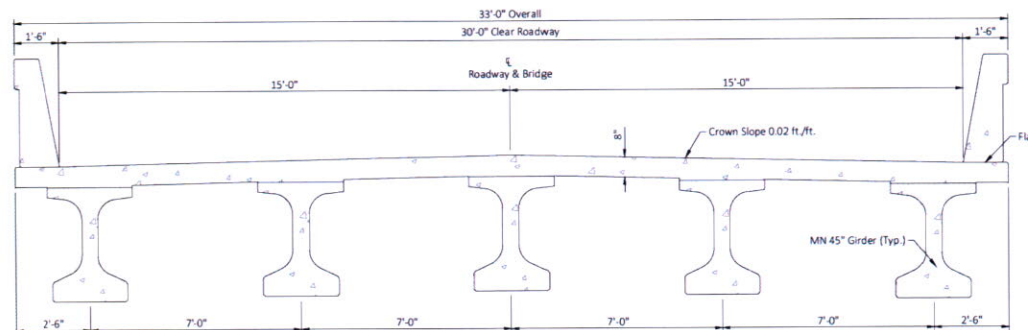
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HALF PLAN



SECTION A-A

Whetstone River Restoration Project Upper Minnesota River Watershed District Ortonville, Minnesota	No.	Revision	Date	By
SUPERSTRUCTURE DETAILS				
 Maple Grove Engineering, Inc. P: 763.493.4522 F: 763.493.5572				
DRAFTED BY				
REVIEWED BY DDM				
DATE 1-29-2021				
PROJECT NUMBER 5304-0022				
S-7				

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Technical Memorandum

To: DANR- Water Rights
Dewell, Amanda; Duvall, Ron; Kilts, Whitney; Steen, Nakaila

From: Lisa Odens PE, CFM
Houston Engineering, Inc.

Subject: Application for Flood Control Permit Within the State of South Dakota – Project Narrative

Date: February 4, 2026

Project: Whetstone River Restoration Project (HEI# 5304-0022)

1. Project Summary

The Upper Minnesota River Watershed District (UMRWD), (applicant) proposes to restore a portion of flows back to the historic Whetstone River channel which was bypassed in the 1930s when a channel was constructed to divert flows into Big Stone Lake. Restoration of the historical channel (approximately one mile in length beginning in the NE 1/4 SE 1/4 Sec 17, T121N, R46W) involves construction of a weir to divert water back to the historical channel and constructing flood control levees along the historical channel (See attached Project Map (Alternative 2B)). The restored, historical channel of the Whetstone River will discharge to the Minnesota River. During flood events, water will flow in the existing bypass channel and discharge into Big Stone Lake and the Minnesota River. The project has many benefits including habitat restoration, flood reduction and water quality improvements. A schematic of the pre-project and post-project River layout is shown in **Figure 1**.

The preferred alternative is Alternative 2B.

2. Project Funding

The project is funded by numerous sources. Initial feasibility studies were paid for by Citizens for Big Stone Lake, a local citizens group to explore options to reduce reoccurring flooding for SD & MN residents of Big Stone Lake. The preliminary design and permitting efforts have been funded by a Flood Damage Reduction Grant through the MnDNR via General Obligation Bond (\$1.2 million), Minnesota Clean Water Funds grant from MnBWSR (\$600k) and \$600k in UMRWD matching funds to satisfy conditions of the Flood Damage Reduction Grant. Additionally, the UMRWD applied for an MPCA 319 Loan (\$430K) to cover project funding for engineering design and permitting support of project features in South Dakota that were prohibited from the conditions of the MN grant sources.

The UMRWD has also secured all the necessary funds for project construction, based on current estimates, that include a grant from the MnDNR for Stream Restoration (\$3 million). The UMRWD and project partners were successful in obtaining federal funds through the National Fish Passage Program as a component of the bipartisan infrastructure law (BIL) (\$3 million), and an America the Beautiful grant through the National Wildlife Federation (\$1.3 million).

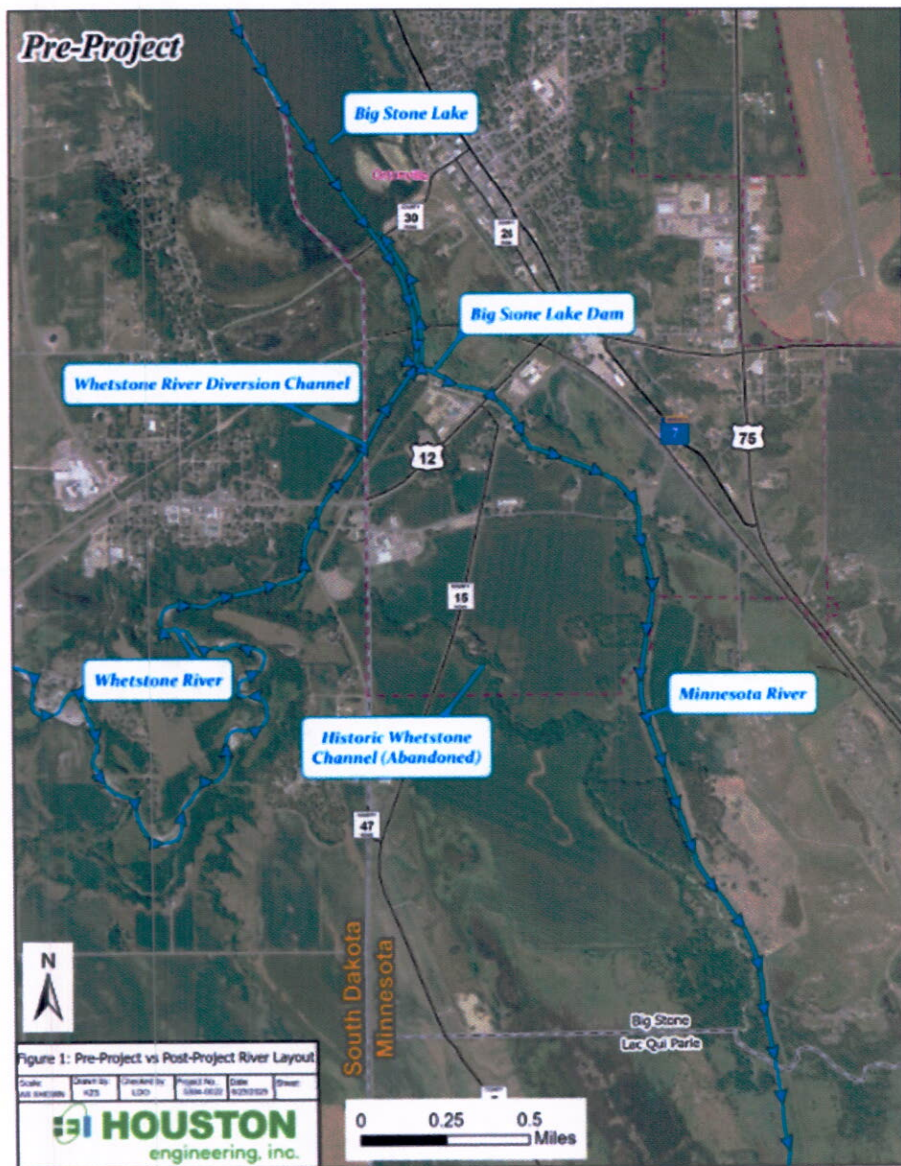


Figure 1: Pre-Project vs Post Project River Layout

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3. Project Permitting and Timelines

The UMRWD initiated the process to obtain project permits in the fall of 2022. The UMRWD is still pursuing permits through local, state, and federal agencies. Below is a summary of the various permits and authorizations the UMRWD is working to obtain for the project.

3.1. USACE 401/404

The UMRWD is working to obtain Section 404 permit authorization from USACE utilizing a Nationwide Permit 27 and Section 401 water quality certification through SD DANR. Given the combination of permitting requirements, permissions and obligations for the various funding sources NEPA compliance will be satisfied for the project.

3.2. USACE 408

Since reconnecting the historic channel to the Minnesota River will alter the timing and routing of flows that currently enter Big Stone Lake, and thus modestly increasing peak downstream discharges, a comprehensive hydrologic and hydraulic (H&H) assessment was conducted to evaluate potential impacts to downstream flood control systems and federal infrastructure. Federal flood control projects downstream include Highway 75 Dam, Lac qui Parle Reservoir and Marsh Lake, the Montevideo Levee System, and Granite Falls Flood Protection. The project is subject to USACE Section 408 review and significant coordination has occurred from 2021 to 2025 to ensure the modeling framework, assumptions, and evaluation metrics meet federal requirements. Since the project does not physically impact any federal infrastructure the 408 authorization is limited to a technical review process. Specifically, for the Whetstone Project the technical review is focused primarily on H&H impacts.

Pre-project and post-project modeling using HEC-HMS and HEC-RAS was completed. The modeling assessed downstream discharges, water-surface elevations, flood frequencies, levee freeboard, overtopping potential, and system performance for significant historical events, including the 1997 flood-of-record and annual peak events from 2010–2022. Pre- and post-project hydrographs were developed using a calibrated HEC-HMS model, which incorporated historic USGS gage data, and reservoir operations. The changes to historical events post-project were plotted on flow-frequency charts to determine the impacts to Federal reservoirs at a range of events. On February 12, 2024, the USACE formally concluded that the project does not result in injurious impacts to federal reservoirs.

Downstream of the Laq Qui Parle Dam, the USACE's Corps Water Management System (CWMS) HEC-RAS model was modified to reflect completed flood control features. Post-project peak discharges were applied to assess changes in stage, freeboard, velocities, and closure operations. The increased discharges yielded minimal changes in water-surface elevation, generally between 0.02 and 0.21 feet. These changes are within the available excess freeboard at downstream levee systems. No modeled scenarios resulted in significant operational conflicts or impacts that would alter levee certification. The USACE acknowledged a completeness determination on Jan 22, 2026. The USACE noted in their completeness determination that a decision is anticipated in 2-3 months.

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3.3. FEMA and Floodplains

The UMRWD and Houston Engineering coordinated directly with the Minnesota DNR, which administers the National Flood Insurance Program in Minnesota, to confirm FEMA regulatory requirements associated with the Whetstone River Restoration Project. MnDNR, with input from FEMA's Regional MT-2 review team, verified the appropriate extent of the Conditional Letter of Map Revision (CLOMR), confirming that the downstream tie-in should occur at the Zone A floodplain near the Highway 75 Dam and that no revisions to Minnesota River hydrology would be required. MnDNR also reviewed and agreed with the proposed CLOMR mapping extent and approach.

The project will require local permitting administered via County ordinances, which will require coordination with Big Stone County and Grant County Floodplain Administrators.

3.4. SD DANR

UMRWD and HEI completed initial coordination calls with Erik Gronlund in 2023 for application of the SD Flood Control Permit. Following coordination with the USACE related to the 408 authorization, HEI facilitated a pre-application meeting on September 27, 2025 to engage with DANR staff to explain the project and discuss permit logistics. It is the applicants opinion that the previously completed hydrologic and hydraulic technical assessment supports issuance of the South Dakota Flood Control Permit for the project.

3.5. MnDNR

Following coordination with the SD DANR related to the SD Flood Control permit the UMRWD and HEI will coordinate completion of a MnDNR Public Waters Work Permit.

4. Public Engagement and Notifications

The Upper Minnesota River Watershed District held a public hearing on February 23, 2015 to review the Whetstone River Restoration Project plan and addendum presented by the Watershed District Engineer, Mark R. Deutschman of Houston Engineering, Inc. The hearing included consideration of the District's basic watershed management plan, the Minnesota Department of Natural Resources Division of Ecological and Water Resources report dated February 13, 2015, the Board of Water and Soil Resources report dated February 20, 2015, and all public comments received before and during the hearing.

The UMRWD conducted a follow up public meeting on July 29, 2020 at the Big Stone City Community Building in Big Stone City, South Dakota. The meeting was conducted to explain the project features and related schedule for engineering design of Project Alternative 2B to landowners located adjacent the project. The meeting served as an opportunity for adjacent landowners to provide comment on project features relative to impacts to their property to be utilized for support in the development of 30% engineering design documentation and related environmental review.

The project has been noticed to the public on numerous occasions to satisfy applicable permit/authorization requirements. These notices include:

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- Minnesota Environmental Assessment Worksheet (EAW) public noticed 12/6/2022 thru 1/5/2023. With comments satisfied the UMRWD produced a negative EIS declaration on 2/24/2023
- USACE Section 408 (USACE Public Notice ID#2023-0003) noticed on 10/15/2025 thru 11/14/2025. No comments were received.
- Section 401 Water Quality Certification. Thirty (30) day public notice pending SD DANR administrative processing for approval.

5. Low Flow Operations

5.1. Existing Conditions

The operations for the Big Stone Dam are governed by the manual: Proposed Operation of Control Works: Big Stone Lake (U.S. Army Corps of Engineers, 1987). The manual describes operational requirements as well as coordination requirements. Guidance related to low flow conditions are summarized below:

- When lake levels are below 964.6 (NGVD 29) between May 1 and September 30th gates must be adjusted so the outflow equals Whetstone River inflow, but not less than 5 cfs. This is completed using the silt barrier sluice gate and operations gates at the dam.
- From October 1 through April 30th (Winter Operation) the release must be the Whetstone River inflow or 5 cfs, whichever is greater.
- During periods when lake level is at or below the silt barrier elevation the operator must ensure at least 5 cfs passes through the dam into the Minnesota River.
- During drought conditions the USACE may require more frequent reporting and additional observations.

The operations plan does not mandate maintaining Big Stone Lake at any specific elevation during drought or low flow conditions, rather all drought or low flow instructions are related to managing minimum necessary downstream releases.

5.2. Proposed Conditions

During proposed conditions, all Whetstone River discharges up to approximately 2-year event will pass through the restored historic Whetstone River restoration channel and pass downstream without operational intervention. Additionally, the operational gates at the silt barrier and Big Stone Dam will remain intact allowing the operator to ensure a minimum of 5 cfs passes; thus meeting the requirements of the operations plan (from downstream of the confluence between the historic Whetstone River channel and the Minnesota River).

With the diversion of Whetstone River discharges to the historic channel, a portion of the existing diversion channel will be un-utilized during small events. This river segment will be bound by the proposed diversion weir, and the Big Stone Dam. In this river segment, stagnant water may become an environmental and aesthetic concern. Final design may include consideration of an

operational gate to allow minimum flows (5 cfs) to pass through the diversion weir structure. This would allow the UMRWD (operator) to address stagnant water issues as they arise. The existing low flow operations gates at the silt barrier and dam can be utilized to address stagnant flow between Big Stone Lake and the downstream confluence with the historic Whetstone River channel.

Because the operations plan does not currently mandate maintaining Big Stone Lake at any specific elevation during drought conditions, and because the operation plan dictates that all Whetstone River discharges pass downstream when the lake is at or below an elevation of 965.6 (NGVD 29), it is not anticipated that the project will impact Big Stone Lake water levels during drought or low flow conditions.

6. Summary of Attachments

Details regarding the proposed project are available in the following attachments:

- 30% Plans (Houston Engineering). Dated March 9, 2021
- Whetstone River Restoration Project – Addendum (Houston Engineering). Dated January 15, 2015
- Modified Alternative 2B Hydrologic and Hydraulic Final Functional Design and Updated Analysis (Houston Engineering). Dated August 25, 2015
- Project Map (Alternative 2B) (Houston Engineering). Dated March 13, 2024
- Whetstone River Restoration Project – Downstream Impact Analysis – Montevideo and Granite Falls (USACE 408 Supplementary Documentation) (Houston Engineering). Dated June 23, 2025)
- Ottertail – Whetstone and Browns Valley Fish Passage Acknowledgement. Dated December 29, 2025
- Proposed Operation of Control Works: Big Stone Lake (U.S. Army Corps of Engineers). Dated 1987)

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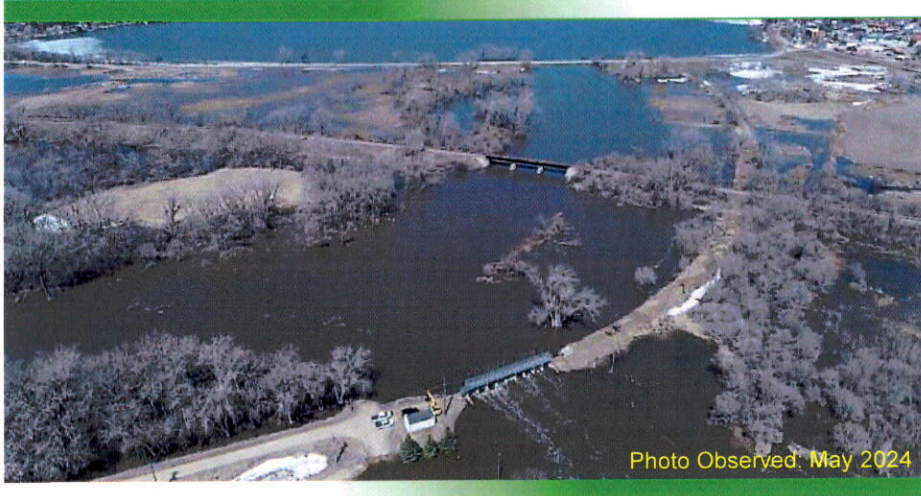
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ProgramHOUSTON
engineering, inc.UMRWD
Feb 2026

Photo Observed: May 2024

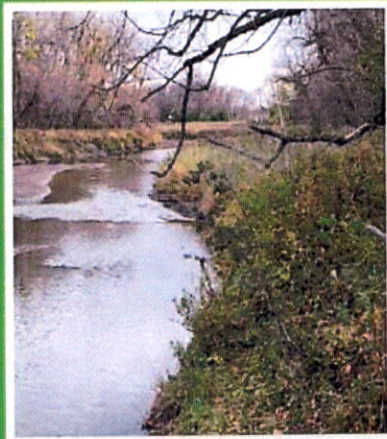
Whetstone River Restoration Project

Application for Flood Control Permit – Project Narrative

1

Agenda

- Project Summary
- Project Components
- Project Benefits
- Project Timeline/History
- Project Permitting and Timelines
- Current Funding
- Public Engagement and Notifications
- Low Flow Operations
- Summary of Attachments



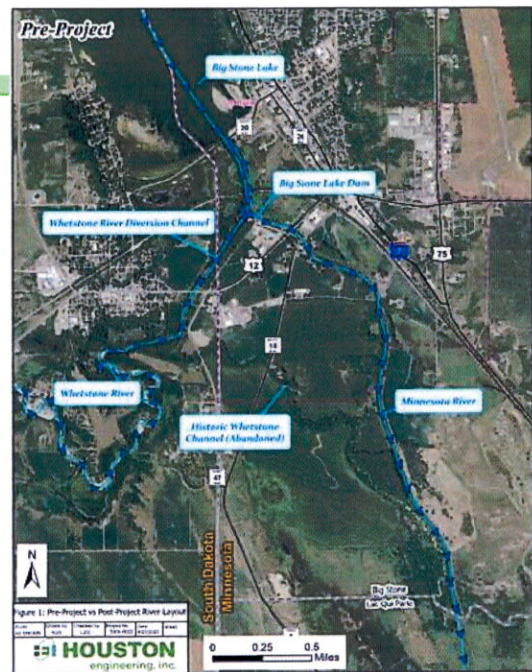
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- The Whetstone River is a 35-mile long tributary of the Minnesota River.
- The Whetstone River was diverted into Big Stone Lake in the 1930's to augment lake water levels.
- Discharges leaving the lake are controlled by the Big Stone Lake Dam.



3

PROJECT BACKGROUND

- Dam is not intended to be flood control, but holds back water due to the physical constraints.
- Reconnection results in ability to "short-circuit" the flow restrictions at the Big Stone Lake Dam
- All discharges up to approximately the 2-year routed through the historic channel.



4

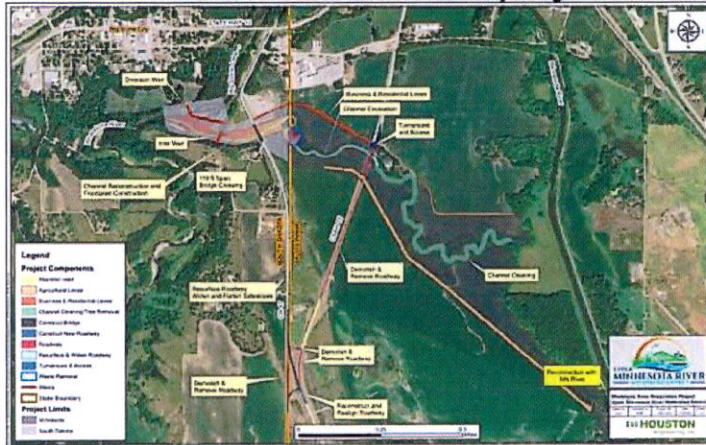
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PROJECT COMPONENTS

Whetstone River Restoration - Preliminary Design



Diversion and Inlet Weir

Channel Excavation and Floodplain Construction

Bridge Crossing over CR 47

Demise of CSAH15

Business and Residential Levees

Agricultural Levees

Transportation Modifications

Native Prairie Plantings

5

PROJECT BENEFITS Summary



- The Upper Minnesota River Watershed District proposes to restore flow to 9,000-feet of the historic channel.
- The Project will:
 - **Improve regional fish passage**
 - **Improve water quality and ecological integrity in Big Stone Lake; and**
 - **Reduce flooding and bypass Big Stone Lake Dam during high-flow events;**

6

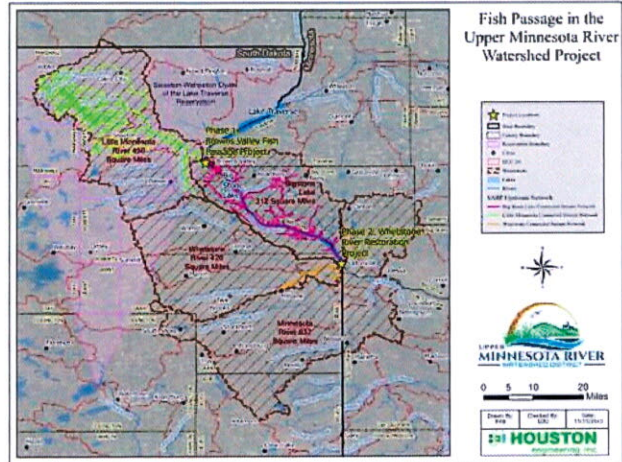
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Program**PROJECT BENEFITS – Fish Passage**

Improve Regional Fish Passage
by:

- Connecting the Minnesota River to Big Stone Lake and the Little Minnesota River
- In combination with other proposed projects will improve spearing opportunities for the Sisseton Wahpeton Oyate.



7

PROJECT BENEFITS – Water Quality

- 68% average annual reduction in TP and TSS to Big Stone Lake
- Includes a floodplain bench that:
 - Stores water
 - Provides nutrient treatment
 - Improves sediment and pollutant retention
- Enhances natural filtration and reduces nutrient loading to Big Stone Lake.



Big Stone Lake State Park – ExploreMinnesota.com

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PROJECT BENEFITS – Stream Ecology/Stability



- Aligns with stream restoration goals (MN DNR coordination).
- Captures: 87% of 2-year peak flow and 98% of 30-day volume
- Uses floodplain bench for overflow management.
- Removes CSAH 15 to reduce runoff and improve connectivity.



Figure 2: MNDNR Recommended Riffle Cross-section

Recommended Riffle Cross-section

Example of Whitestone cross-section from the Minnesota River

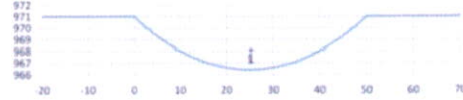
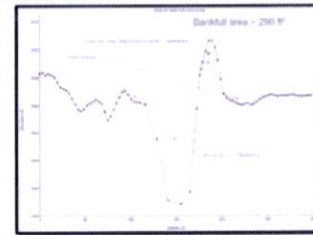


Figure 3: Surveyed Cross Section (Station 5585) in Historic Whitestone near the Minnesota River



9

PROJECT BENEFITS – Flood Reduction

- Historically this diversion has been an issue since the 1950s
- After the 1997 flood, 172 inhabited structures on the Minnesota side of Big Stone Lake were surveyed
- 76 of these structures are below the 100-year flood elevation.
- HEC-RAS modeling shows:
 - Project reduces at-risk structures by 25
 - 1997 flood level down ~1.8 ft
 - 2010 flood level down ~1.0 ft



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Project Timelines/History



■ Project Development

- Local petition to reduce flood damage/risk following **1997, 2001 & 2010** flood events
- Led to development of **2015** project alternatives (locally funded UMRWD, Citizens for Big Stone Lake, Ottertail Power)
- MN DNR Flood Damage Reduction Grant applied August **2017**, awarded July **2019**
- Initiate land purchase (MN Property) March **2018**
- MN land agreement July **2019**, HEI initiates design work Spring **2021**, UMRWD exercised agreement July **2021**

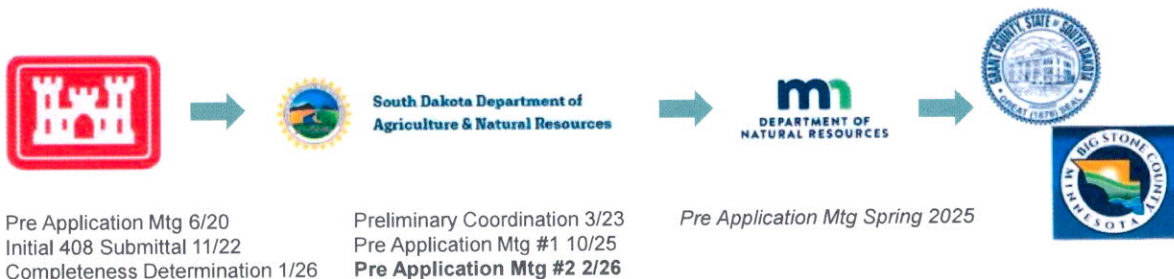
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Project Permitting and Timelines



■ Overall Permitting Status

- The project is actively pursuing permits from local, state, and federal agencies.



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USACE Permitting



USACE 401& 404:

- 401 - SD DANR WQC granted for NWP 27, MPCA may require an Individual WQC for temporary impacts
- 404 - Nationwide Permit 27 (Aquatic Habitat Restoration)
- NEPA Compliance



13

USACE Permitting



USACE 408

- Reconnection of the historic Whetstone River channel alters flow timing/routing and modestly increases peak discharges to Big Stone Lake. Comprehensive hydrologic & hydraulic modeling completed (HEC-HMS and HEC-RAS): Evaluated downstream flood control systems:
 - Highway 75 Dam
 - Lac qui Parle Reservoir & Marsh Lake
 - Montevideo Levee System
 - Granite Falls Flood Protection
- Assessed water surface elevations, flood frequencies, levee freeboard, overtopping risk, and system performance.
- Analysis included 1997 flood-of-record and annual peaks (2010–2022).
- USACE determination (Feb 12, 2024): No injurious impacts to federal reservoirs.
- Downstream CWMS HEC-RAS modeling showed: Stage increases of only 0.02–0.21 ft, within available levee freeboard. No operational conflicts and no impacts affecting levee certification.
- Completeness determination issued Jan 2026; decision expected in 2–3 months.

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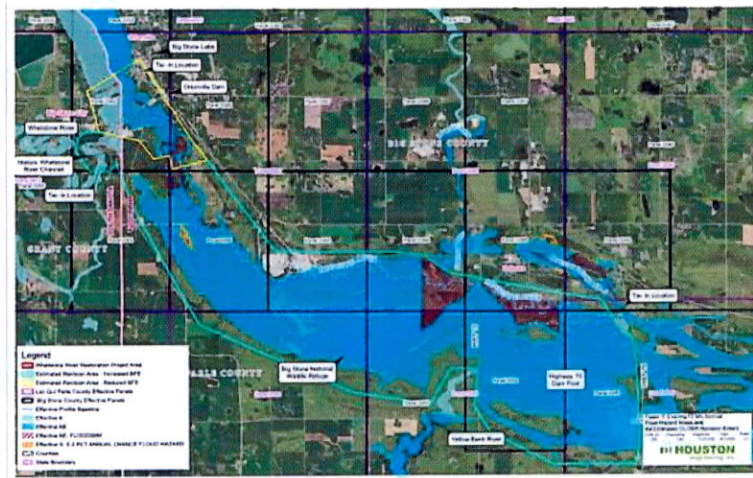
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Floodplain Management and CLOMR Coordination



Floodplain Management & CLOMR Coordination

- MnDNR oversees floodplain regulations and the National Flood Insurance Program in Minnesota.
- HEI and UMRWD coordinated with the State Floodplain Manager on CLOMR extents and regulatory scope.
- MnDNR and the Regional MT-2 team confirmed:
 - CLOMR tie-in at Zone A near Highway 75 Dam.
 - No changes needed to Minnesota River hydrology.



15

State and Local



South Dakota Flood Control

- Initial coordination occurred in 2023; expanded discussions in October, 2025
- Critical path following USACE 408 resolution.



**South Dakota Department of
Agriculture & Natural Resources**

MN DNR

- Following SD DANR coordination, UMRWD will prepare a MnDNR Public Waters Works Permits.



Local

- Local permits will be needed through Big Stone County and Grant County floodplain ordinances.



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CURRENT FUNDING



Project Funding Summary

	Minnesota	South Dakota
Original FDR Grant (2019)	\$1,200,000.00	\$0.00
District Match for FDR Grant (2019)	\$610,614.00	\$0.00
MPCA 319 Loan (2022)	--	\$430,000.00
Potentially remaining in FDR Grant	\$600,000.00	--
CWF BWSR Grant (2024)	\$600,000.00	--
DNR Stream Restoration (2026)	\$3,000,000.00	--
National Fish Passage Program (2024/2025)	--	\$3,000,000.00
America the Beautiful Program(2024/2025)	--	\$1,300,000.00
Total =	\$6,010,614.00	\$4,730,000.00

17

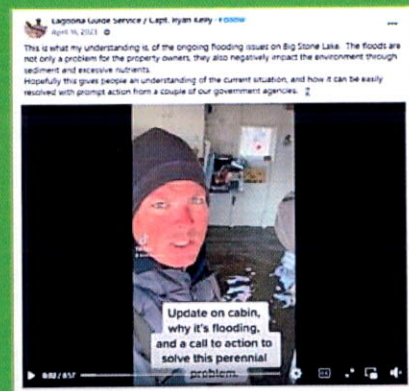
Public Engagement and Notifications

Public Hearing

- UMRWD meetings/coordination with impacted landowners in 2014
- UMRWD held a public hearing on July 29, 2020 in Big Stone City, South Dakota.
- Purpose: Present Project Alternative 2B features and engineering schedule to adjacent landowners.
- Provided opportunity for landowners to comment on potential property impacts.
- Input used to support 30% design development and environmental review.

Public Notices for Regulatory Requirements

- Minnesota Environmental Assessment Worksheet (EAW)
 - Public notice: 12/6/2022 – 1/5/2023
 - Comments resolved; Negative Declaration issued 2/24/2023 (no EIS required).
- USACE Section 408 Review
 - Public Notice ID #2023-0003
 - Noticed: 10/15/2025 – 11/14/2025
 - No public comments received.
- Section 401 Water Quality Certification
 - 30-day public notice pending SD DANR administrative processing



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Low Flow Operations – Current Condition

Operations governed by Proposed Operation of Control Works: Big Stone Lake (USACE, 1987):

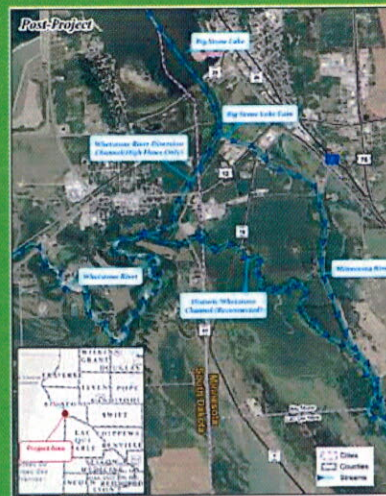
- May 1 – Sept 30: If lake < 964.6 ft (NGVD 29) → Outflow must equal Whetstone River inflow, minimum 5 cfs using silt barrier sluice gate and dam gates.
- Oct 1 – Apr 30 (Winter): Release must equal Whetstone inflow or 5 cfs minimum, whichever is greater.
- When lake ≤ silt barrier elevation: Operator must ensure ≥ 5 cfs passes through the dam.
- During drought conditions USACE may require additional observations and more frequent reporting.
- No requirement to maintain lake at a specific elevation during drought/low flow, requirements focus on minimum downstream releases only.



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Low Flow Operations – w/Project Condition

- Up to approximately 2-year Whetstone River events will fully pass through the restored historic channel without operational intervention.
- Existing operational gates at the silt barrier and Big Stone Dam remain functional; operator can continue ensuring ≥ 5 cfs minimum releases.
- Portions of the diversion channel may remain unused during small events; could result in stagnant water concerns.
- Proposed solution:
 - Operational gate at Diversion Weir to allow 5 cfs minimum flow, reducing stagnant water risk.
 - Existing low-flow gates at the silt barrier and dam can manage flow between Big Stone Lake and the historic channel confluence.
- Project impacts on lake levels:
 - None anticipated during drought/low flow.
 - Operations plan already requires all Whetstone River flow to pass downstream when lake ≤ 965.6 ft, aligning with proposed conditions.



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Summary of Attachments



Details regarding the proposed project are available in the following attachments:

- Proposed Operation of Control Works: Big Stone Lake (U.S. Army Corps of Engineers). Dated **1987**)
- Whetstone River Restoration Project – Addendum (Houston Engineering). Dated January 15, **2015**
- Modified Alternative 2B Hydrologic and Hydraulic Final Functional Design and Updated Analysis (Houston Engineering). Dated August 25, **2015**
- 30% Plans (Houston Engineering). Dated March **2021**
- Project Map (Alternative 2B) (Houston Engineering). Dated March 13, **2024**
- Whetstone River Restoration Project – Downstream Impact Analysis – Montevideo and Granite Falls (USACE 408 Supplementary Documentation) (Houston Engineering). Dated June 23, **2025**)
- Ottertail – Whetstone and Browns Valley Fish Passage Acknowledgement. Dated December 29, **2025**

Name	Org.	Position/Title	Email	Phone Number
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Chris Domeier	MN DNR	Area Fisheries Supervisor, Ortonville Office	chris.domeier@state.mn.us	320-839-2656
Ethan Jensen	MN DNR	Regional Hydrologist	ethan.jenzen@state.mn.us	320-796-2161 ext 232
Amanda Hillman	MN DNR	River Restoration Consultant / Grant Contact	amanda.hillman-roberts@state.mn.us	218-671-7953
Neil Haugerud	MN DNR	River Ecologist	neil.haugerud@state.mn.us	218-671-7936
Luther Aadland	MN DNR	River Ecologist, Retired		
Michelle Prosser	USACE	Project Manager, U.S. Army Corps of Engineers	michelle.e.prosser@usace.army.mil	651-290-5373
Catherine Juhas	USACE	Environmental Resource Specialist, Omaha District	catherine.d.juhas@usace.army.mil	605-906-3428
Mark Ermer	SD GFP	Area Fisheries Supervisor, Webster, SD	mark.ermer@state.sd.us	605-626-3343
Jason Jungwirth	SD GFP	Senior Biologist – Aquatic Habitat & Access, Pierre, SD	jason.jungwirth@state.sd.us	605- 773-3212

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WHETSTONE RIVER RESTORATION PROJECT - ADDENDUM

Upper Minnesota Watershed District

January 15, 2015



HoustonEngineering Inc.

Houston Engineering, Inc.

6901 E Fish Lake Rd., Suite 140

Maple Grove, MN 55369

Phone # 763-493-4522

HEI No. 5304_005

I hereby certify that this plan, specification, or 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 Minnesota.



Mark R. Deutschman

State Reg. No. 41259

1-15-2015

Date

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1 BACKGROUND AND INTRODUCTION

This document is an addendum to the report titled Whetstone River Restoration Project Engineer's Report dated January 15, 2015 (hereinafter referred to as the "Engineers Report"). The Engineer's Report identified, described and evaluated three alternatives for restoring flow to a portion of the (historic) Whetstone River channel from near Big Stone City, South Dakota downstream to the confluence with the Minnesota River. During the late 1930's flow which made it ways through the Whetstone River to the Minnesota River was effectively diverted into Big Stone Lake to augment lake levels by constructing a new channel to near the lake outlet and a levee system.

The three alternatives evaluated within the Engineer's Report differed primarily in the amount of flow restored to the historic Whetstone River channel. The alternatives evaluated in the Engineer's Report included:

1. Alternative 1, Low Flow / DNR Bankfull Channel: a low flow diversion alternative intended to provide perennial flow confined within the historic channel for discharges equal to or less than the one-half the 2-year return period event (an estimated 550 cfs);
2. Alternative 2, 2 year Compound Channel: an alternative providing perennial flow by the diversion of all flows equal to or less than the 2-year return period event (an estimated 1,100 cfs) and conveyed within a "compound channel" consisting of the DNR bankfull channel and an adjacent excavated floodplain and;
3. Alternative 3, 5-year Channel / Riparian Flow: an alternative providing perennial flow by the diversion of all flows equal to or less than the 5-year return period event (3,200 cfs) conveyed within the historic Whetstone channel.

The alternative names fail to reflect that additional flow will be diverted and carried by the adjacent floodplain. Because of a lack of information about the ability to acquire land along the historic channel, each alternative included levees designed next to the open channel (not setback) to various levels of flood protection. These levees were designed to ensure the amount of land flooded adjacent to the historic channel remained the same as the current condition, for events up to the 10% annual chance flood event. Each alternative also included various features necessary to allow water to reenter the historic channel and pass additional flow under road crossings. These features included a diversion structure on the Whetstone River to raise the water level and divert flow into the historic channel, excavation of an embankment, excavation of upstream portions of the historic channel to remove accumulated sediment and debris, and culvert and bridge upgrades at Minnesota County State Aid Highway 15 (CSAH 15) and South Dakota (Grant County) County Road 47. A full description of these alternatives is provided within the Engineer's Report.

Following the completion of the Engineer's Report, District staff and the District Engineer had several meetings to solicit input about the project. Houston Engineering, Inc. (the "Engineer") completed the draft Engineer's Report on June 5, 2014 and orally presented the report to the Upper Minnesota River Watershed District Board (the District) of Managers on July 8, 2014 during their regular meeting. The District convened the Technical Advisory Committee on October 21, 2014 to present the restoration alternatives and receive comment. Several meetings were held with potentially affected landowners. Department of Natural Resources staff became more engaged, assisting with the definition of the restoration design concept and provided considerable input and suggestion through email correspondence.

As a result of these discussions, the Board requested the District Engineer to consider the input received and further evaluate the initial recommendation and to revise the recommendation if necessary. The purpose of this document is to present a revised Engineer's Recommended Alternative with modifications based upon the landowner and public discussions, as an addendum to the Engineer's Report. It is intended that this addendum,



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coupled with the findings of the Engineer's Report, will be used by the Board to order a project containing the components outlined in their preferred alternative. This addendum is necessary because of more detailed information about the availability of land adjacent to the historic channel, discussions with Grant County South Dakota and Big Stone County Minnesota about the project's transportation features, and input from the Minnesota Department of Natural Resources on the restoration design concept.

2 PROJECT GOALS AND DESIGN CRITERIA

The goal of the proposed project is to restore ecological services by reestablishing perennial flow and increasing base flow to an estimated 9,000 and 7,000 feet of open channel within the Whetstone River and Minnesota River, respectively. In addition, floodplain areas of the Big Stone National Wildlife Refuge (Refuge) will also receive ecological services restoration from increased flows. The portions of the Whetstone River and the Minnesota River being restored are generally located downstream of the Big Stone Dam and upstream of the Highway 75 dam, within western Minnesota. The hydrologic regime within these portions of the Minnesota and Whetstone River became substantially altered when the Whetstone River was diverted into Big Stone Lake to supplement water supply within the lake. The proposed project diverts a portion of the discharge from the Whetstone River entering Big Stone Lake into a segment of the historic Whetstone River channel, upstream of the lake. This historic channel connects to the Minnesota River downstream of the Lake.

Restoring ecological services will be accomplished by:

1. Establishing longitudinal connectivity within the historic stream channel of the Whetstone River by creating a hydrologic connection between the Whetstone River upstream and the Minnesota River downstream;
2. Establishing lateral connectivity between the riparian area and the historic stream channel of the Whetstone River by creating a hydrologic connection between the Whetstone River upstream and the Minnesota River downstream;
3. Improving the habitat along the existing riparian corridor for the movement of animal species;
4. Establishing a geomorphologically stable open channel system.

The project goals include establishing hydrologic predictability to landowners adjacent to the restored portion of the historic channel. Hydrologic predictability means establishing a reasonable expectation of the frequency in which lands in agricultural production adjacent to the channel will experience flooding. Minimizing the amount of land and identifying the likely area of land which could experience accumulations of debris and sediment as a result of the diversion is included in the goal.

This project is potentially one component of a larger project aimed at restoring portions of the Whetstone River and the Minnesota River, upstream and downstream respectively. An additional goal is to design and construct this project, in a manner which does not preclude subsequent design and construction of other restoration components.

Design criteria were also established in addition to the project goals. These design criteria, used in conjunction with Project Goals, were used to size the various features of the proposed alternatives and select an alternative capable of meeting the goals and design criteria. The design criteria used for developing each alternative include:

- The restoration of ecological services along the historic Whetstone River channel, consistent with the project goals, which include design of the open channel and setback levees in a manner which reestablishes the lateral and longitudinal connectivity of the floodplain.

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- Providing for fish passage in accordance with Minnesota Department of Natural Resources guidelines. These guidelines include when feasible the use of a single culvert or bridge which spans the natural bankfull width to allow for debris and sediment transport rates to closely resemble those of upstream and downstream conditions. Provide for a single culvert to be recessed in order to pass bedload and sediment load, where appropriate, with additional culvert inverts set at a higher elevation. All culverts should match the alignment and slope of the natural stream channel, and extend through the toe of the road side slope.
- Consideration of the frequency of potential roadway overtopping of SD Grant County 47 (CR 47) and MN County State Aid Highway 15 (CSAH 15) and transportation movement within the project area. Crossings were designed to prevent overtopping during a 100-year event and provide fish passage.
- Protection of tillable agricultural lands located beyond the levees up to the 10-year return period event and residences and commercial businesses to the 100-year return period event.

3 ALTERNATIVE 2B SETBACK LEVEES

This addendum presents a “new” alternative for consideration by the Board of Managers. The alternative is named “Alternative 2B Setback Levees” because the amount of water diverted into the historic Whetstone River Channel is equal to or somewhat greater than the amount diverted by Alternative 2 (as presented in the Engineer’s Report). This alternative differs from Alternative 2 by incorporating levees “setback” from the centerline of the historic channel, rather than the levees being located immediately adjacent to the historic channel. Setting the levees back in this manner improves the quality of the restoration project by creating greater lateral connectivity between the stream channel and the riparian floodplain. This alternative also envisions modifying the cross-sectional geometry of those portions of the channel needing excavation to a more “natural” shape. Alternative 2B is possible provided the land needed can be acquired and generally is more characteristic of a restoration project.

Alternative 2b is designed to achieve the project goals in **Section 2** by diverting the largest reasonable discharge through the restored channel, while being consistent with the stream restoration purpose. This alternative envisions an open channel geometry and slope which results in full channel flow for the bankfull discharge, which has recently been estimated at 475 cfs by the Minnesota Department of Natural Resources (MnDNR). This alternative will completely divert all Whetstone River discharges up to at least 1,100 cfs through the restored historic Whetstone River channel (1,100 cfs represents the 2-year discharge for the Whetstone River). The portion of the discharge between the bankfull discharge and the 2-year discharge will be carried by an excavated floodplain bench. Only a portion of the discharge in excess of the 2-year return period event within the Whetstone River is diverted to the restored channel. **Figure 1** shows the non-transportation related features of this alternative. The following paragraphs describe the alternative with further detail.

3.1 LEVEES

Existing agricultural levees are present along much of the historic Whetstone channel. However, downstream of CSAH 15 the agricultural levees are more pronounced and currently provide flood protection to agricultural lands from the Minnesota River. To provide lateral connectivity between the open channel and the riparian area with the floodplain, these existing levees will need to be breached intermittently at a distance of no less than 500-feet. As flow increases this will allow water to leave the channel and become stored within the adjacent floodplain.

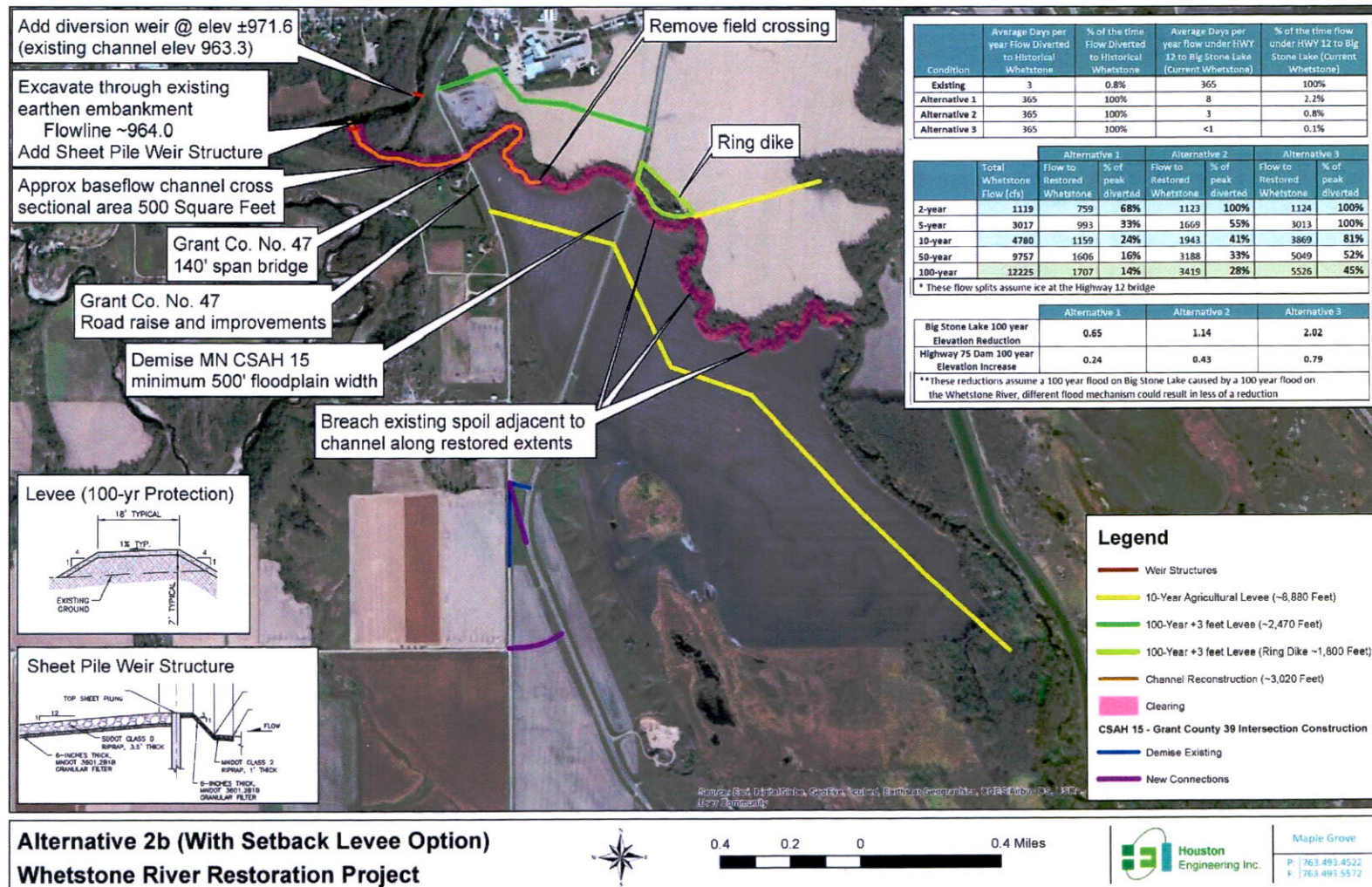
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Figure 1: Alternative 2B (With Setback Levee Option)



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East of CSAH 15 and just north of the historic Whetstone alignment there is a private residence requiring flood protection. A levee encircling the residence (i.e., a ring dike) is proposed to protect this residence to the 1% chance flood with 3 feet of freeboard. The ring dike will be approximately 1,800 linear feet in length and range from 5.0 to 8.6 feet above natural ground based on preliminary hydraulic analysis. The ring dike will be constructed with a 16-foot top width and 4:1 side slopes.

Tillable agricultural land beyond the setback levees will to be protected up to the 10% chance flood event, while residences and businesses will be protected to the 1% chance flood event with 3 feet of freeboard (see **Figure 1**). An estimated 8,000-feet of agricultural levee are needed. One levee segment will be south of the historic Whetstone from CR 47, extending south to tie-in with existing levees within U.S. Fish and Wildlife lands. The north segment will extend from the Dwyer rink dike and extend east to tie-in with existing agricultural levees along the Minnesota River. The top of levee elevation for the agricultural levees will range from 0.0 to 8.3 feet above natural ground based on preliminary hydraulic analysis. The agricultural levees will be constructed with a 16-foot top width and 4:1 side slopes. The agricultural levees are located at a minimum offset distance of 500-feet from the historic channel centerline. The offset distance exceeds the minimum distance of 250-feet recommend by the Minnesota Department of Natural Resources. Expectations are that on-site materials will be used to construct the agricultural levees.

An additional 2,470 linear feet of business/residence levees between CR 47 and CSAH 15 on the north side of the historic Whetstone is needed. These certified levees will protect several businesses south of Mill Road for events up to and including the 1% chance flood with 3 feet of freeboard. The top of levee elevation for these levees will range from 2.7 to 11.2 feet above natural ground based on preliminary hydraulic analysis. These levees will be constructed with a 16-foot top width and 4:1 side slopes.

3.2 HISTORIC WHETSTONE CHANNEL RECONSTRUCTION

Since the Whetstone River was diverted into Big Stone Lake in the 1930's the elevation of the channel bottom has lowered an estimated 4.5 feet, based on survey data collected for this project and the current invert of the historic channel. This "headcutting" within the Whetstone River was likely caused by shortening the stream reach, which increased the channel slope and the energy of flowing water. Hydrology has also likely changed through time due to upstream land use changes (increased discharges).

An embankment currently blocks discharge from entering the historic Whetstone river channel. This embankment is effectively a portion of the levee believed to be constructed when the Whetstone River was diverted into the lake. The embankment is connected to the Big Stone Lake Dam embankment. The embankment is approximately 600 feet West of CR 47 and contains a 2' diameter culvert. Excavation through this embankment will be required to reconnect the historic Whetstone River channel to the Whetstone River. Excavation and removal of the embankment is proposed beginning 1,960 feet upstream from the Highway 12 Bridge and continue to approximately 1,500 feet downstream from CR 47 for a total distance of an estimated 2,960 linear feet.

In order to restore flow, the historic channel can be either excavated to the elevation of the current Whetstone River channel (964.01) or the current bottom elevation (flowline) of the historic channel (968.0). Excavation of the historic channel to near an elevation of 964.0 is recommended. Raising the Whetstone River channel bottom to the historic Whetstone flowline could result in a less entrenched channel upstream of the restored portion on the Whetstone River, which may reduce head cutting and reconnect discharges with the floodplain

¹ All elevations reference North American Vertical Datum of 1988 (NAVD 88)

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upstream of the project. However, raising the elevation of the Whetstone River channel bottom is likely more challenging from a construction perspective and changes the channel slope of the Whetstone River relatively little within the unstable portion of the river. Raising the flowline of the Whetstone River channel bottom to elevation 968.0 reduces the discharge capacity through the historic channel, reduces the amount of water which can be diverted at higher discharges and therefore reduces the potential flood damage reduction benefits on Big Stone Lake. This lost capacity could be offset by excavating a floodplain bench along the historic channel and/or raising the elevation of the diversion weir structure (discussed below).

Alternatively the elevation of the Whetstone River where flow will be diverted into the historic channel could remain unmodified. To avoid entrenchment of the historic channel a floodplain bench can be constructed adjacent to the bankfull channel along the restored stream. The excavated material may be suitable and could be used to construct the levees. Only the upstream portion of the historic channel would need excavation. The conveyance capacity of the lower portion of the historic channel towards the Minnesota River is generally sufficient to pass the 2-year discharge. This is the recommended method for restoration.

During final design, the geometry and slope of the historic channel and the elevation of the diversion structure (see below) will be optimized to ensure capacity is not compromised, adverse impacts on the Whetstone River are avoided, and the historic restored channel is not entrenched.

During final design a stable cross section will be determined. Guidance provided by the Minnesota Department of Natural Resources indicates a desired bankfull cross sectional area of approximately 150 square feet within riffles and 300 in pools. Survey information for several locations along the historic Whetstone River channel upstream from the Minnesota River indicate a typical top-of-bank to top-of-bank cross sectional area of approximately 290 square feet. An example of a surveyed cross section in this location is shown in **Figure 2**. On historic aerial photos from 1938 and 1955 several breakout reaches are visible, which may have reduced the discharge historically flowing through parts of the Whetstone. These breakouts are no longer available. Therefore, we anticipate the final cross sectional area of the excavated portion of the historic channel will include a floodplain bench sufficient to pass the 1.5-yr to 2-year discharge (~800-1,100 cfs).

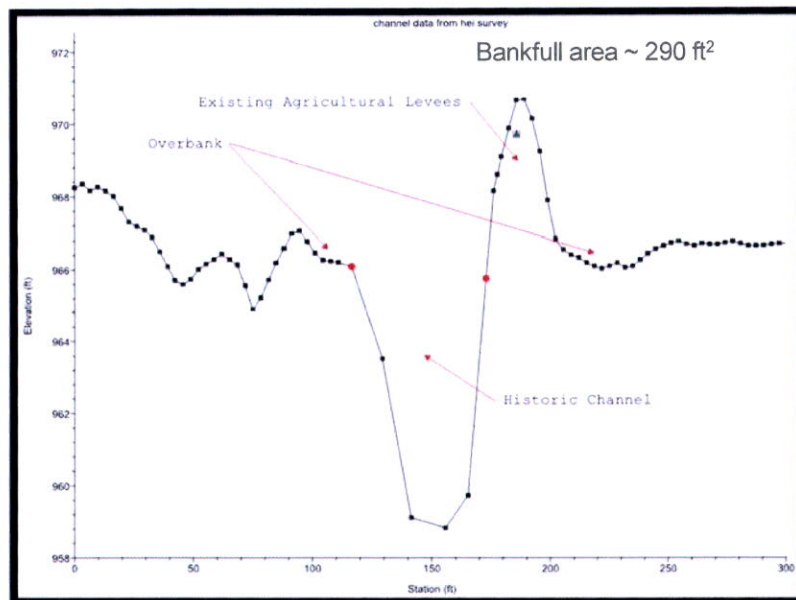


Figure 2: Surveyed Cross Section (Station 9586) in Historic Whetstone near the Minnesota River

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The current channel is overgrown with vegetation in many places and contains a substantial amount of downed trees blocking the channel. Clearing will need to take place in the area below normal water levels. Clearing debris, primarily fallen trees and growing trees from the historic Whetstone channel will be required along the 9,000 foot length. Much of this material will be stockpiled and used as toe wood protection at select locations.

3.3 WEIR STRUCTURES

To divert water into the historic channel a “plug” (i.e., a diversion structure) is needed in the Whetstone River to raise water levels (see **Figure 1**). The diversion structure also needs to be designed and constructed in a manner which allows large flows to pass over the top as none of the alternatives are able to pass Whetstone River flows for all flood events. The proposed diversion structure consists of a sheet pile weir with a crest elevation of approximately 971.6 located 1,080 feet upstream from the Highway 12 Bridge. The existing channel bottom is 963.3. The sheet pile weir will be embedded within rock with 3:1 and 12:1 slopes on the upstream and downstream faces, respectively. The design is intended to provide safe passage for fish and recreational canoeists and allow debris and ice to pass through the downstream debris barrier by the dam. Rock arch rapids can be incorporated into the riprap during final design.

A second weir structure designed similar to the diversion structure will be constructed at the location where the existing levee is removed near the entrance to the historic channel. The purpose of this “weir” is to create a “hard point” to ensure grade control at the inlet of the historic channel. The structure consists of a sheet pile weir with a crest elevation of approximately 964.0. The sheet pile weir will be embedded within rock with 3:1 and 12:1 slopes on the upstream and downstream faces, respectively. During final design the crest elevation of the structure may be adjusted, as design of the open channel and diversion weir is optimized.

3.4 TRANSPORTATION FEATURES

County Road 47 crosses the historic Whetstone channel approximately 1,800 feet south of Highway 12. The road had an Average Annual Daily Traffic (AADT) of 226 in 2011 based on published maps. The elevation of the road crown is approximately 4-feet above natural ground and 15 feet above the current channel bottom of the Whetstone River where the road crosses the river. The road appears to consist of 2 11-foot driving lanes and 2-foot gravel shoulders. Shoulder width increases to 5-feet as Highway 12 is approached. The probable right of way is a total of 60-feet. There is currently a 60” by 84” corrugated metal arch culvert under the road where it crosses the historic Whetstone River. This crossing is to be replaced with a 140-foot span bridge with a total waterway area of 1,140 square feet. This bridge was proposed in Alternative 3 of the Engineer’s Report and will allow the largest reasonable discharge to be diverted to the historic Whetstone, which will provide the greatest impact in regards to reconnecting the floodplain during flood events.

CSAH 15 crosses the historic Whetstone Channel approximately 3,600-feet south of Highway 12 and approximately 3,200 feet east of the Whetstone River. The AADT for the road was 470 in 2012 based on published maps. The current road elevation is only slightly above the elevation of the surrounding fields. The elevation of the top of the roadway is approximately 10-feet above the current historic Whetstone channel and appears to consist of 2, 12-foot driving lanes with 4-foot paved shoulders. There is currently one line of 48-inch reinforced concrete pipe where the road crosses the historic channel of the Whetstone River.

From their intersections with Highway 12 to approximately 1.0 miles south of the historic Whetstone, CR 47 and CSAH 15 are redundant. Approximately 1.0 miles south of the historic Whetstone River the two highways converge to within 240-feet of one another with a small connection road in-between. These highways then both extend north, crossing the historic Whetstone and meet Highway 12 approximately 0.7 miles apart from each other. These roads are also connected on the north side of the Whetstone and south of Highway 12 by Mill

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Road, which has several businesses. Between the south connection and Mill Road on CSAH 15 there is one access to a residence. Along CR 47 there are five access points to residences and business.

The proposed modifications to the transportation system are shown in **Figure 3**. After preliminary discussions with both the Grant County highway superintendent and Big Stone County Engineer, it was determined that the redundant section of CSAH 15 could be demised (while maintaining access to the residence). This eliminates the need for a second large crossing over the restored Whetstone River. Demolition of a minimum of 500-feet of CSAH 15 where it currently crosses the historic channel is recommended to restore floodplain flow. The portion of CSAH 15 north of the Whetstone historic channel is to remain for residential access. The portion of CSAH 15 south of the historic channel to CR 47 will be reclaimed (1,950 linear feet) and a new turf surface established south of the Whetstone River to the CR 47 connection.

With the demolition of MN CSAH 15, new transportation features and upgrades will be required to allow traffic movements to and from Big Stone City and onto Highway 12. The current design of CR 47 is likely to a lesser tonnage than CSAH 15. The road cross section of CR 476 is also narrower than CSAH 15 and therefore driver expectations differ between the two roads.

Approximately 7,200 linear feet of improvements to CR 47 are planned. These improvements will entail upgrading CR 47 to a cross section consisting of two 12-foot lanes with 4-foot aggregate shoulders. An estimated 40-feet of additional ROW (6.2 acres) is needed to construct the road, assuming no change in current grade. A new connection will be made between CSAH 15 to CR 47 by construction a horizontal curve with a 60-mph design speed. A new connection from CR 47 to CSAH 15 is also be needed and will consist of a 45-mph horizontal curve (890 linear feet) with a stop connection at CSAH 15. With the improved intersections, several segments (2,840 linear feet) of existing roadway can be obliterated. This includes the current connection between CR 47 and CSAH 15 and the segment of CR47 north of the new connection and south of the existing connection. In addition there will be 1,100 linear feet of new aggregate surface constructed to provide several residential accesses. A small field crossing between CR 47 and CSAH 15 is also to be removed.

3.5 LAND REQUIREMENTS

A considerable amount of land is needed for the construction of Alternative 2B. All land located between (interior to) the levees is expected to be purchased by the District. **Figure 4** shows the preliminary land requirements. A detailed table of land needs is provided in **Appendix A: Land Requirements**. A total of 254 acres is planned for fee purchase. Levee construction is expected to occur on the land purchased. Temporary easements are necessary to complete construction. Flowage easements are also needed as the proposed project will alter the area inundated by the 1% chance flood event. The area inundated for the 1% flood event on land exterior to the levee system may increase or decrease. Although the net change in the acreage inundated on a specific parcel may be small or even zero, the acquisition of flowage easements for any land newly inundated for the 1% chance flood event (based on a channel design characteristics of Alternative 3 (design of 3,200 cfs) and setback levees of Alternative 2B) is proposed (see **Figure 4**). An estimated 105 acres is planned for flowage easements. The District will also need access to the proposed diversion weirs for future maintenance, which will be accomplished through approximately 1 acre of permanent right-of-way or easement.

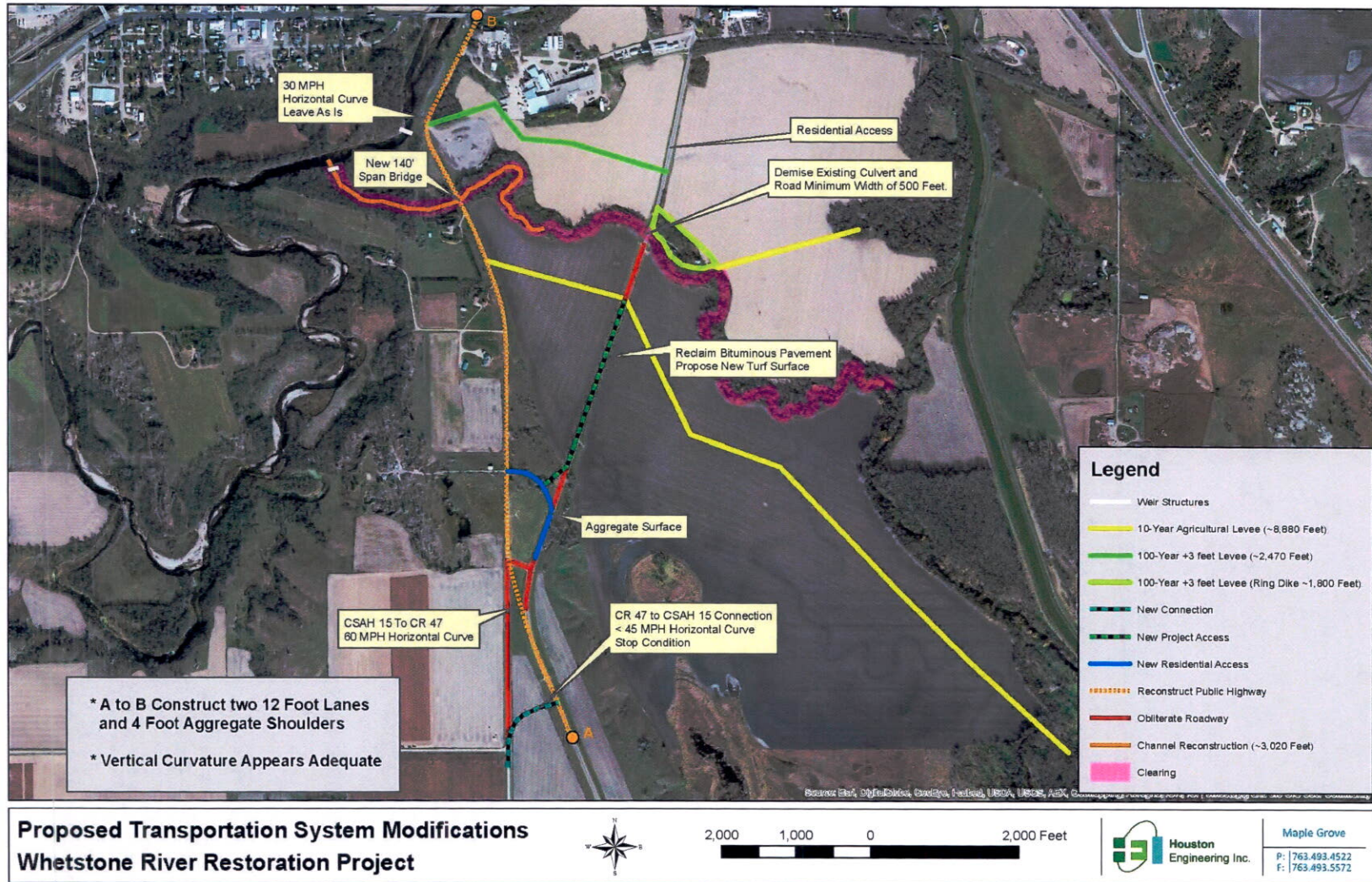
Widening CR 47 requires additional acquisition of additional ROW. The current ROW is believed to be 60-feet total. Acquisition of an additional 40-feet is proposed. Existing roadway ROW will be vacated at select locations.

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Figure 3: Proposed Transportation System Modifications

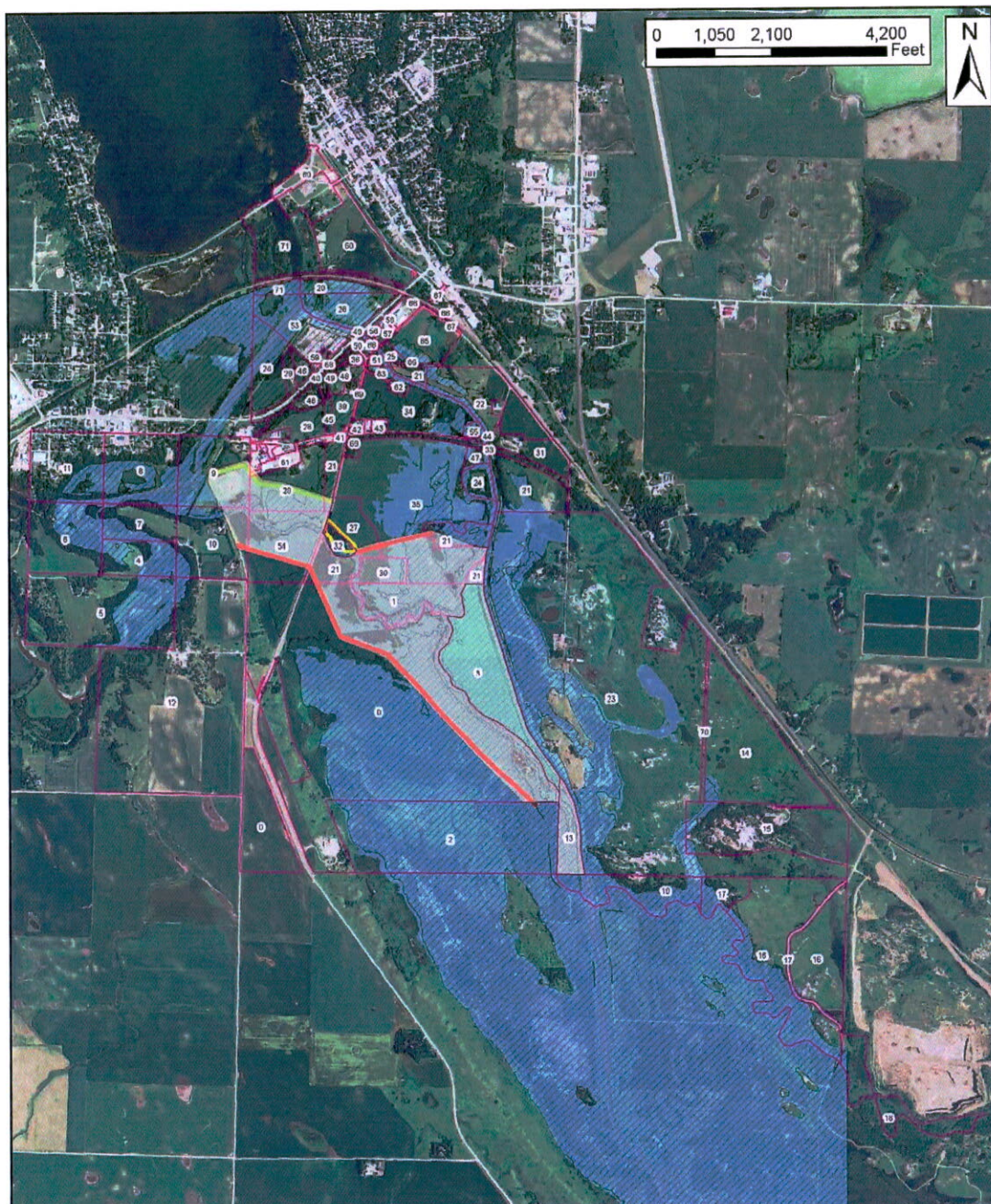


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Figure 4: Preliminary Land Requirements



PRELIMINARY FOR DISCUSSION ONLY

12/10/2014

The information shown by this map is preliminary, based upon a concept levee design, including their alignment, elevation, and tie in locations. Additional design is necessary to confirm the engineering feasibility, including levee tie-in location.

Note: The depth and duration of inundation may increase within the existing floodplain boundary. Newly inundated areas during the 100-yr base flood are potential areas of flow easements.

Preliminary with parcel ID's					
Scale	Drawn by	Checked by	Project No.	Date	Sheet
AS SHOWN	LDO		5304-008	12/10/2014	
 Houston Engineering Inc. P: 763.493.4522 F: 763.493.5572			Maple Grove P: 763.493.4522 F: 763.493.5572		

Legend

-  Maintenance Easement
-  Purchase
-  Parcels shown in table
-  10-Year Agricultural Levee
-  100-Year +3 feet Levee
-  100-Year +3 feet Levee (Ring Dike)
-  100-Year Existing Flood Extent
-  100-yr Proposed Flood Extent

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4 ALTERNATIVE 2B IMPACT ANALYSIS

4.1 INTRODUCTION

The designs of the various alternatives including Alternative 2B (i.e., Alternative 2 with Setback Levees) described within the Engineer's Report and this addendum are conceptual. This means preliminary sizes, lengths, dimensions and elevations of the various project features (e.g., the crest elevation of the Whetstone River diversion weir) have been determined and the function and probable performance evaluated using the hydrologic and hydraulic models. Based on these dimensions an estimate of the Preliminary Opinion of Probable Construct Cost (POPCC) is provided with an appropriate contingency, reflecting some design uncertainty. Should the Board of Managers decide to proceed with a restoration project, additional design will be required for the selected alternative.

The potential impacts resulting from Alternative 2B and described within this portion of the Addendum are based on the functional design of Alternative 2. The effects of setting the levees back from the channel are yet to be explicitly modeled. Optimization of the design characteristics of the Whetstone River Diversion weir, the elevation of the historic channel bottom, and the restored channel geometry will be need to be coordinated with the Minnesota Department of Natural Resources. The performance and potential impacts described within this section for Alternative 2B reasonably reflects the consequences of project implementation.

4.2 RESTORATION HYDROLOGY

The purpose of the restoration project is to return perennial flows to the historic channel of the Whetstone River. The amount of water which can potentially be diverted into the historic channel is primarily a function of the elevation of the Whetstone River diversion structure (i.e., the amount of "head" created), the cross sectional area and elevation of the excavated portion of the historic Whetstone Channel, and the effect of the downstream structures under CR 47 and CSAH 15. Downstream water levels on the Minnesota River also can affect the amount of water diverted.

For all three alternatives, placing the diversion weir in the existing Whetstone channel combined with channel excavation will restore flow into the historical channel on a daily basis. **Table 1** provides details on the anticipated regularity of daily discharges in the Whetstone. These values are based on the daily discharge record at the USGS gaging station on the Whetstone River near Big Stone City and the capacity of the historic channel. Each alternative accomplishes the purpose of returning perennial flows to the historic Whetstone channel.

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Table 1: Frequency of Diverted Mean Daily Flows (1910-2013)

Condition	Average Days per year flow diverted to Historical Whetstone Channel	Average Days per year flow to Big Stone Lake (Current Whetstone)
Existing	3	365
Alternative 1 Low Flow / DNR Bankfull Channel	365	8
Alternative 2 2 Year Compound Channel	365	3
Alternative 3 5 Year Channel, Riparian Maintenance	365	<1

Typically restoration projects such as this are initially designed and their performance analyzed by engineers using “design events”. Design event hydrographs are those with a certain shape and estimated peak discharge and a probability assigned based on the typical likelihood of a hydrologic event occurring. Design events are the typical method used to size project features, and are useful for analyzing how the proposed features will perform for a range of differing amounts of runoff, which are likely to occur during the life of the proposed features. These events are referred to by an annual probability or sometimes an average recurrence interval. For example the 100-year flood event is the flood event that has a 1% chance of being exceeded on average in any given year.

Table 2 summarizes the estimated peak discharge and the proportion of that discharge diverted to the historic Whetstone channel for the three alternatives. For example, during the 100-year flood event with Alternative 2, 28% of the peak discharge will be diverted to the historic Whetstone. A much larger portion of the total volume of the flood event will still be diverted to the historic Whetstone. The amount diverted under existing conditions is virtually none.

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Table 2: Peak Flows Restored to Whetstone Historic Channel

	Total Whetstone Flow (cfs)	Alternative 1 Low Flow / DNR Bankfull Channel		Alternative 2 2 Year Compound Channel		Alternative 3 5 Year Channel, Riparian Maintenance	
		Peak Flow to Restored Whetstone (cfs)	% of peak diverted	Peak Flow Restored to Whetstone (cfs)	% of peak diverted	Peak Flow to Restored Whetstone (cfs)	% of peak diverted
2-year	1119	759	68%	1119	100%	1119	100%
5-year	3017	993	33%	1669	55%	3013	100%
10-year	4780	1159	24%	1943	41%	3869	81%
50-year	9757	1606	16%	3188	33%	5049	52%
100-year	12225	1707	14%	3419	28%	5526	45%
These flow splits assume ice at the Highway 12 bridge							

Often, local residents can gain more perspective on the impacts of a project by analysis of historical runoff events than design events. The impacts the project would have, had it been in place, during “the big one” can be more relevant to those living in the area. As such, the impacts were also analyzed using the 1997 and 2010 flood events. **Table 3** shows the effects of each alternative, had the project been in place, during the 1997 and 2010 flood events.

Table 3: Effects of the Alternatives for the Historic Flood Events

	Existing Conditions	Alternative 1: Low Flow / DNR Bankfull Channel	Alternative 2 & 2B**: 2 Year Compound Channel			Alternative 3: 5 Year Channel, Riparian Maintenance	
Big Stone Lake Maximum Elevations*							
	Maximum Elevation	Maximum Elevation	Change	Maximum Elevation	Change	Maximum Elevation	Change
1997	973.94	972.6	-1.34	971.75	-2.19	969.83	-4.11
2010	972.38	971.72	-0.66	971.31	-1.07	970.43	-1.95
Highway 75 Peak Discharge							
	Peak Discharge (cfs)	Peak Discharge (cfs)	Change (cfs)	Peak Discharge (cfs)	Change (cfs)	Peak Discharge (cfs)	Change (cfs)
1997	9,335	10,215	880	10,885	1,550	12,229	2,894
2010	10,665	11,561	896	12,144	1,479	13,615	2,950
Highway 75 Total Volume***							
	Total Volume (acre-feet)	Total Volume (acre-feet)	Change (acre-feet)	Total Volume (acre-feet)	Change (acre-feet)	Total Volume (acre-feet)	Change (acre-feet)
1997	508,352	512,946	4,594	519,332	10,980	513,175	4,823
2010	439,704	450,476	10,772	453,446	13,742	450,551	10,847
Highway 75 Maximum Elevations							
	Maximum Elevation	Maximum Elevation	Change	Maximum Elevation	Change	Maximum Elevation	Increase
1997	957.98	958.23	0.25	958.38	0.40	958.69	0.71
2010	958.33	958.54	0.21	958.67	0.34	958.98	0.65
Diversion Split Peak Flow							
	Peak Whetstone Flow (cfs)	Peak Flow Restored to Historical Whetstone (cfs)	% of peak to Historical Whetstone	Peak Flow Restored to Historical Whetstone (cfs)	% of peak to Historical Whetstone	Peak Flow Restored to Historical Whetstone (cfs)	% of peak to Historical Whetstone
1997	6,593	1,396	21%	2,441	37%	4,345	66%
2010	6,394	1,372	21%	2,334	37%	4,299	67%
Diversion Split Total Volume							
	Total Whetstone Volume (acre-feet)	Total Volume Restored to Historical Whetstone (acre-feet)	% of total volume to Historical Whetstone	Total Volume Restored to Historical Whetstone (acre-feet)	% of total volume to Historical Whetstone	Total Volume Restored to Historical Whetstone (acre-feet)	% of total volume to Historical Whetstone
1997	159,547	79,843	50%	105,441	66%	146,945	92%
2010	112,503	70,742	63%	87,239	78%	108,434	96%

* The existing 100-year floodplain elevation for Big Stone Lake established by FEMA is 972.1 (NAVD88, effective April 17, 2006).

** The effects of alternative 2B are yet to be modeled, but the downstream peak discharge and water surface elevations are expected to be less than Alternative 2 because of the additional floodplain storage between the setback levees.

***If the model was run for a long enough period of time, such that areas with storage (such as Big Stone Lake) were allowed to find the same equilibrium at their initial starting condition and ending condition, these volumes would be equal for all alternatives. These volumes indicate that the timing of volumes is changed dependent on the alternative.

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These results provide additional information about the performance of the alternatives. The results show the proportion of the peak discharge entering the historic channel for Alternative 2 is 1,000 cfs more than Alternative 1 (assuming no setback levees), the additional lowering of the peak water elevation of Big Stone Lake, and the increase in discharge downstream through the wildlife refuge. Remembering that the modeling of the setback levees is still necessary for Alternative 2B, the probable downstream effects will be lessened compared to Alternative 2 (peak discharges and water levels will be lower).

Hydrologic restoration is also intended to provide longitudinal and lateral connectivity between the riparian area and floodplain, and fish and wildlife habitat improvement. Longitudinal connectivity means that the water can flow freely from upstream to downstream through the open channel of the stream or river in the absence of barrier (e.g., dams). Lateral connectivity means that the open channel and floodplains carry a proportionate share of their flow; i.e., the land next to the open channel has a reasonable chance of flooding and the open channel of the stream or river does not carry all the flow.

From a restoration perspective only Alternative 2B achieves lateral connectivity as conceived. Alternatives 1, 2, and 3 are inconsistent with the goal of establishing lateral connectivity, because the levees to provide protection of agricultural lands are placed immediately adjacent to the historic channel and the flow is largely carried by the open channel. The levees were placed adjacent to the channel for these alternatives because the amount of land that could be acquired was unknown. Consistency with the goal of lateral connectivity *can be* easily accomplished for Alternatives 1, 2 and 3 by setting the proposed levees back from the historic channel as done in Alternative 2B.

4.3 FLOODPLAINS AND FLOOD POTENTIAL

Because a considerable portion of the water moving downstream in the Whetstone River will be diverted into the historic channel, the location of the floodplain and lands affected will change. In general, a considerable portion of the flow from the Whetstone River (i.e., 21% of the peak discharge for the historic floods) will no longer reach Big Stone Lake, reducing flood elevations on Big Stone Lake.

Following the 1997 flood, the low floor elevation of 172 inhabited structures on only the Minnesota side of the lake were surveyed by the Upper Minnesota River Watershed District and Big Stone County. Currently 72 structures are lower than the 100-year lake elevation of 972.65. Alternatives 1, 2, and 3 reduce the number of structures to 57, 50, and 17 respectively. Alternative 2B is expected to reduce the number of structures similar to Alternative 2. The 100 year flood elevation decrease ranges from 0.65 feet to 2.02 feet, depending on the alternative. The maximum elevation decrease, assuming all Whetstone discharges are diverted was calculated to be 2.7 feet.

Water which is diverted through the historic channel will reach downstream areas more quickly, and potentially increase the maximum water depth. **Error! Reference source not found. Table 4** shows the changes in maximum water surface elevation on Big Stone Lake, the Refuge, and at the Highway 75 Dam for each of the 3 Alternatives. At the Highway 75 dam the increases in the maximum water surface level compared to existing conditions ranged from 0.24 feet to 0.79 feet for the 100-year flood, depending on the alternative. **Table 5** also shows the duration of the increased water surface elevations at the Refuge, and the corresponding increases in peak discharge and water surface elevation. These increases were modeled assuming no changes to the Highway 75 dam operations plan, no changes to the Big Stone Lake Dam, and without setback levees.

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Table 4: Estimated Floodplain Elevation Changes (100 year event)

	Alternative 1 Low Flow / DNR Bankfull Channel	Alternative 2 & 2B* 2 Year Compound Channel	Alternative 3 5 Year Channel, Riparian Maintenance
Big Stone Lake 100 year Elevation Reduction	0.65	1.14	2.02
Big Stone National Wildlife Refuge (downstream of Highway 17) Elevation Increase	0.40	0.72	1.31
Highway 75 Dam 100 year Elevation Increase	0.24	0.43	0.79
*Alternative 2B will be less than alternative 2 because of setback levees. **These reductions assume a 100 year flood on Big Stone Lake caused by a 100 year flood on the Whetstone River, different flood mechanism could result in less of a reduction			

Table 5: Estimated Impacts to Big Stone National Wildlife Refuge (downstream of Highway 17) 100 year event

	Alternative 1 Low Flow / DNR Bankfull Channel	Alternative 2 & 2B* 2 Year Compound Channel	Alternative 3 5 Year Channel, Riparian Maintenance
Elevation Increase (feet)	0.40	0.72	1.31
Discharge Increase (cfs)	763	1270	2516
Duration of Water Surface Elevation greater than Existing Conditions (days)	15	18	21
Duration of Water Surface Elevation greater than 0.1 feet above Existing Conditions (days)	6	9	15
*Alternative 2B will have lower values than alternative 2 because of setback levees.			

Without the use of the floodplain available because of the setback levees, water is forced through the historic channel quickly, without any attenuation of the peak discharge. Figure 5 shows the discharge and stage hydrographs for existing conditions and each of the alternatives within the Big Stone Lake National Wildlife Refuge. The discharge hydrographs illustrate how discharges stack on top of one another due to the diverted discharge's quick movement through the historic channel. The use of the floodplain adjacent to the restored channel will increase storage and attenuation of the peak discharge, which will reduce the impacts at the Highway 75 dam from what was previously modeled. Therefore, the increase in peak discharge rate, elevation, and duration of increased discharge at the Refuge and Highway 75 dam will be less than Alternative 2. The downstream impacts will be reduced even further with changes to the Big Stone Lake Dam operations procedures. Impacts downstream will decrease if the gates remained closed more often than they would during the current operation plan. Additionally modifications to the Highway 75 operations or different hydraulic structures crossing the Refuge can decrease the impacts to the water surface.

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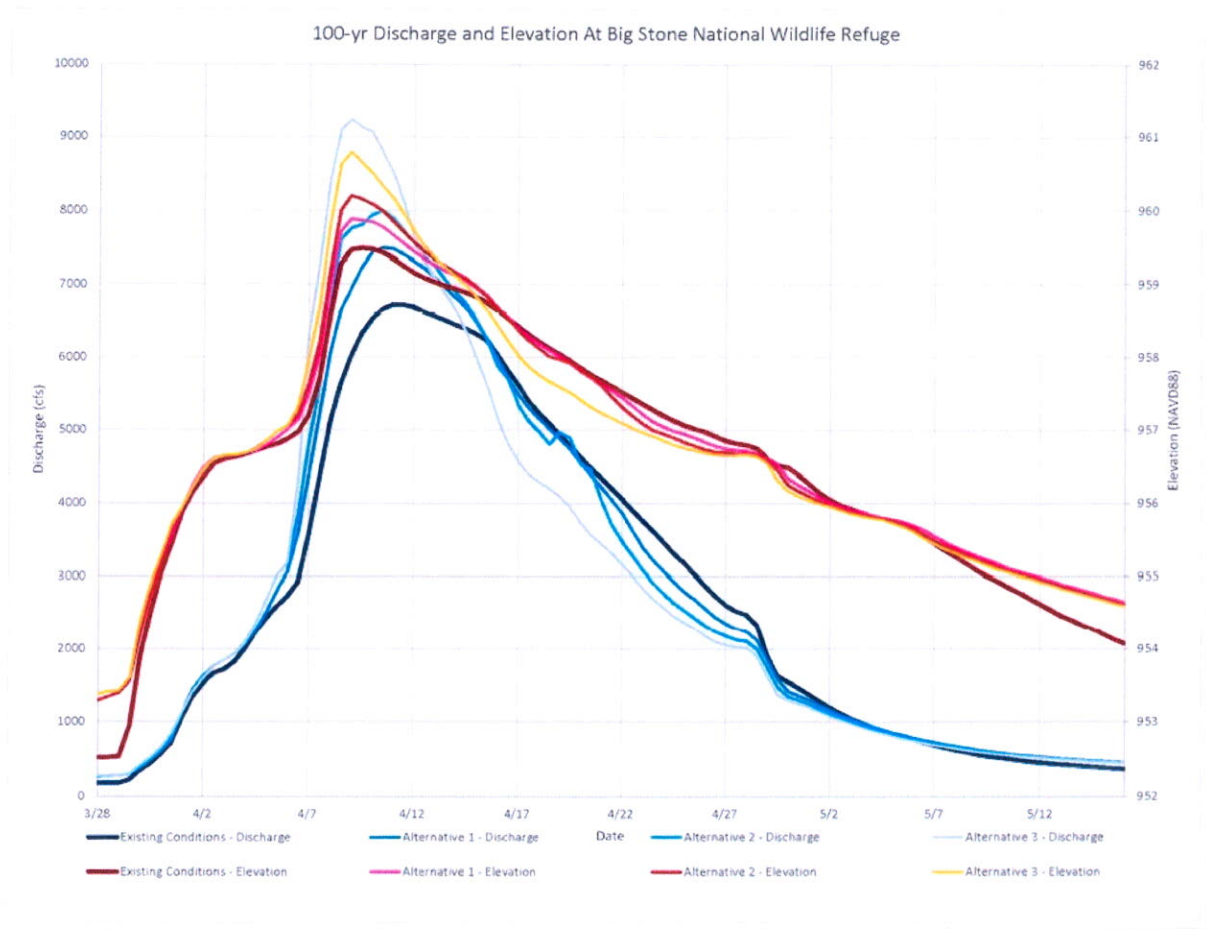


Figure 5: 100-yr Discharge and Elevation at Big Stone National Wildlife Refuge

This project will require input from the United States Army Corps of Engineers (USACE), who operates the Highway 75 dam and will have to consider and approve any changes to the operation plan at the Highway 75 Dam. The following project purpose for the Highway 75 dam was provided in the Water Control Manual for the Highway 75 Dam by the Army Corps of Engineers.²

In 1960 the Corps of Engineers investigated flood problems on Big Stone Lake and the immediate vicinity. The recommended plan included (1) erosion control and siltation improvements on the Whetstone River, (2) channel improvements downstream of Big Stone Lake (4) increase capacity of the Big Stone Lake outlet, and (5) construction of the Highway 75 Dam as mitigation for the increase outlet capacity. The dam was to provide storage for the increase outflow such that there was no increase in flood damages downstream. A dry reservoir was considered but was not economically justified. Therefore, the project was designed to be multipurpose in that it not only provides flood

² U.S. Army Corps of Engineers, "Water Control Manual, Flood Control - Minnesota River and South Dakota, Highway 75 Dam and Reservoir, Big Stone Lake - Whetstone River Project," Updated March 2005.

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control, but also provides a means for the enhancement of migratory wildlife. Thus, the Highway 75 Reservoir was born.

All the proposed alternatives achieve benefits that are in line with the original purpose of the USACE Highway 75 dam project, which serves as a mitigation project Big Stone Lake.

There will also be changes to the areas inundated and floodplain between Big Stone Lake and the Highway 75 dam. **Figure 4** shows the change in area flooded based on a channel design similar to Alternative 3 and setback levees as shown in Alternative 2B. In many cases external to the setback levees, the net change in the amount of floodplain on a specific parcel is small. Often one portion of land no longer floods, but a new portion does flood. The setback levees actually result in greater probability that land external to the levees can be tilled and farmed, because of the additional protection provided.

In general areas adjacent to the current Whetstone and Minnesota Rivers upstream of the historic confluence will have decreased inundation, while areas adjacent to the restored historic Whetstone will have increased inundation. Levees have been proposed to protect agricultural lands from the 10% chance flood event and businesses and residents from the 1% chance flood event. These levees if constructed will bring greater certainty to where flooding will occur. Newly inundated areas during the 1% chance flood event will have flood easements purchased, thus offsetting any adverse flooding impacts in these areas. Floodplain maps will need to be updated and submitted to FEMA following project construction.

4.4 ECOLOGICAL, WILDLIFE AND WETLANDS

One of the goals of the project is to improve fish and wildlife habitat. Under existing conditions, the Big Stone Lake dam hinders fish passage from the Minnesota River to the Whetstone River and Big Stone Lake. All the proposed alternatives restore this longitudinal connectivity by reestablishing the connection between the Whetstone and Minnesota Rivers. This will allow aquatic species to freely move between the Whetstone and Minnesota Rivers.

All crossings and weir structures have been designed to enable fish passage. The crossings on the historic Whetstone were designed as bridges spanning the channel or with one culvert recessed. The weir structures are completely embedded in riprap which is sloped on either side to connect with the channel bottom. Arched rapids can be added during final design. Additionally, alternative 2B removes a crossing from the historic Whetstone (CSAH 15).

With alternative 2B and the setback levees, the area interior of the levees can be planted with native vegetation and maintained as a naturally functioning floodplain. The more water that is diverted to the historic Whetstone, the more discharges will utilize the floodplain. This utilization of the floodplain is important to many ecosystem services such as the deposition of nutrients and riparian habitat.

There are several wetlands mapped by the National Wetland Inventory along or near the historic Whetstone channel (Error! Reference source not found.). Most of these are palustrine forested wetlands along the channel itself, but there is one Palustrine Emergent and one Palustrine Emergent Unconsolidated Bottom. Expectations are that this will be a self-mitigating restoration project (therefore, no cost for mitigation is included). An estimated 254 acres between the setback levees for alternative 2B is expected to be purchased, placed into permanent set aside, and planted into native vegetation. The estimated amount of acreage needed for alternatives 1, 2, and 3 is 171 acres, although this could be reduced by constructing additional levees. This acreage is based on purchasing the area interior to the existing agricultural levees and the area east to the Minnesota River. The land interior to the levees will be subject to periodic flooding and wetland will redevelop adjacent to the historic channel. This same riparian area will establish a riparian corridor along the historic

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channel allowing animal species to freely migrate along the open channel between the Whetstone River and the Minnesota River.

The incorporation of setback levees with Alternative 2B (compared to the other alternatives) greatly increases the ecological, wildlife and habitat value of this project, provided these lands are planted to permanent cover comprised preferable of native plant species. An additional 254 acres of habitat would result and a riparian corridor established from the Minnesota River and the Big Stone Lake National Wildlife River and the Whetstone River.

The Minnesota Department of Natural Resources maintains a “natural heritage database.” The database contains information about the presence of rare plant species within Minnesota based on surveys completed by ecologists at the Department of Natural Resources. A review of the database shows the presence of two rare vascular plant species (*Myosotis Verna*, Forget-Me-Not; *Alopecurus Carolinianus*, Carolina Foxtail) on the west side of the Minnesota River, between the setback levees. No constructed related work is planned for this area, but there is some potential for disruption during construction. Numerous species are located on the east side of the Minnesota River, outside of the propose project work area. Because much of the area within the project area is tilled and disrupted, the likelihood of adverse impacts seems low.

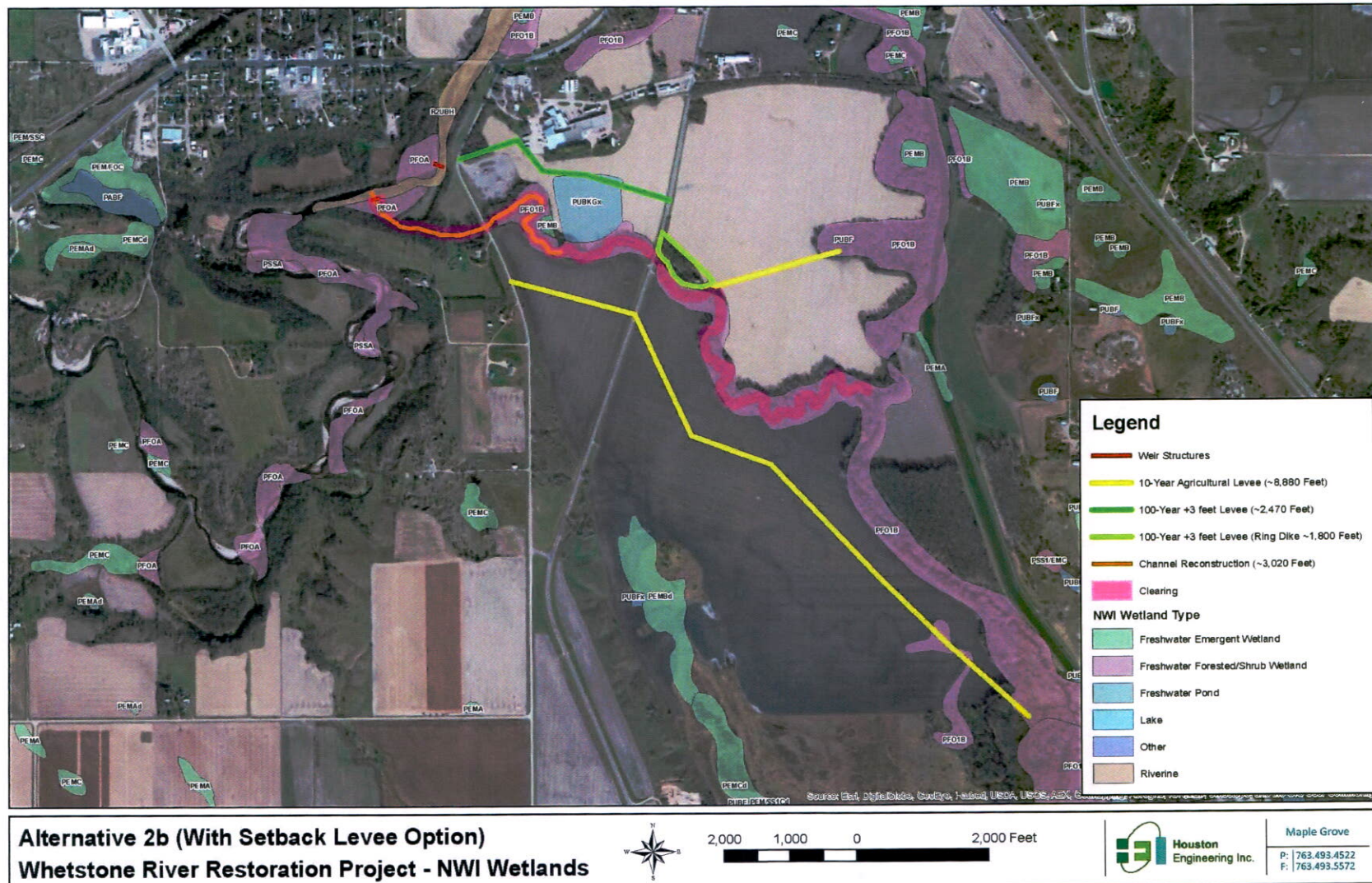
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Figure 6: NWI Wetlands



4.5 WATER QUALITY

Another significant benefit of the project is improving water quality in Big Stone Lake. Big Stone Lake is not currently listed as impaired by the Minnesota Pollution Control Agency (MPCA), but will soon begin the Watershed Restoration and Protection Strategy (WRAPS) process led by the MPCA. The lake has been and continues to be the focus of considerable restoration effort both within Minnesota and South Dakota. This lake is known to have excess nutrients and large algal blooms are common. Accelerated silt deposition in the lower end of Big Stone Lake has been of local interest since the original Big Stone Lake-Whetstone River project was undertaken in the mid 1930's. Multiple agencies have proposed plans since that time to improve water quality and flood control on Big Stone Lake, however few have been executed.³

Since a significant volume of water that is currently entering Big Stone Lake will now flow downstream, sediment and nutrient loads will be reduced and lake water quality will be improved. A water quality analysis was performed to estimate the water quality impacts. During this analysis, all flows below 1,500 cfs were assumed to pass through Big Stone Lake Dam, and not enter the lake. All flow above 1,500 cfs was assumed to enter Big Stone Lake. The load reductions from the various alternatives range from 48% to 94% as seen in Table 6.

Table 6: Big Stone Lake Water Quality Impacts - Estimated Annual Load Reductions

ALTERNATIVE	Average Annual Volume (acre-feet/year)	Estimated Average Annual Load Reaching Big Stone Lake from Whetstone River		Estimated % Annual Load Reduction From Existing Conditions	
		Total Phosphorus (lbs/yr)	Total Suspended Solids (tons/yr)	Total Phosphorus	Total Suspended Solids
Existing Conditions	6,403	3341	556	0%	0%
Alternative 1 Low Flow / DNR Bankfull Channel	3,348	1747	291	48%	48%
Alternative 2 2 Year Compound Channel	2,033	1061	176	68%	68%
Alternative 3 5 Year Channel, Riparian Maintenance	368	192	32	94%	94%

There is reason for concern about potential downstream water quality impacts, as additional sediment and nutrient loads will be delivered to the Big Stone Lake National Wildlife Refuge and Highway 75 dam. Compared to the other Alternatives, Alternative 2B is better at reducing potential impacts, because the floodplain and channel are laterally connected. With proper design and construction of the historic channel sediment will be deposited on the floodplain, phosphorous attached to sediment will be deposited and sequestered, and dissolved phosphorous will be sequestered through natural channel and floodplain processes.

³ U.S. Army Corps of Engineers, "Water Control Manual, Flood Control - Minnesota River and South Dakota, Highway 75 Dam and Reservoir, Big Stone Lake - Whetstone River Project," Updated March 2005.

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5 PRELIMINARY OPINION OF PROBABLE COST

Preliminary Opinion of Probable Construction Costs (POCCC) for the restoration alternatives are provided for each alternative in **Table 7**. The POCCC for Alternative 2B is new, while the estimates for the remaining alternatives were updated based on recent project bidding results. A 20% construction contingency is included in the POCCC, in addition to the land needs, completing a geotechnical investigation, technical support including the preparation of final plans and specifications, construction management, and obtaining necessary permits and approvals. The 20% construction contingency is to account for the fact that final design of the project is yet to occur and potential unforeseen construction circumstances. These circumstances are typically related to soil conditions or other geotechnical concerns and dewatering methods. The contingency is more than typical for this particular project due to the multiple agencies both permitting and reviewing the project, and due to potential design changes that may be necessitated. **Table 7** includes the project features shown in **Figure 1** considered necessary for the restoration project including the work of either constructing new crossings or modifying existing crossings where the historic channel crosses CR 47 and CSAH 15.

Table 7: Preliminary Opinions of Probable Construction and Total Project Costs for the Restoration Project

	Alternative 1 Low Flow / DNR Bankfull Channel	Alternative 2 2 Year Compound Channel	Alternative 2B Alternative 2 With Setback Levees and Natural Channel Design	Alternative 3 5 Year Channel, Riparian Maintenance
RESTORATION				
Channel Restoration, Levees, and Ring Dike	\$364,833	\$695,833	\$1,633,102	\$1,909,385
Crossing at SD CR 47	\$390,970	\$533,969	\$792,328	\$792,328
Crossing at MN CSAH 15	\$471,434	\$624,000	—	\$884,000
Grading and Bituminous MN CSAH 15	NA	\$809,276	\$20,607	\$330,172
Diversion Weir on Whetstone River	\$259,100	\$309,200	\$309,200	\$1,037,625
Grade Control Weir on Historic Whetstone Channel	\$34,135	\$41,965	\$41,965	\$41,965
Construction Right-Of-Way/Easements	\$11,000	\$32,000	\$32,000	\$140,200
SUBTOTAL Construction Cost	\$1,531,473	\$3,046,244	\$2,829,201	\$5,135,675
ADMINISTRATION, TECHNICAL AND LEGAL				
Construction Contingency (20%)	\$306,295	\$609,249	\$565,840	\$1,027,135
Engineering/Construction Observation (20%)	\$306,295	\$609,249	\$565,840	\$1,027,135
Geotechnical	\$25,000	\$25,000	\$25,000	\$25,000
Permitting	\$25,000	\$30,000	\$30,000	\$40,000
Administrative/Legal (15%)	\$229,721	\$456,937	\$424,380	\$770,351
SUBTOTAL	\$892,310	\$1,730,434	\$1,611,061	\$2,889,621
TOTAL Excluding Land	\$2,423,783	\$4,776,678	\$4,440,262	\$8,025,296
LAND ACQUISITION				
Fee Purchase	\$268,205	\$268,205	\$1,030,300	\$268,205
Flowage and Work Easements	\$167,427	\$305,552	\$123,180	\$311,447
SUBTOTAL Land Acquisition	\$435,631	\$573,757	\$1,153,480	\$579,652
TOTAL PROJECT COST	\$2,859,414	\$5,350,435	\$5,593,742	\$8,604,947

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There are additional transportation related costs, not included in **Table 7**, associated with modifying the local transportation system. These items are shown in **Table 8**.

Table 8: Additional Related Transportation System Improvement Costs (Alternative 2B only)

Feature	Estimated Cost
Grade Widening – CR 47 / CSAH 15 Connection	\$780,000
Bituminous Surfacing – CR 47 / CSAH 15 Connection	\$100,000
Existing CSAH 15 Roadway Obliteration/ Reclaiming	\$80,000
Additional Roadway Connections and Driveways	\$230,000
TOTAL Transportation Construction	\$1,190,000

6 PERMITS AND APPROVAL

Obtaining permits and approvals is expected to be considerably less of a challenge should the Board of Managers decide to proceed with Alternative 2B, compared to the other alternatives evaluated within the Engineer's Report. The reason is Alternative 2B includes setback levees and open channel design more consistent with a stream restoration project. Obtaining permits for the other alternatives could be similar to Alternative 2B with regard to the probable level of effort, simply by setting the levees back from the historic Whetstone channel and incorporating a more "natural" open channel design. However, the larger open channel dimensions of Alternative 3 could prove problematic, as the open channel is considerably larger than needed to carry the DNR bankfull discharge. To achieve channel stability this would potentially require excavating a considerable floodplain bench. This would not necessary prove problematic, depended on the need for material to construct the agricultural levees should they be setback from the channel. Ultimately, this is final design consideration (i.e., balancing the amount of material to construct levees and excavation of a floodplain bench adjacent to the open channel need to convey bankfull discharge).

7 ENGINEER'S RECOMENDATION

The determination of project feasibility is based upon several design criteria established by the Engineer. These criteria include:

- The ability to attain the project goals (i.e., consistency with stream restoration project);
- An understanding of the perceived magnitude of the potential environmental adverse and beneficial impacts and the likelihood of obtaining the necessary regulatory approvals and permits;
- The perceived constructability of the project;
- Whether the project is conducive to public health, safety, and welfare; and
- Probable construction cost.

Based upon the information presented in the Engineer's Report and this Addendum, it is the opinion of the Engineer that all four alternatives are feasible and capable of achieving the design goals, but to differing degrees. All of the alternatives will achieve the primary design goal of restoring perennial flow to the historic Whetstone River channel. However, by setting the levees back from the historic Whetstone channel, the quality of the restoration is greatly improved.

Unacceptable adverse resource impact as a result of this project as a result of an increase in peak discharge and water surface elevation within the refuge are not anticipated. However coordination with the U.S. Army

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Corps of Engineers will be needed to discuss whether operational changes at the Highway 75 dam are needed. Downstream adverse impacts because of increased peak discharge are less of a concern with Alternative 2B because of the additional storage located between the setback levees.

Alternative 2B is expected to have many beneficial environmental benefits, compared to Alternatives 1, 2, and 3, because these alternatives place the levees adjacent to the historic Whetstone channel. The benefits of Alternative 2B could be realized for each of these alternatives simply placing the levees in a location similar to Alternative 2B. The open channel dimensions and characteristics of Alternative 3 seem too large for a restoration project.

Both capital and maintenance costs can be considered when assessing project feasibility. There was no specific quantitative criterion established related to project cost. Generally, project cost is evaluated relative to other, similar type projects. There is typically a strong relationship between the constructability of a project and the project cost. Based on the estimated POPCCs the cost for all three alternatives is considered “reasonable” as the project costs fall within similar type projects. With regard to future maintenance Alternative 2B should require less maintenance than the other alternatives, because on road crossing is eliminated and there is considerable floodplain area for sediment and debris to deposit.

Based upon our analysis, alternative 2B is recommended (see Table 9:). This recommendation is based on the following considerations:

- Because of the presence of setback levees, the design of alternative 2B is more consistent with a stream restoration project than alternatives 1, 2, or 3. Alternatives 1, 2, and 3 could be modified should the Board desire, to realize the benefits of the setback levees for these alternatives;
- Compared to alternatives 1, 2, and 3 the potential for adverse and beneficial ecological impacts downstream is significantly reduced and enhanced respectively, because of the setback levees;
- Based upon the judgment of the Engineer, the cross-sectional area of the open channel for the restored and reconstructed portion of the historic Whetstone channel for Alternative 2B (and Alternative 2) is more appropriate and consistent with a restoration, than either alternatives 1 and 2. Although the DNR has estimated a bankfull capacity based on geomorphic analysis of the Whetstone River of a channel cross sectional area similar to Alternative 1, the surveyed cross sectional area of the historic channel in undisturbed areas (see Section 3.2, **Figure 2**) is more consistent with Alternative 2B (~ 300 ft²). The Engineer believes the capacity of and cross sectional area of Alternative 3 is larger than desired, although it could be designed in a manner to improve geomorphic stability. This is admittedly a design detail to be resolved through discussions with the Department of Natural Resources. However, final design of the channel should be consistent with that of a “natural channel” as shown in Figure 7;
- Water quality will improve within Big Stone Lake, because of a reduction in the annual load delivered. An estimate of the load reduction is provided. The reduction in nutrient loads should result in the reduction in the abundance of algae. Even though this load will be now be delivered downstream, restoring the stream channel with connection to the floodplain (for alternative 2B) will ameliorate potential adverse impacts. A large portion of the sediment and phosphorus adhered to sediment is expected to deposit in the floodplain adjacent to the historic restored channel. The absence of setback levees is more likely to result in sedimentation issues associated with the project, including the need for and cost of maintenance.
- The opinion of the Engineer, is the long term maintenance requirements and costs for Alternative 2B will be less than the other Alternatives, because debris and sediment entering the historic

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Whetstone channel will largely be deposited with the adjacent floodplain area. Additional discussion is needed with the DNR about the design of the Whetstone River diversion structure and the grade control structure near the inlet to the historic Whetstone River. The DNR has requested a design similar to Figure 8 for the Whetstone River structure. The Engineer recommends pursuing this type of design with an embedded sheet pile structure. The Engineer believes the POPCC reflects the construction of both designs.

The presence of the setback levees incorporated into Alternative 2B provides greater certainty with regard to the likelihood of flooding of agricultural lands external to the levees;

- Although reduction in peak flood elevations on Big Stone Lake are a positive consequence of the project, Alternative 2B results in a reasonable reduction compared to the other Alternatives;
- Perceived potential adverse impacts because of an increase in the peak discharge and peak water surface elevations within the Big Stone Lake National Wildlife Refuge and upstream of the Highway 75 dam are in fact more reflective of historic conditions. Although the peak discharge delivered downstream and therefore the water elevations (assuming Highway 75 dam operation remains unaltered) will increase for each alternative including 2B compared to existing conditions, the volume of water compared to existing conditions for each alternative will not differ. Only a portion of the water will flow through the restored Historic Channel during flood events. Because the volume will remain unchanged it seems reasonable to believe management of any peak discharge can be accomplished through operation of the Highway 75 dam (and perhaps the Big Stone Lake Dam as the analysis assumed no operational change). Additional analyses is needed to evaluate how dam operation at Highway 75 and Big Stone Lake should and can be modified; and
- It is the opinion of the Engineer that the project is in the public interest. The project can be implemented without reducing public safety and increasing public welfare.

There are some potential adverse consequences with alternative 2B. These consequences include:

- The removal of an estimated 254 tillable acres of land from production; and
- The additional cost associated with the need to modify the local transportation system (which will improve the system) and acquire land.

Should the Board of Managers decide to proceed and order the Engineer's recommended alternative, additional coordination with the agencies should begin as soon as possible. Specifically, discussions with the Department of Natural Resources are needed to finalize design of the historic Whetstone open channel. Secondly, discussions are needed with the U.S. Fish and Wildlife Service about potential hydrologic changes within the refuge and the U.S. Army Corps of Engineers to discuss operational considerations with the Highway 75 dam.



Table 9: Summary of the Whetstone River Restoration Alternatives

	Factor											
	Perennial Flow to Historic Whetstone Channel	Lateral (Floodplain) Connectivity	Longitudinal Connectivity	Fish Passage	Big Stone Water Quality Improvements	Downstream Water Quality	Big Stone Lake Flooding Reduction	Downstream Impacts: Agricultural	Downstream Impacts: Highway 75 Dam	Transportation Safety	Cost	Permitting Complexity/Impacts
Existing Condition	O	O	O	-	-	O	-	O	O	O	O	O
Alternative 1: Low Flow / DNR Bankfull Channel	+++	O	++	+++	+	-	+	-	O	O	-	-
Alternative 2: 2 Year Compound Channel	+++	O	++	+++	++	-	++	-	O	O	-	-
Alternative 2B: Alternative 2 with Setback Levees	+++	+++	+++	+++	++	O	++	-	+	+	-	++
Alternative 3: 5 Year Channel, Riparian Maintenance	+++	O	++	+++	+++	-	+++	-	O	O	-	-

Assumes operation of Hwy 75 dam can mitigate downstream impacts. Setback levees is positive.

Assumes widening of SD CR 47 improves safety.

O = no change from current condition. In some cases, lost opportunity for improving current conditions (e.g., Big Stone Lake)

+ slight positive benefit

++ moderate positive benefit

+++ substantive positive benefit

- slight adverse impact

-- moderate adverse impact

--- substantive positive impact

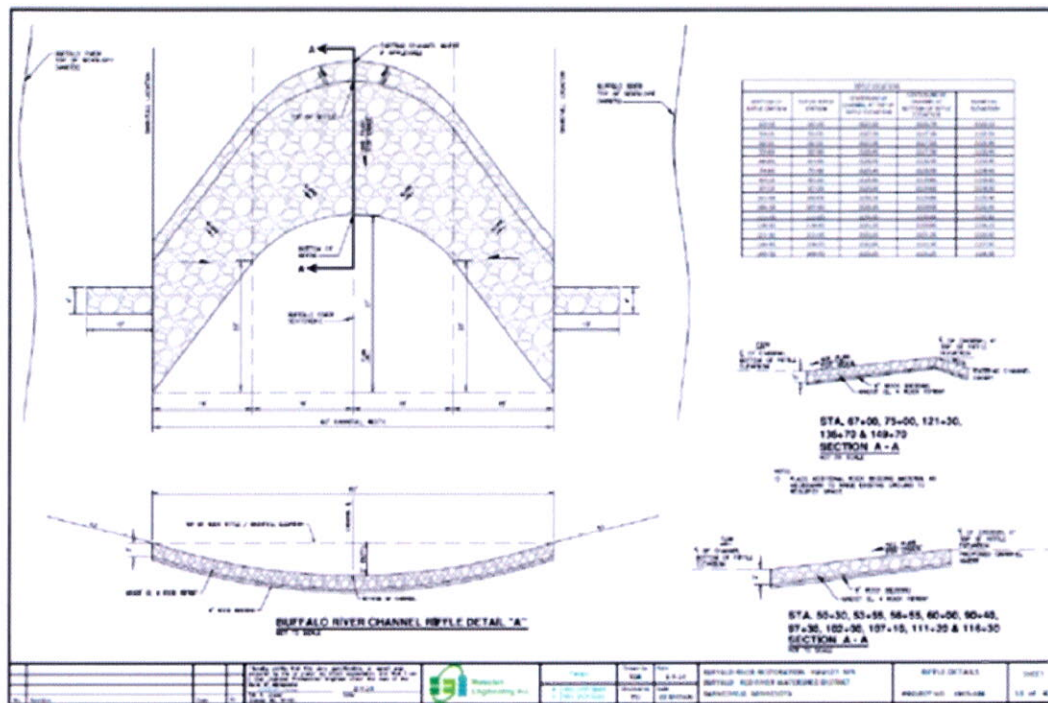
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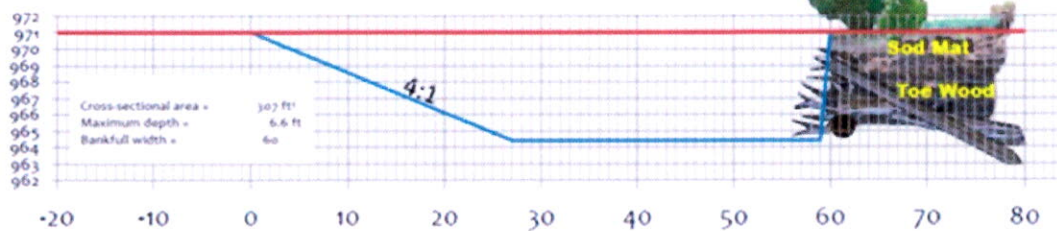
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Rock arch Riffle typical from Buffalo River Restoration



Recommended Pool Cross-section



Recommended Riffle Cross-section

Example at Whetstone entrance from Diversion channel

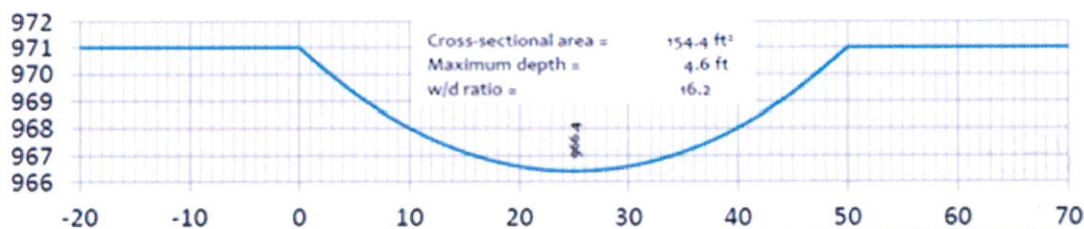


Figure 7: Natural Channel Design Concept for Upper Portion of Historic Whetstone River Channel

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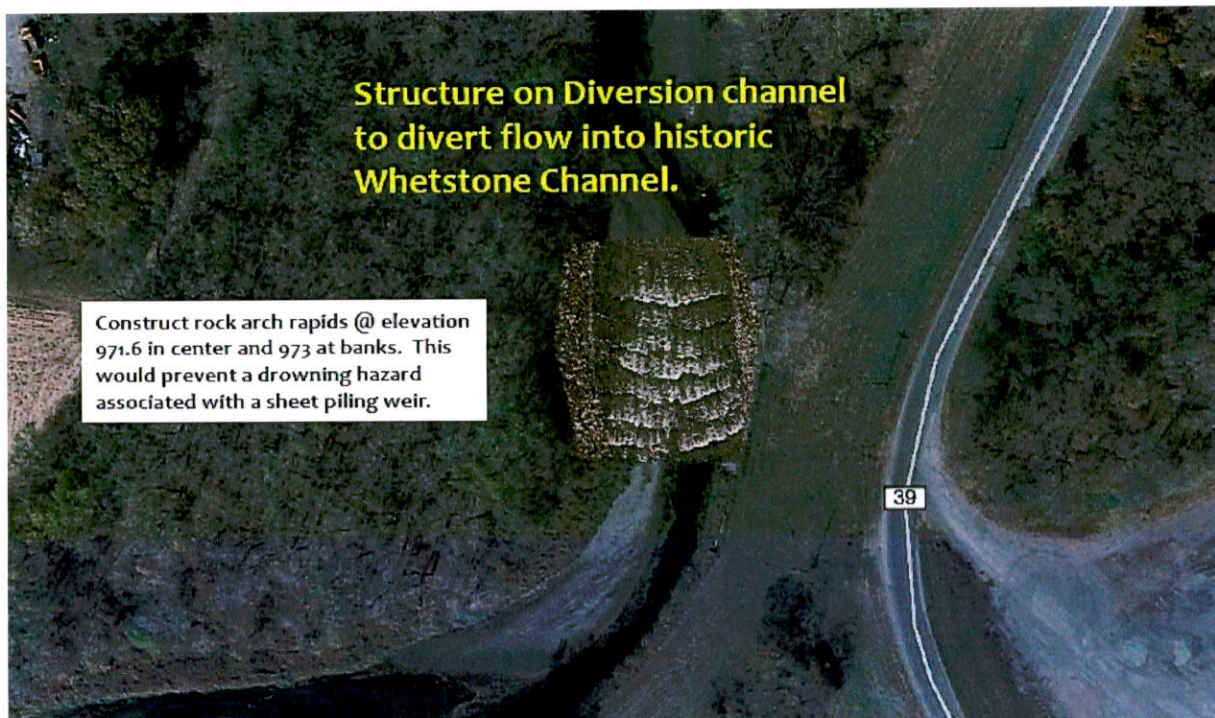


Figure 8: Concept Design of Whetstone River Diversion Structure Preferred by Minnesota Department of Natural Resources

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
WITH THE
SOUTH DAKOTA-MINNESOTA BOUNDARY WATERS COMMISSION
AND THE
UPPER MINNESOTA RIVER WATERSHED DISTRICT

Big Stone Lake Control Works at
Ortonville, Big Stone County, Minnesota

PROPOSED OPERATION OF CONTROL WORKS

A. Introduction.

The Big Stone Lake/Whetstone River project was designed chiefly as a conservation/recreational use project and was built under Minnesota state auspices with federal contributions. The need for additional flood control storage in this area is met by the Highway 75 dam (USACE) which is immediately downstream of Big Stone Lake. To provide maximum benefits and to meet the goals of the Big Stone/Whetstone project, the dam at Big Stone Lake shall be operated as provided hereinafter.

B. Objectives.

The operation of the control works in the outlet structure at Big Stone Lake as set forth in paragraph E below shall be conducted as a demonstration project for the period of one year following installation of the gates by the U.S. Army Corps of Engineers. The goal of the demonstration project is the successful accomplishment of the following purposes:

- (1) To maintain the water surface of Big Stone Lake within one foot above elevation 964.6 feet NGVD 1929 (lake gage 6.9) during the period from May 1 to September 30 each year.

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- (2) To prevent excessive discharge of water over the spillway of the dam, when such discharge is due to the action of wind and waves, and while the water surface of the lake is at or below elevation 964.6 feet NGVD.
- (3) To provide for minimum flows in the Minnesota River for the use of riparian owners downstream, for stock-watering, for the dilution of effluent from the sewage plant, and for protection and improvement of fish and wildlife habitat.
- (4) To improve the water quality of Big Stone Lake by maximizing the diversion of the Whetstone River flood flows away from the lake and by increasing the export of accumulated sediment through the selective release of lake water between elevations 964.9 and 965.9 feet NGVD (lake gage 7.2 to 8.2).

Following the one year demonstration project, the "Operation of Control Works" document shall be approved or modified, based on an evaluation of the reported data, in order to provide for permanent operating guidelines which best accomplish the above-stated purposes.

C. Operating Gates.

The control structure located at the outlet of Big Stone Lake contains eight bays with underflow slide gates, which are 10'-10' wide and 7'-0" high. These gates are all operated by electric motors. Hereinafter, they are terms "spillway gates".

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The control works also includes one 4'x4' gate and one 18" diameter gate for low flow operation. Both of these gates are operated with electric motors. Hereinafter, these gates are referred to as "sluice gates".

The silt barrier, located in the Minnesota River on the downstream side of the Milwaukee Railroad bridge crossing, has a 30"x30" wheel-operated gate in the left (looking downstream) abutment. Hereinafter, this gate is called the "silt barrier gate".

D. Gages.

Various water surface measuring gages have been installed on and near Big Stone Lake. Measurements on these gages are determining factors for operation of the control gates. For operating purposes, the pertinent gages are designated and described as follows:

- (1) Whetstone River near Big Stone City, South Dakota (USGS 05291000).

This gage is a water-stage recorder located on the right bank, 1.5 miles west of Big Stone City, and 4.5 miles upstream from Big Stone Lake. (Drainage Area 389 mi²). This gage is also an active sediment gage from March 1 to August 31.

- (2) Big Stone Lake at Ortonville, Minnesota (USGS 05291500).

This is a non-recording (staff) gage located at the Big Stone Power Plant water intake structure near Big Stone City, South Dakota. The

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zero of the lake gage is at elevation 960.1 feet (project datum) or 957.69 feet National Geodetic Vertical Datum (NGVD) 1929. This gage is hereinafter referred to as the "lake level gage". All further references to "elevation" in this operation plan will be in reference to the NGVD 1929. In regard to operation of the structure, the reading of the lake gage shall be corrected to allow for wind set-up.

- (3) Minnesota River at Ortonville, Minnesota (USGS 95292000).

This is a water-stage recorder located on the left bank 1,300 feet downstream of the outlet of the dam at Big Stone Lake at Ortonville, Minnesota. (Drainage Area 1,160 mi²).

- (4) Precipitation, air temperature, and wind gages at the Big Stone Power Plant.

E, Operation.

- (1) Flood control storage in Big Stone Lake shall be only that storage which is above elevation 965.9 feet NGVD (lake gage 8.2) and shall be surcharge storage only; whenever the lake exceeds this level, all spillway gates shall be opened fully. Any water above this level shall be released as rapidly as possible.
- (2) Big Stone Lake has a concrete-capped sheet-pile weir at its exit, just upstream of the gated structure. This weir usually called the "silt barrier", contains a sluice gate for low flows. All "lake gage"

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elevations stated in this section are at the Big Stone Power Plant intake structure near Big Stone City, South Dakota, and are referred to a datum giving 964.6 feet as the elevation of the center section of the silt barrier crest (NGVD 1929).

(3) During the year when the level of Big Stone Lake is at or below the silt barrier the dam will be opened sufficiently to release Whetstone River flows; and if necessary, the silt barrier gate will be opened to provide a minimum flow of 5 cubic feet per second through the dam.

(4) In late winter when the lake has an ice cover and the weather warms to the point of creating runoff due to snowmelt, the dam will be operated as such:

(a) When a normal or above-normal snowpack* exists and the lake level reaches elevation 964.1 (lake gage 6.4) or above, the spillway gates shall be opened.

(b) When a below-normal snowpack* exists and the lake level reaches elevation 964.6 feet (lake gage 6.9) or above, the spillway gates shall be opened.

*Normal snowpack will be defined using National Weather Service snowfall records within the Big Stone Lake Watershed, and correlated to the historical flows of the other tributaries to determine the amount of snowfall normally needed to restore the lake level back to elevation 964.6 feet (lake gage 6.9) from the given end-of-year condition.

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- (5) During the period of May 1 through September 30, when the lake level is at or above elevation 965.6 feet (lake gage 7.9), the gates of the dam shall be opened sufficiently and adjusted daily so that the flows of the Minnesota River are approximately equal to the inflow from the Whetstone River, but not less than 90 cubic feet per second.
- (6) During the period of May 1 through September 30, when the lake level is between elevation 964.6 feet (lake gage 6.9) and elevation 965.6 feet (lake gage 7.9) the gates of the dam shall be opened sufficiently and adjusted daily so that the flows to the Minnesota River are approximately equal to the inflow from the Whetstone River but not less than 20 cubic feet per second.
- (7) During the period of May 1 through September 30, when the lake level is below elevation 964.6 feet (lake gage 6.9) the gates of the dam shall be opened sufficiently and adjusted daily so that the flows to the Minnesota River are approximately equal to the inflow from the Whetstone River but not less than 5 cubic feet per second. This may require that the silt barrier sluice gate be opened to supplement Whetstone River flow.
- (8) During the period of October 1 through April 30, the gates of the dam shall be opened sufficiently and adjusted daily so that the flows to the Minnesota River are at least approximately equal to the inflow from the Whetstone River or 5 cubic feet per second whichever is greater. This may require that the silt barrier sluice gate be opened to supplement Whetstone River flow.

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(9) Water Quality Releases:

- (a) When the lake level is between elevation 965.4 and 965.9 feet (lake gage 7.7 to 8.2), water will be released selectively on days when the wind and waves create resuspension of sediment so that the water sampled at the dike road bridge contains more than (100 ppm suspended) solids. The crest gates shall then be opened but not to exceed _____ cubic feet per second greater than Whetstone River flows.

Ramping Rates

- (b) When the lake level is between elevation 964.9 and 965.4 feet (lake gage 7.2 to 7.7), water will be released selectively on days when the wind and waves create resuspension of sediment so that the water sampled at the dike road bridge contains more than 200 ppm suspended solids. The crest gates shall then be opened, but not to exceed _____ cubic feet per second greater than Whetstone River flows.

Ramping Rates

The operator shall coordinate all such water-quality releases in advance with the Water Control Center, St. Paul District, Corps of Engineers. Water quality releases will not be made when downstream flooding conditions exist or will be caused by the additional releases.

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Operation Chart.

BIG STONE LAKE

Lake Elev. feet NGVD (corrected for wind effects)	Lake Condition:	
	Snowmelt Period	May 1- September 30
	above elev. 965.9, all spillway gates open	
965.9 ft.	8.2 <u>normal or</u> <u>above-normal</u> <u>snowpack</u>	8.2 <u>below-normal</u> <u>snowpack</u>
965.6		8.2 release up to _____ cfs if s/s 100 ppm otherwise release larger of: 1) Whetstone inflow 2) 90 cfs
965.4	service spillway fully open	release up to _____ cfs if s/s 200 ppm otherwise release large of: 1) Whetstone flow 2) 20 cfs
964.9		
964.6	6.9	
964.1	release Whetstone flow or 5 cubic feet per second (whichever is greater)	

Notes:

- (1) Winter operation: release Whetstone flow or 5 cubic feet per second, whichever is greater.
- (2) Normally, sluice gate shall be kept closed when larger gates are open, to reduce clogging by debris.
- (3) Lake level readings will be adjusted to allow for the effects of wind, in regard to project operation.
- (4) Rates of change in flow shall not exceed natural increase rates of the Whetstone River and decrease rates shall not be greater than ____/day/hour.
- (5) Elevation 964.6 feet NGVD = lake gage of 6.9 feet.

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F. Records and Reports.

The operator shall obtain the following data daily and shall record them, with the times of observations, in a record book provided for this purpose:

- (1) The reading of the Whetstone River gage near Big Stone City, South Dakota [gage (1)].
- (2) The reading of lake level gage [gage (2)].
- (3) The reading of the Minnesota River gage at Ortonville, Minnesota [gage (3)].
- (4) The position of all gates (service spillway, sluice and silt barrier gates).
- (5) The time any changes are made in gate positions.
- (6) Weather conditions (wind velocity and direction, air temperature, and precipitation) at the Big Stone Power Plant.
- (7) Unusual occurrences which may affect the lake level, the safety of the dam, or the validity of these operating instructions.

All observations shall be made as far as possible at the same hour each day, at an hour to be agreed upon with the Commissioner, Minnesota Department of Natural Resources and with the Chief, Water Control Center, U.S. Army Engineer District, St. Paul.

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Each week the operator shall send a copy of all observations so recorded to the Water Control Center, St. Paul District, Army Corps of Engineers.

Under certain conditions, including flood or drought conditions, the Corps of Engineers may require additional observations or more frequent reports.

The operation shall also send these observations monthly, including any comments he may consider to be pertinent, to the Commissioner, Minnesota Department of Natural Resources. Under certain conditions, the Commissioner may require additional observations and reports. In addition, when any water quality releases are planned, the operator shall coordinate such releases with the Corps of Engineers Water Control Center in advance.

EMERGENCY conditions shall be reported immediately to the Commissioner by telephone, charges reversed, and to the Water Control Center, U.S. Army Engineer District, St. Paul. The Commissioner shall supply a copy of such monthly or special reports to each member of the South Dakota-Minnesota Boundary Waters Commission.

Any changes in the plan of operation shall be agreed upon in writing by the references boundary commission

U.S. Army Engineer District, St. Paul, the South Dakota-Minnesota Boundary Waters Commission and the Upper Minnesota River Watershed District.

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TECHNICAL MEMORANDUM

To: Dianne Radermacher, Administrator
Upper Minnesota River Watershed District

From: Lisa Odens, PE, CFM
Mark Deutschman, PhD, PE

Subject: Modified Alternative 2B Hydrologic and Hydraulic Final Functional Design and Updated Analysis

Date: August 25, 2015

Project: 5304-008

1 MEMORANDUM PURPOSE

The Upper Minnesota River Watershed District (UMRWD) is proposing to restore flow to a portion of the (historic) Whetstone River channel from near Big Stone City, South Dakota downstream to the confluence with the Minnesota River. During the late 1930's flow which made it ways through the Whetstone River to the Minnesota River was effectively diverted into Big Stone Lake by constructing a new channel and levee. The purpose of the diversion was to augment Big Stone Lake water levels.

Pursuant to Minnesota Statutes Section 103D.605 and its Watershed Management Plan, the Upper Minnesota River Watershed District Board of Managers (District) ordered the project known as the Whetstone River Restoration Project (Project) on March 10, 2015. The Order included a provision directing the Engineer to modify Alternative 2B Setback Levees (Alternative 2B). The District specifically directed the Engineer to modify the alignments of the setback levees from the locations presented at the hearing, to nearer the historic channel, to reduce the amount of cultivated land subject to purchase. The Order also directed the Engineer to work with the Minnesota Department of Natural Resources (MnDNR), to resolve two primary details of the design. These details specifically were the crest elevation of the inlet to the historic channel and the slope and cross sectional area of the restored channel.

Representatives from the District (Ms. Dianne Radermacher), the District's Consulting Engineer Houston Engineering, Inc (Ms. Lisa Odens; Mr. Mark Deutschman) and the MnDNR (Mr. Luther Aadland; Ms. Amanda Hillman) met in Fergus Falls, Minnesota on July 3, 2015 to discuss the project design. During the meeting revised hydraulic modeling results completed by Houston Engineering for the Project were reviewed and discussed. The revised modeling results reflected the updated levee alignment, a range of crest elevations of the weir at the inlet to the historic channel, and various slopes and cross-sectional geometries of the restored channel. Review of the modeling and the ensuing discussion resulted in consensus to finalize the hydraulic modeling for the Project assuming an inlet elevation to the historic channel of 966.41 (NAVD88), an open channel cross section with a base flow area of approximately 150 square feet, and incorporation of a floodplain bench adjacent to the bankfull channel. The MnDNR requested review of the modeling results reflected these design modifications prior to memorializing them in writing. The results were provided to Mr. Luther Aadland on 7/20/2015 for review. Based on Mr. Aadland's review he concurred with the project design on 7/27/2015 and recommended proceeding.

¹ All elevations reference North American Vertical Datum of 1988 (NAVD 88)



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The purpose of this Technical Memorandum (TM) is to memorialize the design of features comprising Alternative 2B, fulfilling the directive to the Engineer by the Board of Managers in the findings and order. The description of Alternative 2B is provided to complete the official record for the Project, before moving to subsequent project phases. Describing the features is also useful to formalize the discussion and agreement reached with the MnDNR relative to project design. The TM includes updated modeling results and a description of the locations and amounts of flowage easements needed.

2 DESCRIPTION OF MODIFIED ALTERNATIVE 2B WITH SETBACK LEVEES

This section describes the modified Alternative 2B. The features modified include the levee alignments (moved closer to the historic channel), the crest elevation the weir at the upstream end of the historic channel, and the slope and cross sectional area and geometry of portions of the historic channel. The District Engineer has concluded the modified alternative is consistent with the project goals established by the District. This Project is designed to achieve the project goals by diverting the largest reasonable discharge through the restored channel, while being consistent with the stream restoration purpose.

This alternative envisions an open channel geometry and slope which results in full channel flow for the bankfull discharge, which has recently been estimated at 490 cfs by the Minnesota Department of Natural Resources (MnDNR). This alternative will divert Whetstone River discharges up to 400 cfs through the restored historic Whetstone River channel, 72% of the peak discharge of 1,100 cfs during the 2-year event, and 94% of the 30-day volume during the 2-year event. The portion of the discharge between the bankfull discharge and the 2-year discharge will be carried by an excavated floodplain bench. **Figure 1** shows the non-transportation related features of the modified 2B Alternative. The following paragraphs describe specific features of the modified 2B Alternative.

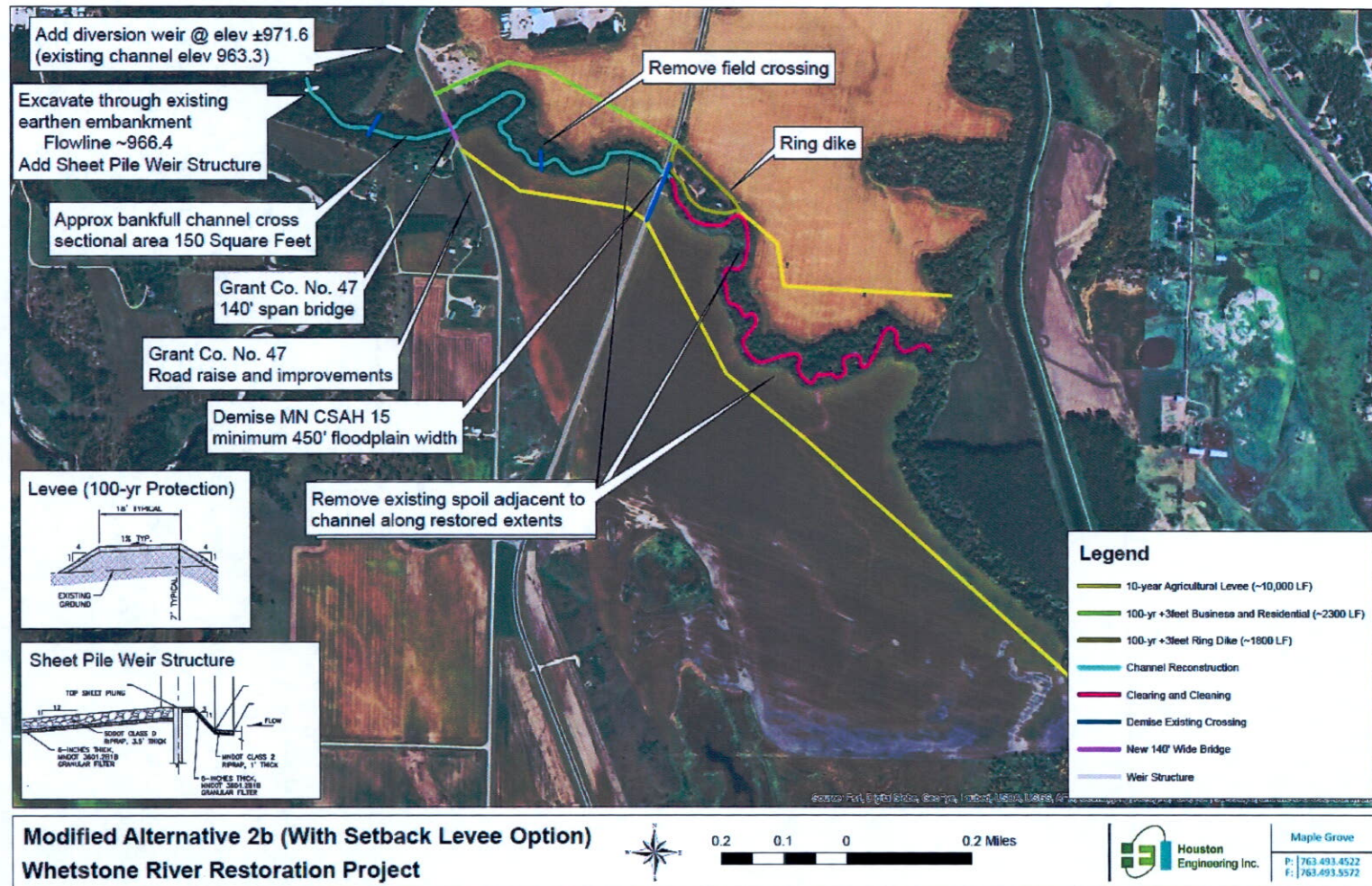
2.1 LEVEES

Existing agricultural levees are present along much of the historic Whetstone channel. However, downstream of CSAH 15 the agricultural levees are more pronounced and currently provide flood protection to agricultural lands from the Minnesota River. To provide lateral connectivity between the open channel and the riparian area with the floodplain, these existing levees will be removed and the material incorporated into the new levees. As flow increases, this will allow water to leave the channel and become stored within the adjacent floodplain.

Tillable land beyond the setback agricultural levees will to be protected up to the 10% chance flood event, while residences and businesses will be protected to the 1% chance flood event with 3 feet of freeboard (see **Figure 1**). An estimated 10,000-feet of agricultural levee are needed. One levee segment will be south of the historic Whetstone from Grant (South Dakota) CR 47, extending south to tie-in with existing levees within U.S. Fish and Wildlife lands. The north segment will extend from the Dwyer ring dike and extend east to tie-in with existing agricultural levees along the Minnesota River. The top of levee elevation for the agricultural levees will range up to 4.7 feet above natural ground based on preliminary hydraulic analysis. The agricultural levees will be constructed with a 16-foot top width and 4:1 side slopes. The agricultural levees are located at a minimum offset distance of 250-feet from the historic channel centerline. In most areas, the offset distance exceeds the minimum distance of 250-feet recommend by the Minnesota Department of Natural Resources. Expectations are that on-site materials will be used to construct the agricultural levees.



Figure 1: Modified Alternative 2B (With Setback Levee Option).



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East of Minnesota CSAH 15 and just north of the historic Whetstone alignment there is a private residence requiring flood protection. A levee encircling the residence (i.e., a ring dike) is proposed to protect this residence to the 1% chance flood with 3 feet of freeboard. The ring dike will be approximately 1,800 linear feet in length and range from 4.5 to 6.0 feet above natural ground based on preliminary hydraulic analysis. The ring dike will be constructed with a 16-foot top width and 4:1 side slopes.

An additional 2,300 linear feet of business/residence levees between CR 47 and CSAH 15 on the north side of the historic Whetstone is needed. These certified levees will protect several businesses south of Mill Road for events up to and including the 1% chance flood with 3 feet of freeboard. The top of levee elevation for these levees will range up to 5.2 feet above natural ground based on preliminary hydraulic analysis. These levees will be constructed with a 16-foot top width and 4:1 side slopes.

2.2 HISTORIC WHETSTONE CHANNEL RECONSTRUCTION

Since the Whetstone River was diverted into Big Stone Lake in the 1930's the elevation of the channel bottom has lowered an estimated 4.5 feet, based on survey data collected for this project and the current invert of the historic channel. This "headcutting" within the Whetstone River was likely caused by shortening the stream reach, which increased the channel slope and the energy of flowing water. Hydrology has also likely changed through time due to upstream land use changes (increased discharges).

An embankment currently blocks discharge from entering the historic Whetstone river channel. This embankment is effectively a portion of the levee believed to be constructed when the Whetstone River was diverted into the lake. The embankment is connected to the Big Stone Lake Dam embankment. The embankment is approximately 600 feet West of CR 47 and contains a 2' diameter culvert. Excavation through this embankment will be required to reconnect the historic Whetstone River channel to the Whetstone River.

In order to restore flow, the historic channel is proposed to be restored to the elevation of 966.4 at the connection to the Whetstone River, and will be constructed with a slope of approximately 0.155% for approximately 2,760 feet and then transition to a slope of 0.08% to tie-in to the existing channel just downstream of the CSAH 15. The total excavated channel length is approximately 4,600 feet.

To maintain capacity and floodplain connectivity a bench is proposed next to the baseflow channel. This bench will begin at the inlet to the historic channel at an elevation of 972.0 and continue at a slope of 0.12% for approximately 2,300 feet to tie-in to the existing floodplain. The total cross sectional area of the bankfull channel and floodplain bench at the historic channel inlet is approximately 375 square feet.

The MnDNR has indicated a desired bankfull cross sectional area of approximately 150 square feet within riffles and 300 square feet in pools. The MnDNR recommended riffle cross section at the inlet to the historical channel is shown in **Figure 2**. Survey information for several locations along the historic Whetstone River channel upstream from the Minnesota River indicate a typical top-of-bank to top-of-bank cross sectional area of approximately 290 square feet. An example of a surveyed cross section in this location is shown in Error! Reference source not found.. On historic aerial photos from 1938 and 1955 several breakout reaches are visible, which may have reduced the discharge historically flowing through parts of the Whetstone. These breakouts no longer routinely carry flow. The recommended cross sectional area of 150 square feet was utilized at the upstream end, with the excavated floodplain bench above this channel. As both the channel and floodplain bench continue downstream, they tie-in to the existing channel and floodplain bench, which has been left relatively unaltered.

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Figure 2: MNDNR Recommended Riffle Cross Section.

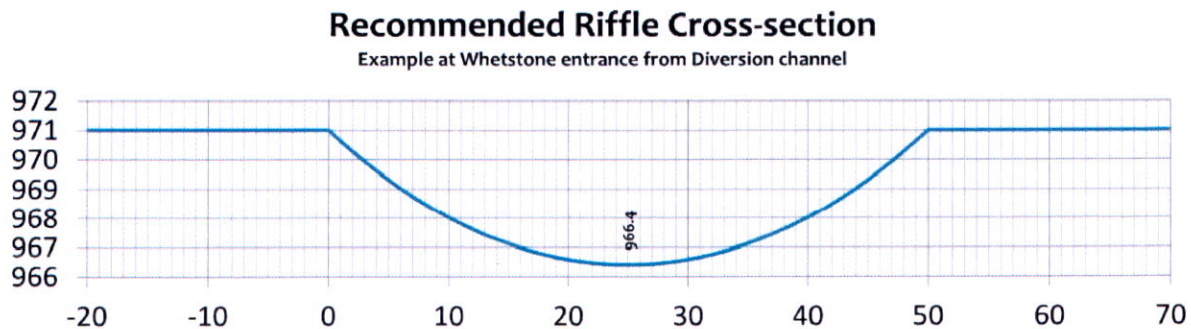
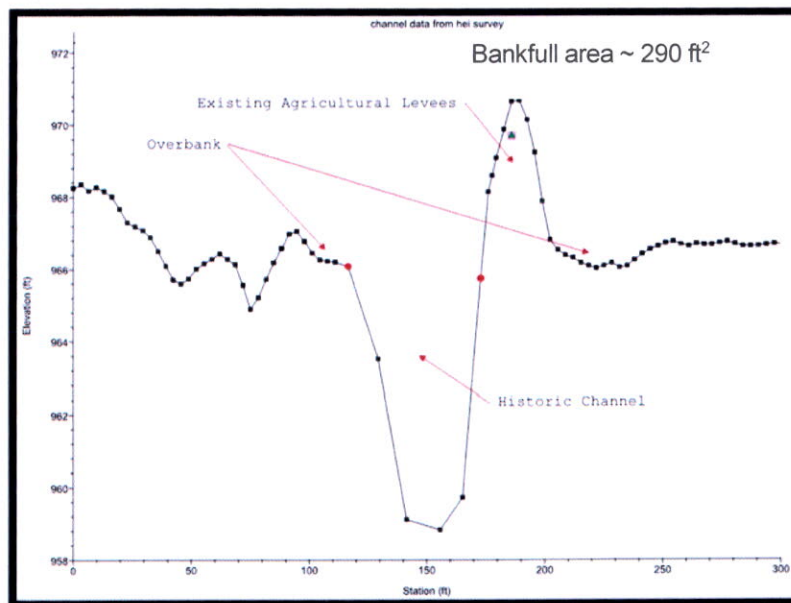


Figure 3: Surveyed Cross Section (Station 9586) in Historic Whetstone near the Minnesota River.



The current channel is overgrown with vegetation in many places and contains a substantial amount of downed trees blocking the channel. Clearing will need to take place in the area below normal water levels. Clearing debris, primarily fallen trees and growing trees from the historic Whetstone channel will be required along the 9,000 foot length. Much of this material will be stockpiled and used as toe wood protection at select locations.

2.3 WEIR STRUCTURES

To divert water into the historic channel a “plug” (i.e., a diversion structure) is needed in the Whetstone River to raise water levels (see **Figure 1**). The diversion structure also needs to be designed and constructed in a manner which allows large flows to pass over the top as none of the alternatives are able to pass Whetstone River flows for all flood events. The proposed diversion structure consists of a sheet pile weir with a crest

elevation of approximately 971.6 located 1,080 feet upstream from the Highway 12 Bridge. The existing channel bottom is 963.3. The sheet pile weir will be embedded within rock with 3:1 and 12:1 slopes on the upstream and downstream faces, respectively. During final design additional analysis will be completed to evaluate removing the interior weir. The design is intended to provide safe passage for fish and recreational canoeists and allow debris and ice to pass through the downstream debris barrier by the dam. Rock arch rapids can be incorporated into the riprap during final design.

A second weir structure designed similar to the diversion structure will be constructed at the location where the existing levee is removed near the entrance to the historic channel. The purpose of this “weir” is to create a “hard point” to ensure grade control at the inlet of the historic channel. The structure consists of a sheet pile weir with a crest elevation of approximately 966.4. The sheet pile weir will be embedded within rock with 3:1 and 12:1 slopes on the upstream and downstream faces, respectively. During final design additional analysis will be completed to evaluate removing the interior weir.

2.4 TRANSPORTATION FEATURES

Grant County (SD) Road 47 crosses the historic Whetstone channel approximately 1,800 feet south of Highway 12. The road had an Average Annual Daily Traffic (AADT) of 226 in 2011 based on published maps. The elevation of the road crown is approximately 4 feet above natural ground and 15 feet above the current channel bottom of the Whetstone River where the road crosses the river. The road appears to consist of 2 11 foot driving lanes and 2 foot gravel shoulders. Shoulder width increases to 5 feet as Highway 12 is approached. The probable right of way is a total of 60-feet. There is currently a 60” by 84” corrugated metal arch culvert under the road where it crosses the historic Whetstone River. This crossing is to be replaced with a 140 foot span bridge with a total waterway area of 1,140 square feet.

CSAH 15 crosses the historic Whetstone Channel approximately 3,600-feet south of Highway 12 and approximately 3,200 feet east of the Whetstone River. The AADT for the road was 470 in 2012 based on published maps. The current road elevation is only slightly above the elevation of the surrounding fields. The elevation of the top of the roadway is approximately 10-feet above the current historic Whetstone channel and appears to consist of 2, 12-foot driving lanes with 4-foot paved shoulders. There is currently one line of 48-inch reinforced concrete pipe where the road crosses the historic channel of the Whetstone River.

From their intersections with Highway 12 to approximately 1.0 miles south of the historic Whetstone, CR 47 and CSAH 15 are redundant. Approximately 1.0 miles south of the historic Whetstone River the two highways converge to within 240-feet of one another with a small connection road in-between. These highways then both extend north, crossing the historic Whetstone and meet Highway 12 approximately 0.7 miles apart from each other. These roads are also connected on the north side of the Whetstone and south of Highway 12 by Mill Road, which has several businesses. Between the south connection and Mill Road on CSAH 15 there is one access to a residence. Along CR 47 there are five access points to residences and business.

The proposed modifications to the transportation system are shown in **Figure 4**. After preliminary discussions with both the Grant County highway superintendent and Big Stone County Engineer, it was determined that the redundant section of CSAH 15 could be demised (while maintaining access to the residence). This eliminates the need for a second large crossing over the restored Whetstone River. Demolition of a minimum of 450-feet of CSAH 15 where it currently crosses the historic channel is recommended to restore floodplain flow. The portion of CSAH 15 north of the Whetstone historic channel is to remain for residential access. The portion of CSAH 15

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south of the historic channel to CR 47 will be reclaimed (2,310 linear feet) and a new turf surface established south of the Whetstone River to the CR 47 connection.

With the demolition of MN CSAH 15, new transportation features and upgrades will be required to allow traffic movements to and from Big Stone City and onto Highway 12. The current design of CR 47 is likely to a lesser tonnage than CSAH 15. The road cross section of CR 476 is also narrower than CSAH 15 and therefore driver expectations differ between the two roads.

Approximately 7,200 linear feet of improvements to CR 47 are planned. These improvements will entail upgrading CR 47 to a cross section consisting of two 12-foot lanes with 4-foot aggregate shoulders. An estimated 40-feet of additional ROW (6.2 acres) is needed to construct the road, assuming no change in current grade. A new connection will be made between CSAH 15 to CR 47 by construction a horizontal curve with a 60-mph design speed. A new connection from CR 47 to CSAH 15 is also be needed and will consist of a 45-mph horizontal curve (890 linear feet) with a stop connection at CSAH 15. With the improved intersections, several segments (2,840 linear feet) of existing roadway can be obliterated. This includes the current connection between CR 47 and CSAH 15 and the segment of CR47 north of the new connection and south of the existing connection. In addition there will be 1,100 linear feet of new aggregate surface constructed to provide several residential accesses. A small field crossing between CR 47 and CSAH 15 is also to be removed.

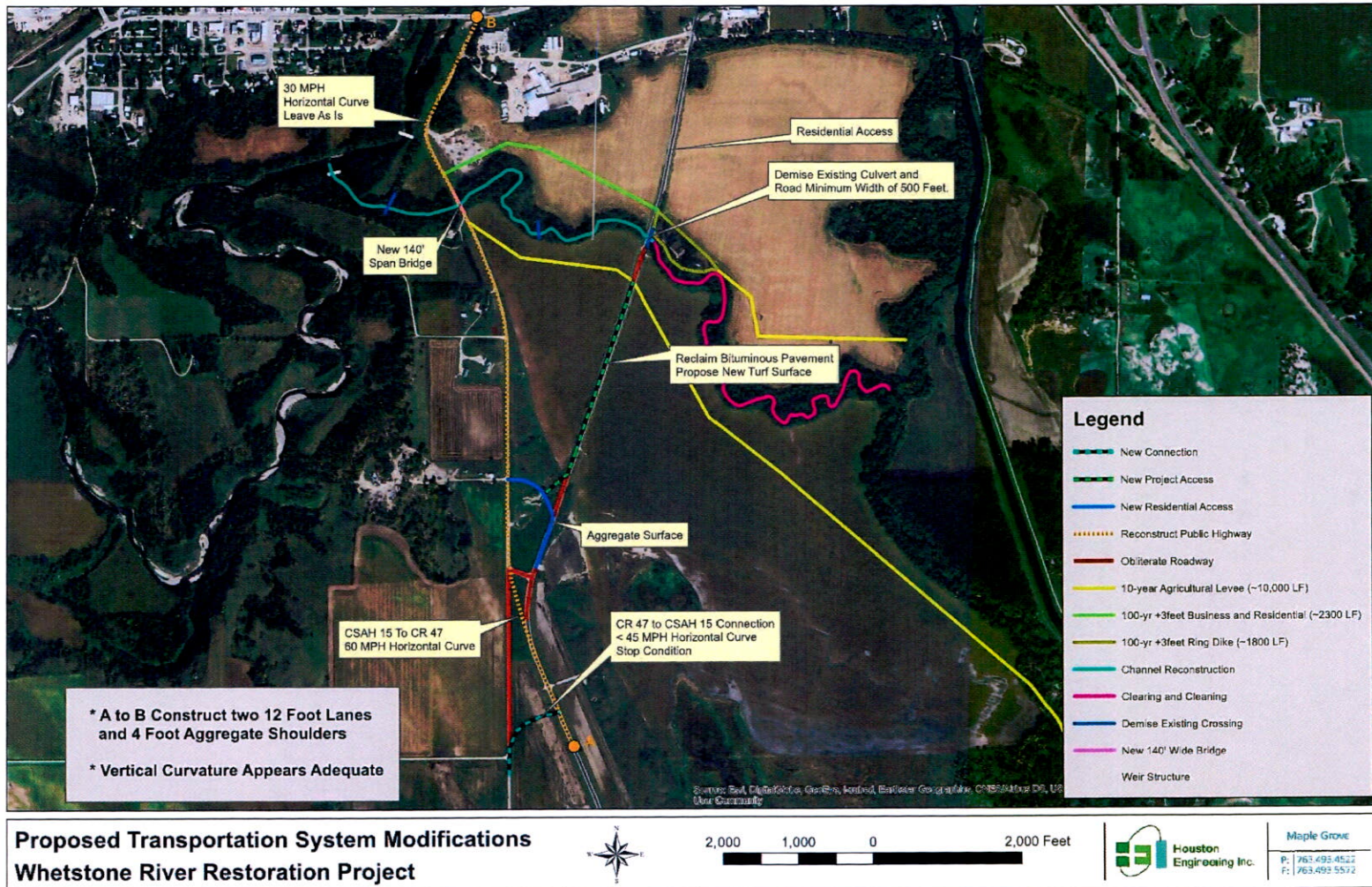
2.5 LAND REQUIREMENTS

A considerable amount of land is needed for the construction of Alternative 2B. All land located between (interior to) the levees is expected to be acquired initially by the District. Error! Reference source not found. **Appendix A** shows the preliminary land requirements and a detailed table of land needsError! Reference source not found.. A total of 141 acres is planned for acquisition. Levee construction is expected to occur on the land acquired. Some temporary easements are necessary to complete construction. The estimated amount of land will be refined and legal exhibits created prior to acquisition.

Flowage easements are also needed as the proposed project will alter the area inundated by the 1% chance flood event. The area inundated for the 1% flood event on land exterior to the levee system may increase or decrease. Although the net change in the acreage inundated on a specific parcel may be small or even zero, the acquisition of flowage easements for any land newly inundated by the 1% chance flood event and setback levees of Alternative 2B) is proposed (see **Figure 4**). An estimated 58 acres is planned for flowage easements. The District will also need access to the proposed diversion weirs for future maintenance, which will be accomplished through approximately 1 acre of permanent right-of-way or easement.

Widening CR 47 requires the acquisition of additional ROW. The current ROW is believed to be 60-feet total. Acquisition of an additional 40-feet is proposed. Existing roadway ROW will be vacated at select locations, where it is no longer needed.

Figure 4: Modified Alternative 2B (With Setback Levee Option) Transportation Features.

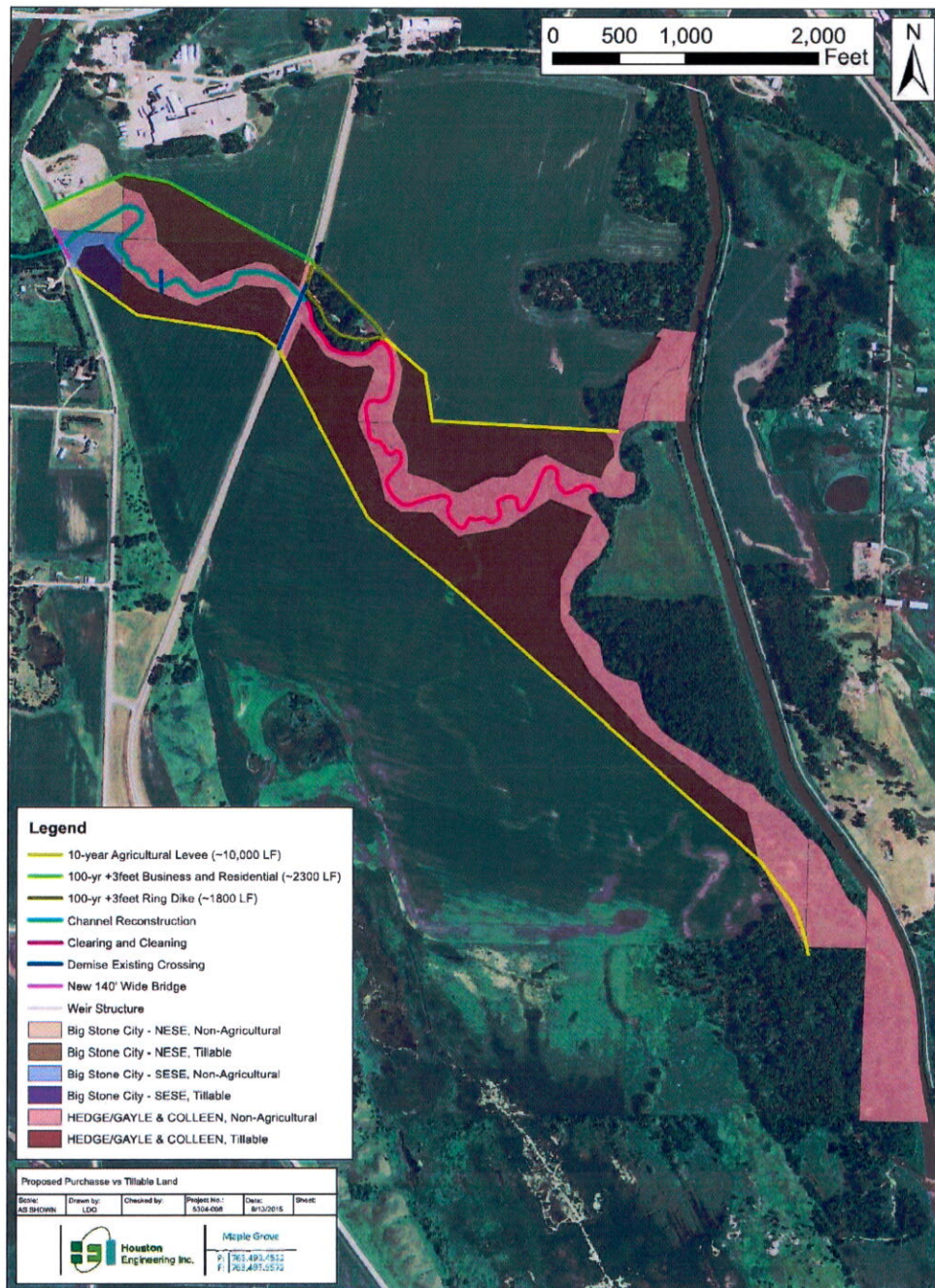


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Figure 5: Land Acquired for Modified Alternative 2B (excludes flood easements).



FOR ILLUSTRATION PURPOSES ONLY, PROPERTY BOUNDARIES REPRESENTED FROM COUNTY GIS DATA ARE KNOWN TO BE INACCURATE. SEE SURVEYED BOUNDARIES.

3 RESULTS SUMMARY

3.1 RESTORATION HYDROLOGY

The purpose of restoration is to return perennial flows to the historic channel of the Whetstone River. The amount of water which can potentially be diverted into the historic channel is primarily a function of the elevation of the Whetstone River diversion structure (i.e., the amount of “head” created), the cross sectional area and elevation of the excavated portion of the historic Whetstone Channel, and the effect of the downstream structures under CR 47 and CSAH 15. This Project anticipates removing the bridge and widening the road embankment for CSAH 15, removing this potential hydraulic constraint. Downstream water levels on the Minnesota River also can affect the amount of water diverted.

Placing the diversion weir in the existing Whetstone channel combined with reconstructing the historic Whetstone Channel restores flow to the channel on a daily basis. **Table 1** provides details on the anticipated regularity of daily discharges in the Whetstone. These values are based on the daily discharge record at the USGS gaging station on the Whetstone River near Big Stone City and the capacity of the historic channel. Table 2 shows reestablishment of the historic channel as a perennial stream.

Table 1: Frequency of Diverted Mean Daily Flows (1910-2013)

Condition	Average Days per year flow diverted to Historical Whetstone Channel	Average Days per year flow to Big Stone Lake (Current Whetstone)
Existing	3	365
Alternative 2B	365	11

Typically restoration projects such as this are initially designed and their performance analyzed by engineers using “design events”. Design event hydrographs are those with a certain shape and estimated peak discharge and a probability assigned based on the typical likelihood of a hydrologic event occurring. Design events are the typical method used to size project features, and are useful for analyzing how the proposed features will perform for a range of differing amounts of runoff, which are likely to occur during the life of the proposed features. These events are referred to by an annual probability or sometimes an average recurrence interval. For example the 100-year flood event is the flood event that has a 1% chance of being exceeded on average in any given year.

Table 2 summarizes the estimated peak discharge and the proportion of that discharge diverted to the historic Whetstone channel for the modified 2B Alternative. For example during the 100-year flood event, 32% of the peak discharge will be diverted to the historic Whetstone. A much larger portion of the total volume of the flood event will still be diverted to the historic Whetstone. The amount diverted under existing conditions is virtually none, as the current 2 foot diameter culvert is elevated above the water level of the Whetstone River. The discharge not diverted into the Whetstone channel will over-top the diversion weir and proceed to the Big Stone Lake Dam. The 100-yr water surface elevation upstream of the diversion weir is 975.78 (4.18 feet of head). The average velocity of discharges flowing over the weir is 4.9 ft/sec.

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Table 2: Peak Flows Restored to Whetstone Historic Channel.

Return Period	Estimated Total Whetstone River Flow (cfs)	Modified Alternative 2B	
		Estimated Peak Discharge to Restored Whetstone (cfs)	% of Peak Discharge Diverted
2-year	1119	806	72%
10-year	4780	1816	38%
100-year	12225	3873	32%
These flow splits assume no ice at the Highway 12 bridge			

Additional perspective about the potential impacts of a project is gained by hydraulic analysis of historical runoff events rather than design events. The analysis of historical runoff events improves understanding about how the project would perform had the project been in place. This type of analysis is often more relevant to those with first-hand experience and to those living in the area. The 1997 and 2010 flood events were used to assess project performance and the change in discharges and runoff volumes. Table 3 shows the effects of the proposed alternative, had the project been in place, during the 1997 and 2010 flood events.

Table 3: Effects of the Alternatives for the Historic Flood Events

Year of Historic Flood	Existing Conditions	Modified Alternative 2B	
Big Stone Lake Maximum Elevations*			
	Maximum Elevation	Maximum Elevation	Change
1997	973.94	972.07	-1.87
2010	972.38	971.38	-1.00
Highway 75 Peak Discharge			
	Peak Discharge (cfs)	Peak Discharge (cfs)	Change (cfs)
1997	9,335	10,886	1,551
2010	10,640	12029	1,389
Highway 75 60-Day Volume**			
	Total Volume (acre-feet)	Total Volume (acre-feet)	Change (acre-feet)
1997	463,473	471,772	8,299
2010	396,055	403,683	7,627
Highway 75 Maximum Elevations			
	Maximum Elevation	Maximum Elevation	Change
1997	957.98	958.34	0.36
2010	958.33	958.65	0.32
Diversion Split Peak Flow			
	Peak Whetstone Flow (cfs)	Peak Flow Restored to Historical Whetstone (cfs)	% of peak to Historical Whetstone
1997	6,593	2,570	39%
2010	6,394	2,300	36%
Diversion Split 60-Day Volume			

	Total Whetstone Volume (acre-feet)	Total Volume Restored to Historical Whetstone (acre- feet)	% of total volume to Historical Whetstone
1997	150,134	81,546	54%
2010	103,755	65,427	63%
* The existing 100-year floodplain elevation for Big Stone Lake established by FEMA is 972.1 (NAVD88, effective April 17, 2006). **If the model was run for a long enough period of time, such that areas with storage (such as Big Stone Lake) were allowed to find the same equilibrium at their initial starting condition and ending condition, these volumes would be equal for all alternatives. These volumes indicate that the timing of volumes is changed dependent on the alternative.			

The proportion of the peak discharge diverted into the historic channel is similar to the amount estimated using design events. The amount of runoff volume moving downstream is the same as the existing condition, as restoring the historic channel does not alter drainage patterns. The elevation reduction within in Big Stone Lake is considerable ranging from 1 foot to 1.9 feet. Although the peak discharge reaching Highway 75 increases, because the volume of water remains unchanged, it seems that the current operation of the downstream dam could remain unchanged.

3.2 FLOODPLAINS AND FLOOD POTENTIAL

Because a considerable portion of the water moving downstream in the Whetstone River will be diverted into the historic channel, the location of the floodplain and lands affected will change. In general, a considerable portion of the flow from the Whetstone River (i.e., 36-39% of the peak discharge for the historic floods) will no longer reach Big Stone Lake, reducing flood elevations on Big Stone Lake.

Following the 1997 flood, the low floor elevation of 172 inhabited structures on only the Minnesota side of the lake were surveyed by the Upper Minnesota River Watershed District and Big Stone County. Currently 76 structures are lower than the 100-year lake elevation of 972.65. Modified Alternative 2B reduces the number of structures to 51. The 100 year flood elevation decrease is 1.08 feet to 971.58. The maximum elevation decrease, assuming all Whetstone discharges are diverted was calculated to be 2.7 feet.

Water which is diverted through the historic channel will reach downstream areas more quickly and potentially increase the maximum water depth. **Table 4** shows the changes in maximum water surface elevation on Big Stone Lake, the Refuge, and at the Highway 75 Dam, assuming fully open gates at the Big Stone Lake Dam. At the Highway 75 dam the increase in the maximum water surface level compared to existing conditions is an estimated 0.50 feet for the 100-year flood. **Table 5** also shows the duration of the increased water surface elevations at the Refuge and the corresponding increases in peak discharge and water surface elevation. These increases were modeled assuming no changes to the Highway 75 dam operations plan and no changes to the Big Stone Lake Dam.

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Table 4: Estimated Floodplain Elevation Changes (100 year event) (in feet).

	Modified Alternative 2B
Big Stone Lake 100 year Maximum Elevation	-1.08
Big Stone National Wildlife Refuge (downstream of Highway 17) Maximum Elevation	+0.86
Highway 75 Dam 100 year Maximum Elevation	+0.50
*These reductions assume a 100 year flood on Big Stone Lake caused by a 100 year flood on the Whetstone River, different flood mechanism could result in less of a reduction.	
**These elevations assume fully open gates at the Big Stone Dam.	

Table 5: Estimated Impacts to Big Stone National Wildlife Refuge (downstream of Highway 17) 100 year event.

	Modified Alternative 2B
Maximum Elevation Increase (feet)	0.82
Peak Discharge Increase (cfs)	1108
Duration of Water Surface Elevation greater than Existing Conditions (days)	14
Duration of Water Surface Elevation greater than 0.1 feet above Existing Conditions (days)	8
*These reductions assume a 100 year flood on Big Stone Lake caused by a 100 year flood on the Whetstone River, different flood mechanism could result in less of a reduction.	
**These elevations assume fully open gates at the Big Stone Dam.	

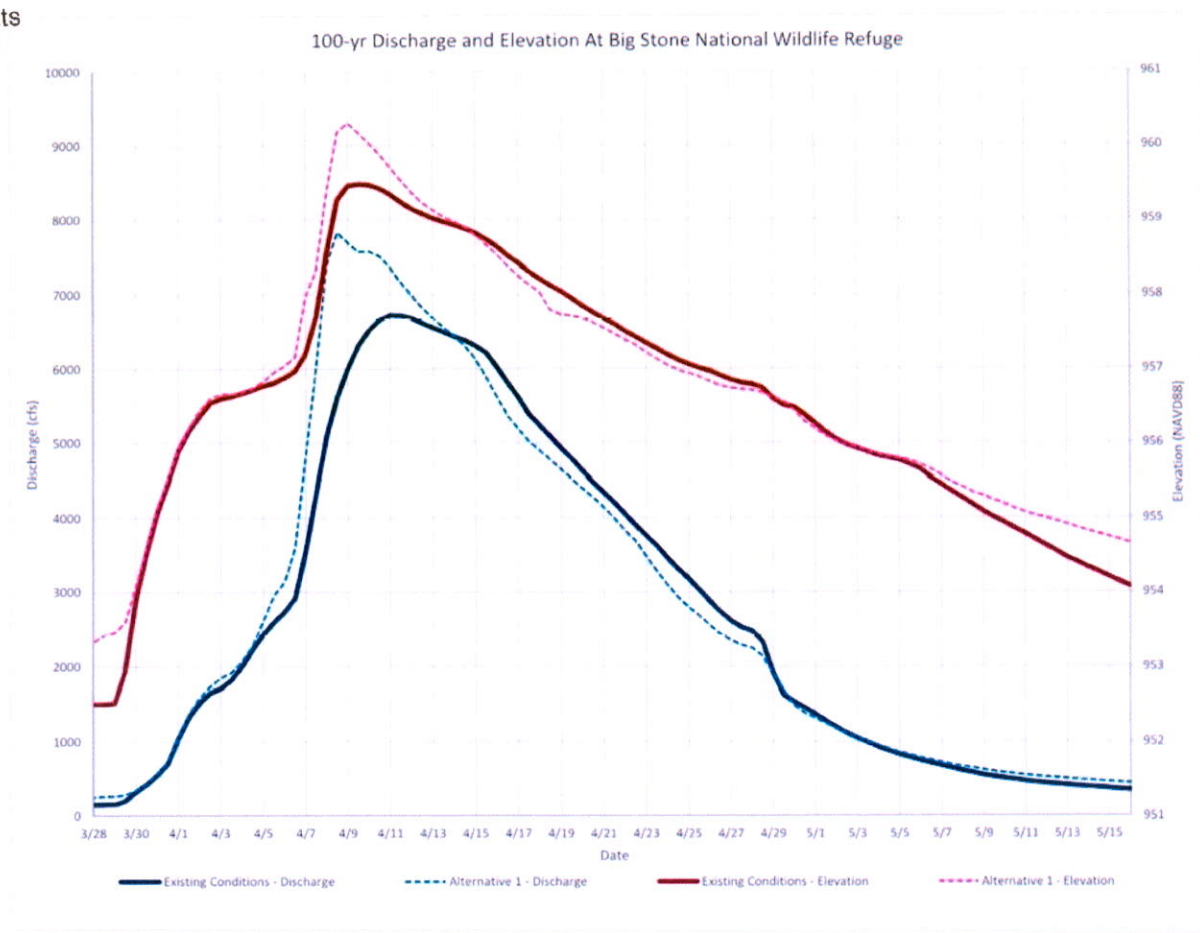
Figure 6 shows the discharge and stage hydrographs for existing conditions the proposed alternative within the Big Stone Lake National Wildlife Refuge, assuming fully open gates at the Big Stone Lake dam. The downstream impacts can be reduced further with changes to the Big Stone Lake Dam operations procedures, should this be determined to be necessary. Impacts downstream will decrease if the gates remained closed more often than they would during the current operation plan. Additionally modifications to the Highway 75 operations or different hydraulic structures crossing the Refuge can decrease the impacts to the water surface.

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Figure 6: 100-yr Discharge and Elevation at Big Stone National Wildlife Refuge.



This project will require input from the United States Army Corps of Engineers (USACE), who operates the Highway 75 dam and will have to consider and approve any changes to the operation plan at the Highway 75 Dam. The following project purpose for the Highway 75 dam was provided in the Water Control Manual for the Highway 75 Dam by the Army Corps of Engineers.²

In 1960 the Corps of Engineers investigated flood problems on Big Stone Lake and the immediate vicinity. The recommended plan included (1) erosion control and siltation improvements on the Whetstone River, (2) channel improvements downstream of Big Stone Lake (4) increase capacity of the Big Stone Lake outlet, and (5) construction of the Highway 75 Dam as mitigation for the increase outlet capacity. The dam was to provide storage for the increase outflow such that there was no increase in flood damages downstream. A dry reservoir was considered but was not economically justified. Therefore, the project was designed to be multipurpose in that it not only provides flood

² U.S. Army Corps of Engineers, "Water Control Manual, Flood Control - Minnesota River and South Dakota, Highway 75 Dam and Reservoir, Big Stone Lake - Whetstone River Project," Updated March 2005.

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control, but also provides a means for the enhancement of migratory wildlife. Thus, the Highway 75 Reservoir was born.

The proposed alternative achieves benefits that are in line with the original purpose of the USACE Highway 75 dam project, which serves as a mitigation project Big Stone Lake.

There will also be changes to the areas inundated and floodplain between Big Stone Lake and the Highway 75 dam. **Figure 7** shows the change in area flooded, with the exception of the around Big Stone Lake. In many cases external to the setback levees, the net change in the amount of floodplain on a specific parcel is small. Often one portion of land no longer floods, but a new portion does flood. The setback levees actually result in greater probability that land external to the levees can be tilled and farmed, because of the additional protection provided. A considerable amount of land along Highway 12 is removed from the floodplain.

In general areas adjacent to the current Whetstone and Minnesota Rivers upstream of the historic confluence will have decreased inundation, while areas adjacent to the restored historic Whetstone will have increased inundation. Levees have been proposed to protect agricultural lands from the 10% chance flood event and businesses and residents from the 1% chance flood event. These levees if constructed will bring greater certainty to where flooding will occur. Newly inundated areas during the 1% chance flood event will have flood easements purchased, thus offsetting any adverse flooding impacts in these areas. Floodplain maps will need to be updated and submitted to FEMA following project construction.

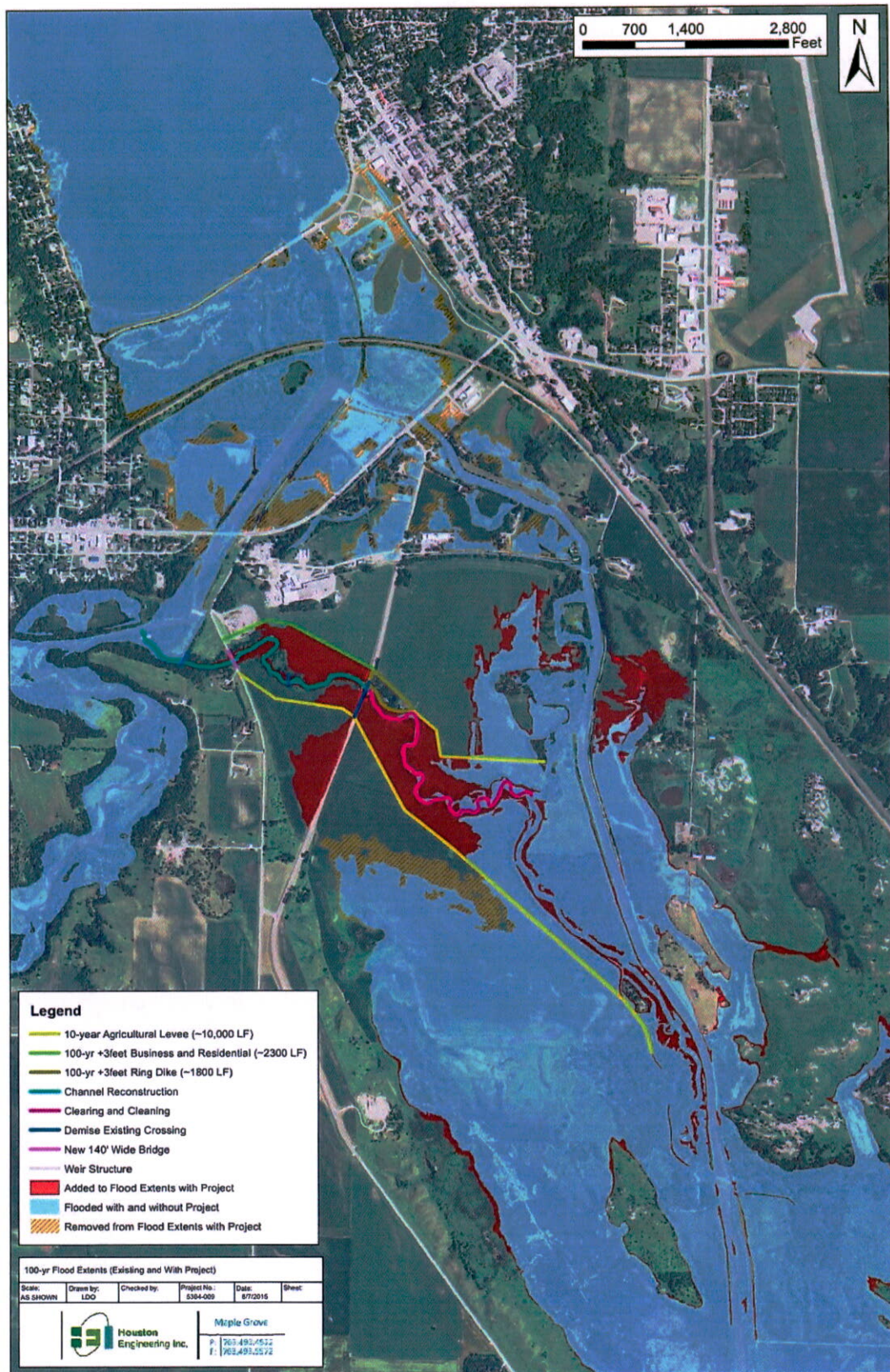
3.3 ECOLOGICAL, WILDLIFE, AND WETLANDS

One of the goals of the project is to improve fish and wildlife habitat. Under existing conditions, the Big Stone Lake dam hinders fish passage from the Minnesota River to the Whetstone River and Big Stone Lake. The proposed alternative restores this longitudinal connectivity by reestablishing the connection between the Whetstone and Minnesota Rivers. This will allow aquatic species to freely move between the Whetstone and Minnesota Rivers.

All crossings and weir structures have been designed to enable fish passage. The crossings on the historic Whetstone were designed as bridges spanning the channel or with one culvert recessed. The weir structures are completely embedded in riprap which is sloped on either side to connect with the channel bottom. Arched rapids can be added during final design. Additionally, alternative 2B removes a crossing from the historic Whetstone (CSAH 15).

With the proposed project, the area interior of the levees can be planted with native vegetation and maintained as a naturally functioning floodplain. The more water that is diverted to the historic Whetstone, the more discharges will utilize the floodplain. This utilization of the floodplain is important to many ecosystem services such as the deposition of nutrients and riparian habitat.

Figure 7: 100-yr Flood Extent (Existing Conditions and for Modified Alternative 2B).



There are several wetlands mapped by the National Wetland Inventory along or near the historic Whetstone channel (**Figure 8**). Most of these are palustrine forested wetlands along the channel itself, but there is one Palustrine Emergent and one Palustrine Emergent Unconsolidated Bottom. Expectations are that this will be a self-mitigating restoration project (therefore, no cost for mitigation is included). An estimated 156 acres between the setback levees is expected to be purchased, placed into permanent set aside, and planted into native vegetation. This acreage is based on purchasing the area interior to the existing agricultural levees and the area east to the Minnesota River. The land interior to the levees will be subject to periodic flooding and wetland will redevelop adjacent to the historic channel. This same riparian area will establish a riparian corridor along the historic channel allowing animal species to freely migrate along the open channel between the Whetstone River and the Minnesota River.

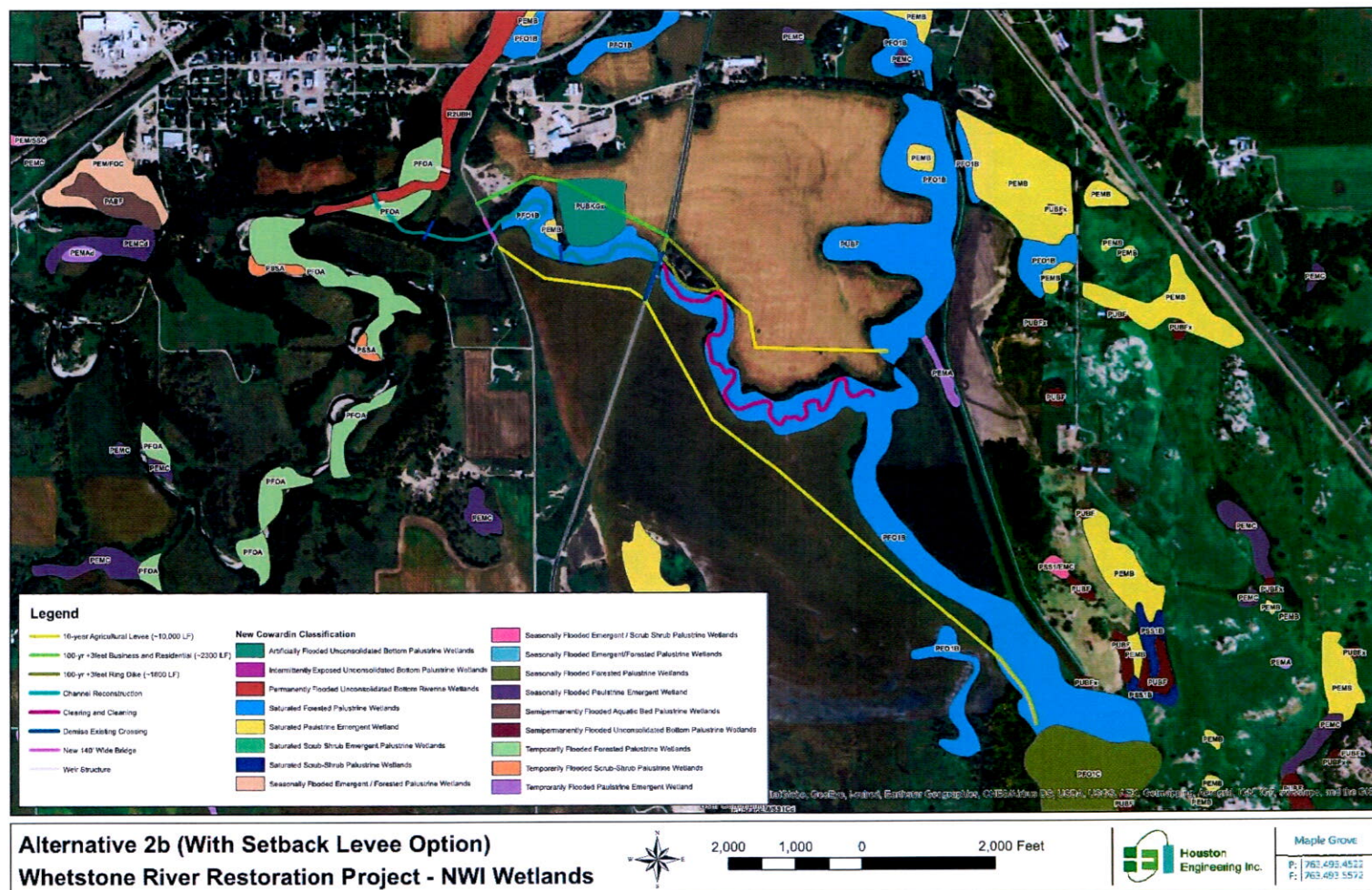
The Minnesota Department of Natural Resources maintains a “natural heritage database.” The database contains information about the presence of rare plant species within Minnesota based on surveys completed by ecologists at the Department of Natural Resources. A review of the database shows the presence of two rare vascular plant species (*Myosotis Verna*, Forget-Me-Not; *Alopecurus Carolinianus*, Carolina Foxtail) on the west side of the Minnesota River, between the setback levees. No constructed related work is planned for this area, but there is some potential for disruption during construction. Numerous species are located on the east side of the Minnesota River, outside of the propose project work area. Because much of the area within the project area is tilled and disrupted, the likelihood of adverse impacts seems low.

4 PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COST

Preliminary Opinion of Probable Construction Costs (POPCC) for the restoration alternatives are provided for each alternative in **Table 6**. Transportation related improvements costs are shown in **Table 7**. The POCCC for Alternative 2B is new, while the estimates for the remaining alternatives were updated based on recent project bidding results. A 20% construction contingency is included in the POPCC, in addition to the land needs, completing a geotechnical investigation, technical support including the preparation of final plans and specifications, construction management, and obtaining necessary permits and approvals. The 20% construction contingency is to account for the fact that final design of the project is yet to occur and potential unforeseen construction circumstances. These circumstances are typically related to soil conditions or other geotechnical concerns and dewatering methods. The contingency is more than typical for this particular project due to the multiple agencies both permitting and reviewing the project, and due to potential design changes that may be necessitated. **Table 6** includes the project features shown in **Figure 1** considered necessary for the restoration project including the work of either constructing new crossings or modifying existing crossings where the historic channel crosses CR 47 and CSAH 15.

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Figure 8: National Wetland Inventory Wetlands



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	Modified Alternative 2B (With Setback Levees)
RESTORATION	
Channel Restoration, Levees, and Ring Dike	\$1,917,532
Crossing at SD CR 47	\$792,328
Crossing at MN CSAH 15	–
Grading and Bituminous MN CSAH 15	\$20,607
Diversion Weir on Whetstone River	\$309,200
Grade Control Weir on Historic Whetstone Channel	\$41,965
Construction Right-Of-Way/Easements	\$32,000
SUBTOTAL Construction Cost	\$3,113,631
ADMINISTRATION, TECHNICAL AND LEGAL	
Construction Contingency (20%)	\$622,726
Engineering/Construction Observation (20%)	\$622,726
Geotechnical	\$25,000
Permitting	\$30,000
Administrative/Legal (15%)	\$467,045
SUBTOTAL	\$1,767,497
TOTAL Excluding Land	\$4,881,129
LAND AQUISITION	
Fee Purchase	\$461,750
Flowage and Work Easements	\$67,680
SUBTOTAL Land Acquisition	\$529,430
TOTAL PROJECT COST	\$5,410,559

There are additional transportation related costs, not included in **Table 7**, associated with modifying the local transportation system. These items are shown in Table .

Table 7: Additional Related Transportation System Improvement Costs (modified Alternative 2B).

Feature	Estimated Cost
Grade Widening – CR 47 / CSAH 15 Connection	\$780,000
Bituminous Surfacing – CR 47 / CSAH 15 Connection	\$100,000
Existing CSAH 15 Roadway Obliteration/ Reclaiming	\$80,000
Additional Roadway Connections and Driveways	\$230,000
TOTAL Transportation Construction	\$1,190,000

5 RECOMMENDATIONS

The results described within this TM should be used by the District to continue to advance the Project, should the District wish to do so. Specifically, these results should be used to prepare portions of an Environmental Assessment Worksheet and the necessary permit applications and approval forms. The results should also be used to engage the U.S. Army Corps of Engineers relative to the need for Section 408 review and continuing to engage the U.S. Fish and Wildlife Service in a discussion about any remaining concerns.

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APPENDIX A: LAND REQUIREMENTS

Flood Easement Requirements for Modified Alternative 2B (with setback levees)

NOTE: Property boundaries represented are from County GIS data and are known to be inaccurate.

Map ID	Parcel ID	Taxpayer Name	Parcel (Acres)				Estimated New Area (Acres) Inundated by 1% Chance Flood With Project Outside Set Back Levee (FLOOD EASEMENT NEEDED)			
			Total	Pasture	Tillable	Non-Agricultural	Total	Pasture	Tillable	Non-Agricultural
11		Big Stone City - NENW**	40.1	2.2	0.0	37.9	0.1	0.1	0.0	0.0
8		Big Stone City - NWSE**	40.3	6.8	0.0	33.5	0.1	0.1	0.0	0.1
10		Big Stone City - SESE**	38.9	9.4	4.6	24.9	0.6	0.0	0.0	0.6
15	11-0100-000	COLD SPRING GRANITE CO	61.9	2.0	0.0	59.9	0.4	0.1	0.0	0.3
32	22-0081-000	DWYER/PATRICK & DIANE	4.3	0.0	0.0	4.3	1.1	0.0	0.0	1.1
12		HAROLD DIMBERG FAMILY TRUST ETUX	200.5	19.6	86.7	94.2	0.1	0.0	0.0	0.1
3	11-0089-000	HEDGE/GAYLE & COLLEEN	58.5	14.8	0.0	43.6	4.6	0.2	0.0	4.4
0	11-0094-000	HEDGE/GAYLE & COLLEEN	389.5	14.5	282.8	92.2	8.9	0.0	7.9	1.0
21	22-0067-000	HEDGE/GAYLE & COLLEEN	61.9	0.1	15.9	45.8	1.1	0.1	0.1	1.0
23	22-0069-000	HEDGE/GAYLE & COLLEEN	451.2	204.5	0.0	246.8	26.2	14.1	0.0	12.1
30	22-0083-000	HEDGE/GAYLE & COLLEEN	10.5	0.0	9.2	1.3	0.7	0.0	0.7	0.0
28	22-0087-000	HEDGE/GAYLE & COLLEEN	66.7	0.0	35.2	31.5	0.2	0.0	0.2	0.0
34,35	22-0103-000	HEDGE/GAYLE & COLLEEN	147.9	0.0	119.0	28.9	8.4	0.0	8.1	0.3
54	22-0105-000	HEDGE/GAYLE & COLLEEN	38.0	0.0	29.8	8.2	4.2	0.0	3.8	0.3
14	11-0104-000	LONGHENRY/KATHLEEN JO	79.3	78.0	0.0	1.3	0.7	0.7	0.0	0.0
2	11-0096-000	U S A (FISH & WILDLIFE)*	118.3	0.4	0.0	117.9	2.1	0.0	0.0	2.1
18	11-0152-000	U S A (FISH & WILDLIFE)*	25.2	0.0	0.0	25.2	0.4	0.0	0.0	0.4
16	11-0153-000	U S A (FISH & WILDLIFE)*	114.1	0.0	0.0	114.1	0.6	0.0	0.0	0.6
19	11-0154-000	U S A (FISH & WILDLIFE)*	27.4	0.0	0.0	27.4	0.7	0.0	0.0	0.7
17	11-0155-000	U S A (FISH & WILDLIFE)*	16.8	0.0	0.0	16.8	0.1	0.0	0.0	0.1

*No flood easement is proposed within USA Fish & Wildlife lands

** Parcel data unavailable within Big Stone City

Proposed Land for Acquisition for Modified Alternative 2B (with setback levees).

Section	Outlot	Description	Lot	Total Acres	Tillable Acres	Non-Tillable Acres
22	X	Government Lot 1, Section 22 Township 121 North, Range 46 West, Lac Qui Parle County MN		5.6	0	5.6
21	X	Government Lot 5, Government Lot 6, and Government lot 10, Section 21, Township 121 North, Range 46 West, Big Stone County, Minnesota	A	13.20	13.20	0
21	X	Government Lot 3, Government lot 5, Government Lot 6, Government Lot 9, and Government lot 10, Section 21, Township 121 North, Range 46 West, Big Stone County, Minnesota	B	31.12	0	31.12
21	X	Government Lot 3, Government Lot 5, Government Lot 6, Government Lot 9, and Government Lot 10, Section 21, Township 121 North, Range 46 West, Big Stone County, Minnesota	C	35.89	35.89	0
16	X	Government Lot 2, Government lot 4, and Government lot 5, Section 16, Township 121 North, Range 46 West, Big Stone County, Minnesota	A	10.92	10.92	0
16	X	Government Lot 2, Government Lot 4, Government Lot 5, Outlots 14, 15, and 16 of Government Lot 4, and Outlot 19 of Government 5, Section 16, Township 121 North, Range 46 West, Big Stone County, Minnesota	B	13.37	0	13.37
16	X	Government Lot 5, Outlot 15, of Government Lot 4, and Outlot 19 of Government lot 5, Section 16, Township 121 North, Range 46 West, Big Stone County, Minnesota	C	14.50	14.50	0
16	X	Outlots 14, 16, and 17 of Government Lot 4 Section 16, Township 121 North, Range 46 West, Big Stone County, Minnesota	D	2.52	2.52	0
16	*	*	*	6.88*	*	6.88*
22	*	*	*	7.15*	*	7.15*
Total Acquired				141.15*	77.03*	64.12*

*Estimated, not yet surveyed

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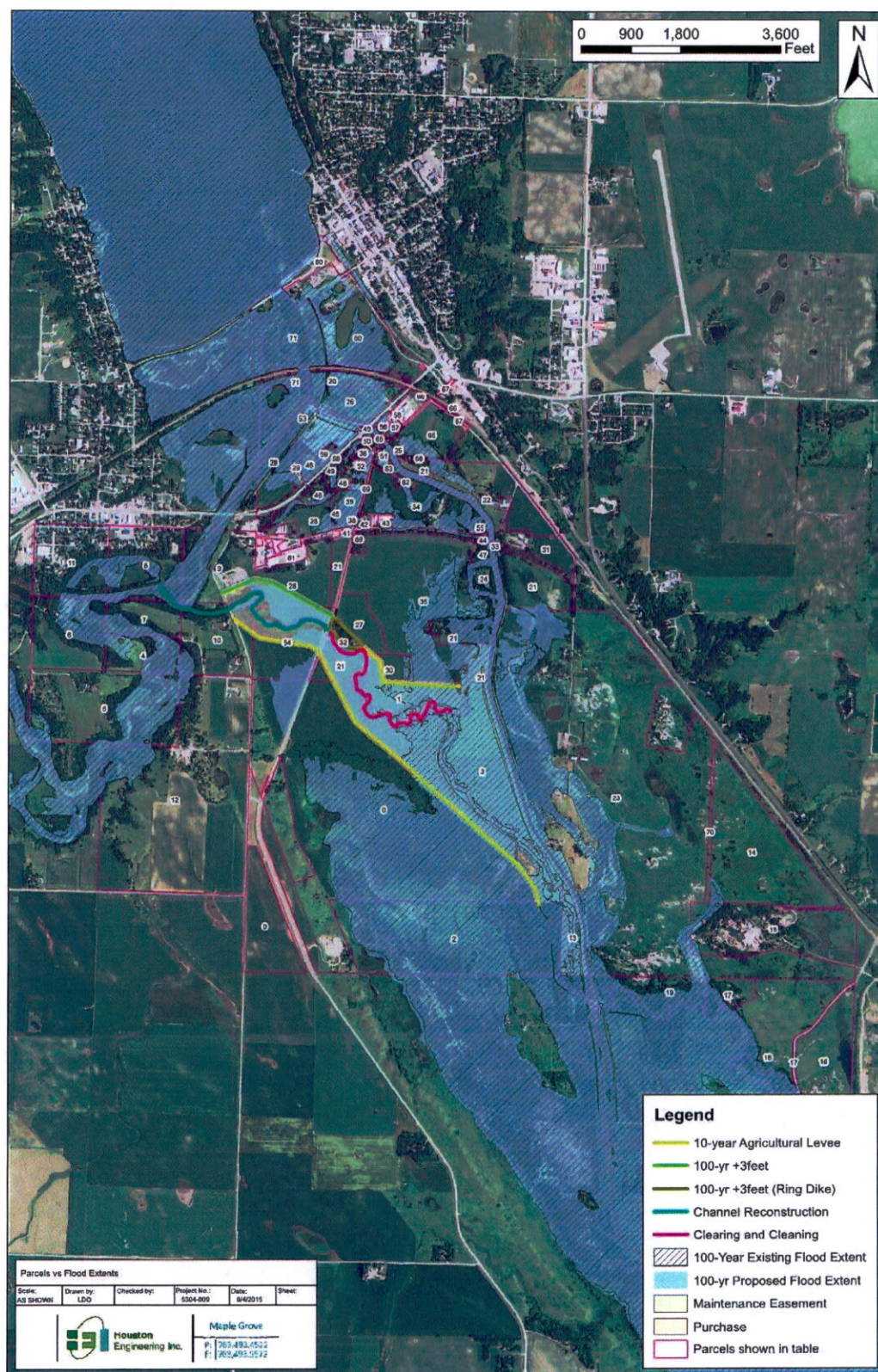
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Existing and modified Alternative 2B 1% chance floodplains vs Parcel Locations

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Preliminary Plats for Land to be Acquired.



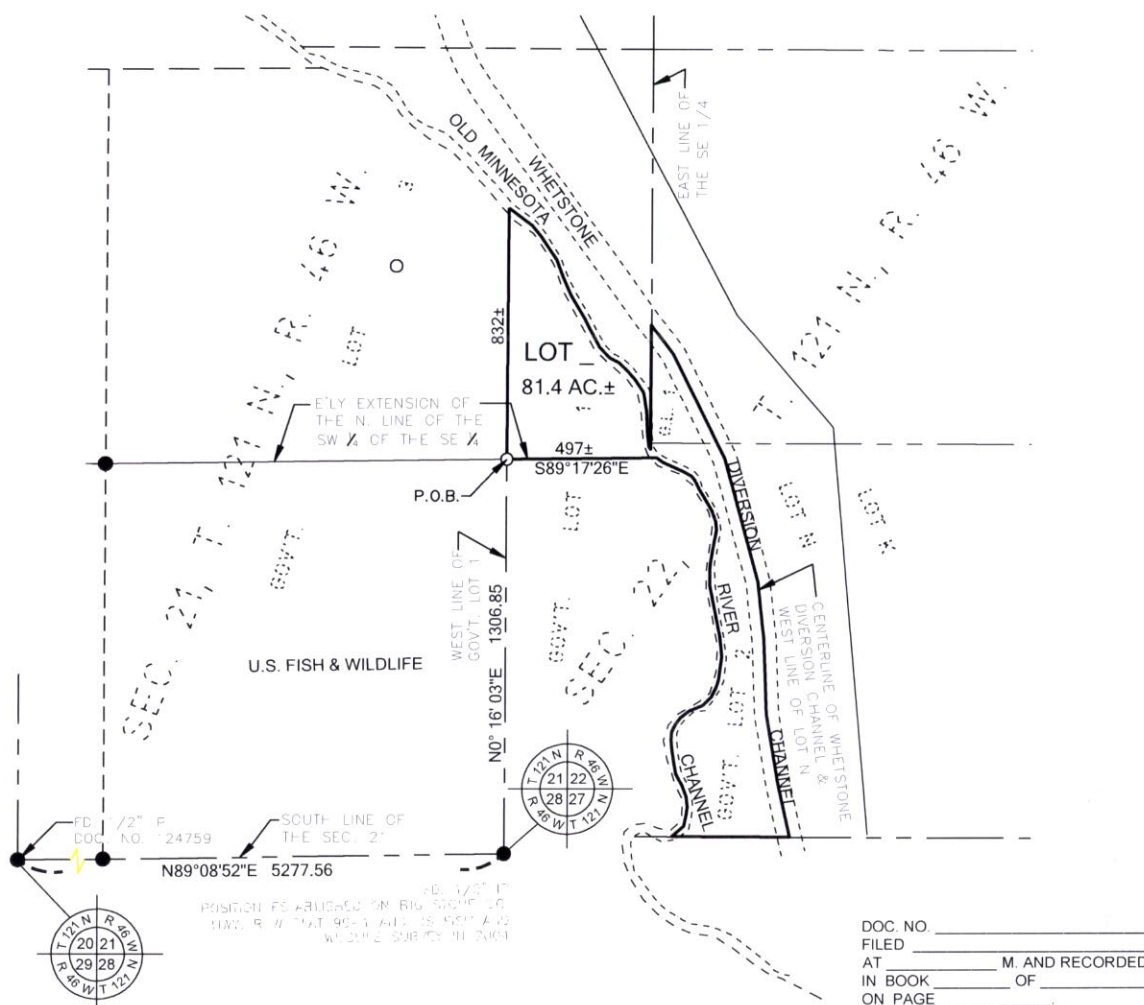
OUTLOT XX OF THE CITY OF ORTONVILLE, MINNESOTA

(BEING PARTS OF GOVERNMENT LOT 3, GOVERNMENT LOT 5, GOVERNMENT LOT 6, GOVERNMENT LOT 9 AND GOVERNMENT LOT 10, SECTION 21, TOWNSHIP 121 NORTH, RANGE 46 WEST, BIG STONE COUNTY, MINNESOTA)

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DOC. NO. _____
FILED _____
AT _____ M. AND RECORDED
IN BOOK _____ OF _____
ON PAGE _____
ELAINE MARTIG
COUNTY RECORDER
BIG STONE COUNTY, MINNESOTA
BY _____ DEPUTY

Lot Description:

That part of Government Lot 1, Section 22, Township 121 North, Range 46 West, originally in Lac qui Parle County, but by legislative enactment detached from said County and annexed to the County of Big Stone, Minnesota, lying north of the following described line:

Commencing at the Southwest corner of Section 21, Township 121 North, Range 46 West; thence on an assumed bearing of North 89 degrees 08 minutes 52 seconds East, along the south line of said Section 21, a distance of 5277.56 feet to the Southwest corner of said Section 22, also being the Southwest corner of said Government Lot 1; thence North 0 degrees 16 minutes 03 seconds East along the west line of said Government Lot 1 a distance of 1306.85 feet to an intersection with the easterly extension of the north line of the Southwest Quarter of the Southeast Quarter of said Section 21, the point of beginning of the line to be described; thence South 89 degrees 17 minutes 26 seconds East, along said easterly extension line a distance of 497 feet more or less to the centerline of the historic Minnesota River channel, and there terminating.

TOGETHER WITH

Those parts of Government Lots 1 and 2, Section 22, Township 121 North, Range 46 West, Big Stone County, Minnesota lying westerly of Lot N, as shown on that plat filed in Book 5 of Plats, page 424 under Document No. 170714.



Bearings based on Big Stone County
Coordinate System, NAD 83 (2011 adj.)

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Michael E. Cannon Lic. No. 40035
Date: 7-7-15

LEGEND

- - Denotes Monument Found
- - Denotes Iron Pipe set w/ cap #40035



6901 East Fish Lake Road, Suite 140
Maple Grove, Minnesota 55369
Phone: 763.493.6966 Fax: 763.493.5572
Web: www.houstoneng.com

OUTLOT XX OF THE CITY OF ORTONVILLE, MINNESOTA

(BEING PARTS OF GOVERNMENT LOT 3, GOVERNMENT LOT 5, GOVERNMENT LOT 6, GOVERNMENT LOT 9 AND GOVERNMENT LOT 10, SECTION 21, TOWNSHIP 121 NORTH, RANGE 46 WEST, BIG STONE COUNTY, MINNESOTA)

Lot Description:

Those parts of Government Lot 3, Government Lot 5, Government Lot 6, Government Lot 9 and Government Lot 10, Section 21, Township 121 North, Range 46 West, originally in Lac qui Parle County, but by legislative enactment detached from said County and annexed to the County of Big Stone, Minnesota, described as follows:

Commencing at the Northwest corner of said Section 21; thence on an assumed bearing of South 89 degrees 43 minutes 27 seconds East, along the north line of said Section 21, a distance of 1473.56 feet to the point of beginning of the parcel to be described; thence South 29 degrees 16 minutes 12 seconds East a distance 848.22 feet; thence South 52 degrees 01 minute 25 seconds East a distance of 859.63 feet; thence South 49 degrees 30 minutes 41 seconds East a distance of 3074.87 feet; thence South 38 degrees 19 minutes 15 seconds East a distance of 408.73 feet; thence South 24 degrees 35 minutes 06 seconds East a distance of 165.38 feet; thence South 14 degrees 39 minutes 22 seconds East a distance of 174.18 feet to the intersection of the easterly extension of the north line of the Southwest Quarter of the Southeast Quarter of said Section 21 with the east line of said Government Lot 3; thence North 0 degrees 16 minutes 03 seconds East, along said east line of Government Lot 3, a distance of 832 feet, more or less, to the centerline of the historic Minnesota River channel; thence northwesterly and northerly along said centerline to a point on the north line of said Section 21, said point bearing South 89 degrees 43 minutes 27 seconds East from the point of beginning; thence North 89 degrees 43 minutes 27 seconds West a distance of 2405 feet, more or less, to the point of beginning.

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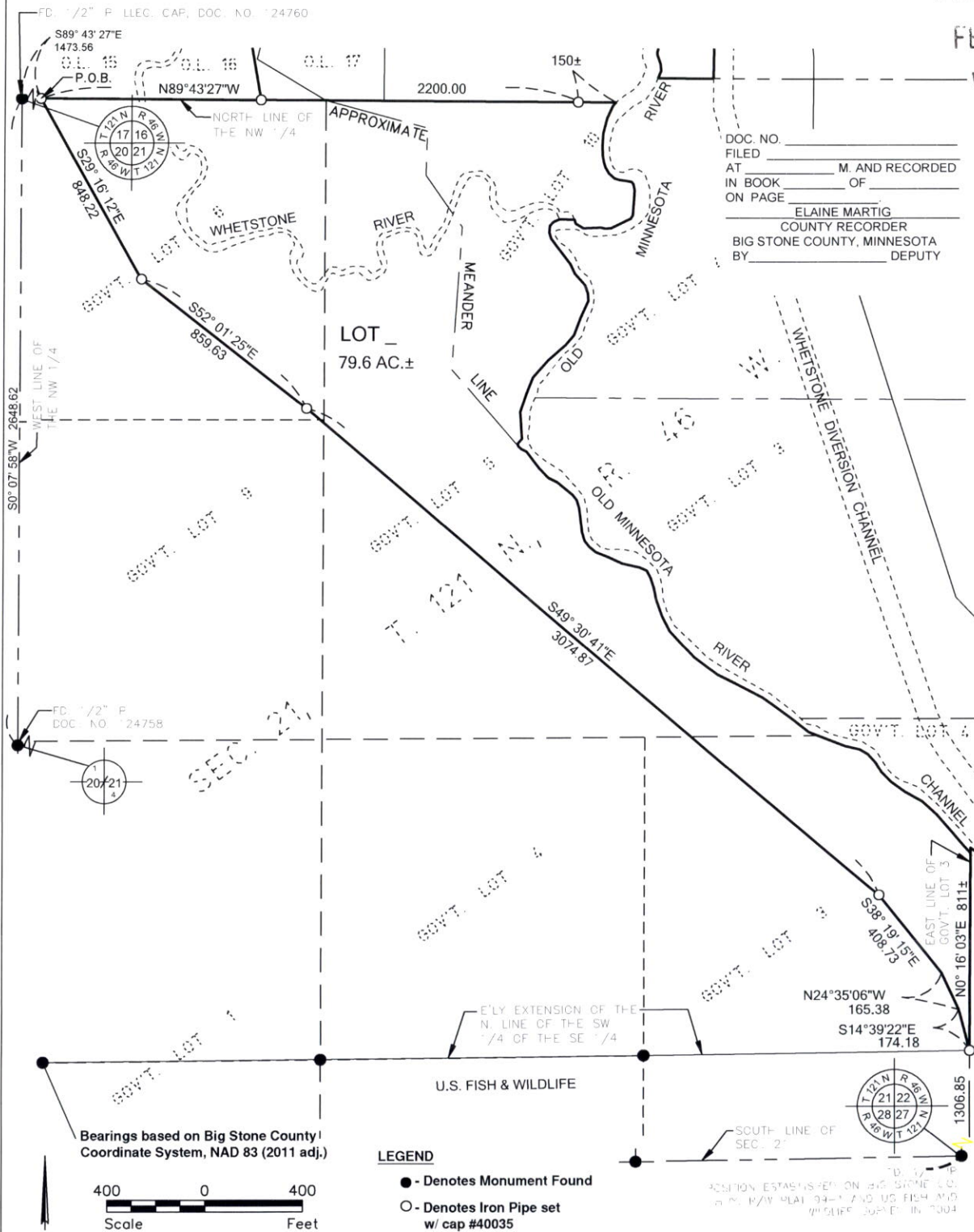


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Web: www.houstoneng.com

(BEING PARTS OF GOVERNMENT LOT 3, GOVERNMENT LOT 5, GOVERNMENT LOT 6,
GOVERNMENT LOT 9 AND GOVERNMENT LOT 10, SECTION 21, TOWNSHIP 121 NORTH,
RANGE 46 WEST, BIG STONE COUNTY, MINNESOTA)

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- Water Rights Program



**A Bearings based on Big Stone County
Coordinate System, NAD 83 (2011 adj.)**

LEGEND

- - Denotes Monument Found
○ - Denotes Iron Pipe set
w/ cap #40035

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Michael E. Cannon Lic. No. 40035
Date: 7-7-15

Sheet 1 of 2



Houston
Engineering Inc.

6901 East Fish Lake Road, Suite 140
Maple Grove, Minnesota 55369
Phone: 763.493.6966 Fax: 763.493.5572
Web: www.houstoneng.com

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WHETSTONE VALLEY

SURVEYOR'S CERTIFICATE:

I, Curtis A. Skarphol, a Professional Land Surveyor in the State of South Dakota, do hereby certify that I did, on or before July 27, 2015, at the request of the owner(s) listed hereon, survey a portion of land described below:

That part of Outlots 19, 20 and 21 of the plat of Big Stone City in Section 17, Township 121 North, Range 43 West, Grant County, South Dakota, said plat made by A.W. Movius, Deputy State Surveyor, which was filed for record in the office of the Register of Deeds for Grant County, South Dakota on April 8, 1897 described as follows:

Commencing at the Southeast corner of the Southeast Quarter of said Section 17; thence on an assumed bearing of North 0 degrees 07 minutes 25 seconds West, along the east line of said Southeast Quarter, a distance of 819.54 feet to the point of beginning; thence North 55 degrees 44 minutes 33 seconds West a distance of 436.82 feet to the centerline of 487th Avenue; thence North 26 degrees 16 minutes 57 seconds West, along said centerline, a distance of 531.15 feet; thence North 64 degrees 39 minutes 54 seconds East a distance 657.28 feet to said east east line of the Southeast Quarter; thence South 0 degrees 07 minutes 25 seconds East, along said east line, a distance of 1003.39 feet to the point of beginning,

and platted the same as shown on the above plat.

The same shall hereafter be known as Whetstone Valley, Grant County, South Dakota.

I have surveyed the tract of land shown and to the best of my knowledge and belief, said plat is an accurate representation of said survey.

Dated this _____ day of _____, 20____

CERTIFICATE OF OWNER:

I, XXXXXXXXXX, hereby certify that I did authorize and do join in and approve the above survey and plat, and that the said tract of land is free of any encumbrances, and that the development of this land shall conform to all existing applicable zoning, subdivision and erosion and sediment and control regulations.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND AND SEAL THIS _____ DAY OF _____, 20____.

XXXXXXXXXXXX

ACKNOWLEDGEMENT OF OWNER

STATE OF _____

COUNTY OF _____

On this day, before me, the undersigned, a Notary Public, within and for the State and County aforesaid, personally appeared XXXXXXXXXX, known to me to be the person(s) who executed the foregoing Certificate of Owner, and acknowledged to me that they executed the same.

IN WITNESS WHEREOF, I HAVE HEREUNTO SET MY HAND AND SEAL THIS _____ DAY OF _____, 20____.

Notary Public
My Commission Expires _____

COUNTY PLANNING COMMISSION CERTIFICATE

Approval of WHETSTONE VALLEY, GRANT COUNTY, SOUTH DAKOTA, is hereby granted by the County Planning Commission on this _____ day of _____, 20____.

COUNTY COMMISSION RESOLUTION

It was moved by _____, seconded by _____, motion carried that WHETSTONE VALLEY, GRANT COUNTY, SOUTH DAKOTA, as described above and hereon be approved and accepted and the Chairman is hereby instructed to endorse on such plat this resolution and to certify to the same.

Chairman, Board of Commissioners,
Grant County, South Dakota

DIRECTOR OF EQUALIZATION

I, _____, Director of Equalization, Grant County, South Dakota, do hereby certify that a copy of the above plat has been filed at my office.

Director of Equalization,
Grant County, South Dakota

COUNTY TREASURER'S CERTIFICATE

I, _____, Treasurer of Grant County, South Dakota, do hereby certify that all taxes which are liens upon the land shown in the above plat, as shown by the records in my office, have been paid in full.

Treasurer,
Grant County, South Dakota

REGISTER OF DEEDS

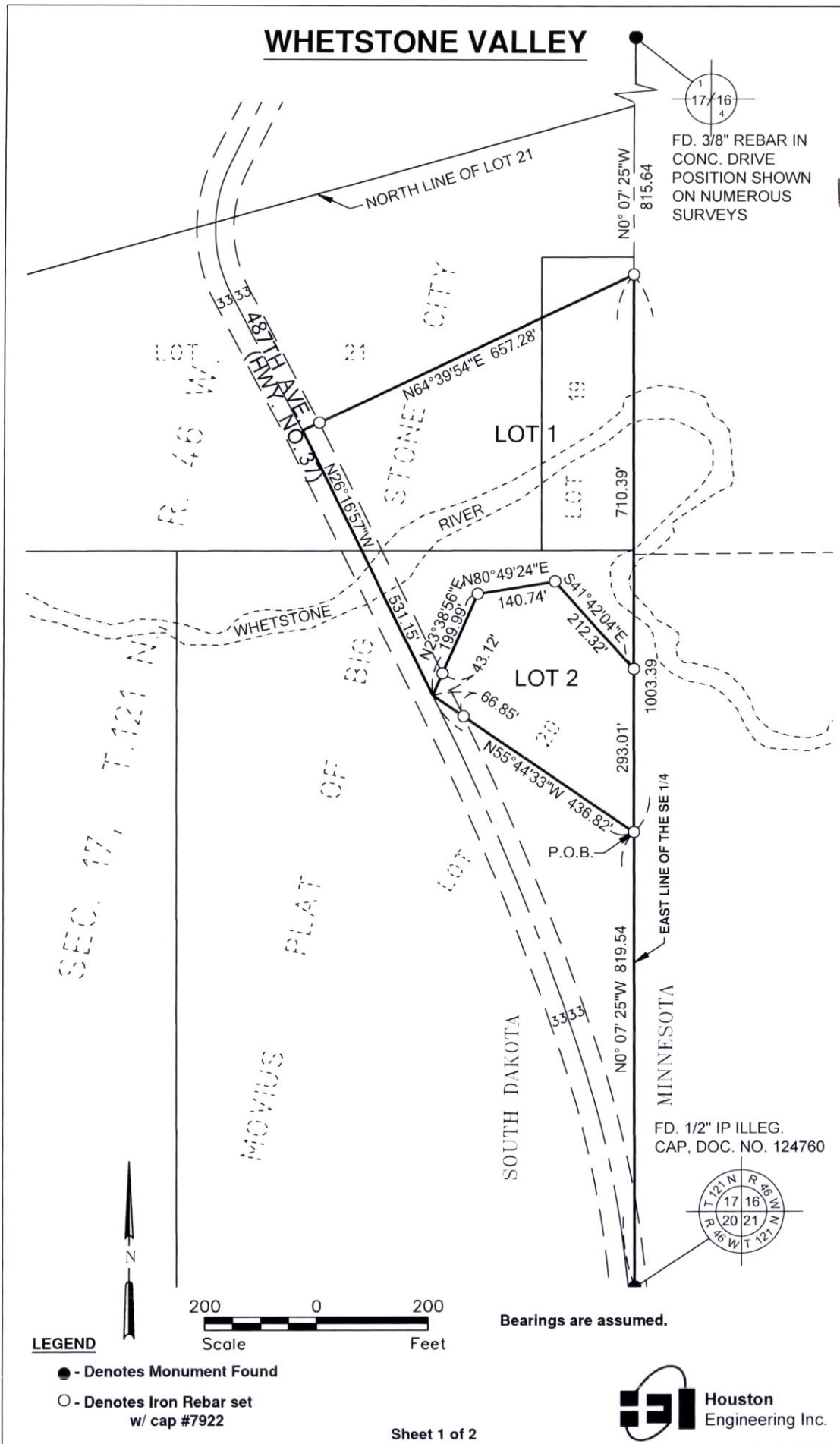
STATE OF _____

COUNTY OF _____

Filed for record this _____ day of _____, 2015 at _____ o'clock ____ M. and recorded in book of Plats _____ on page _____ therein.

Register of Deeds,
Grant County, South Dakota

WHETSTONE VALLEY



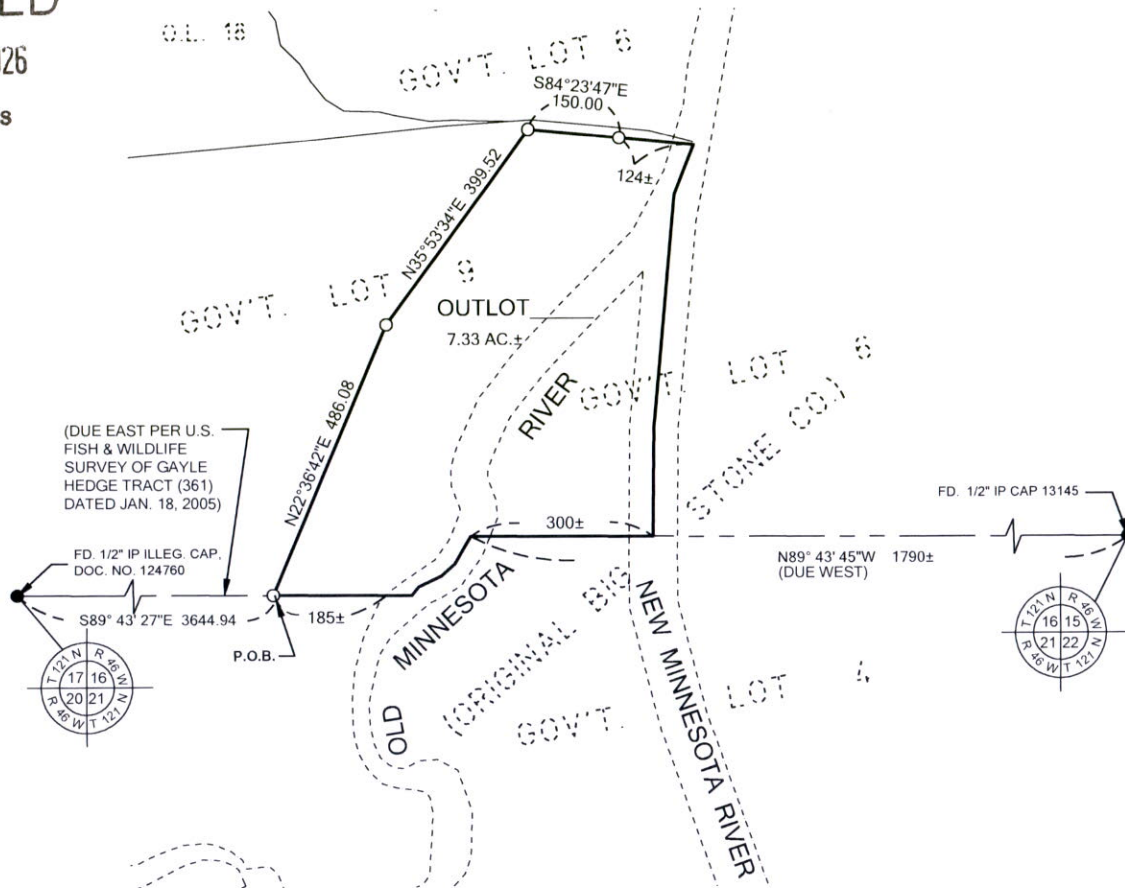
OUTLOT OF THE CITY OF ORTONVILLE, MINNESOTA

(BEING PARTS OF GOVERNMENT LOT 6, (ORIGINAL BIG STONE COUNTY) AND GOVERNMENT LOT 9 (FORMERLY LAC QUI PARLE COUNTY, NOW BIG STONE CO.), SECTION 16, TOWNSHIP 121 NORTH, RANGE 46 WEST, BIG STONE COUNTY, MINNESOTA)

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Outlot Description:

Those parts of Government Lot 9, Section 16, Township 121 North, Range 46 West, originally in Lac qui Parle County, but by legislative enactment detached from said County and annexed to the County of Big Stone, Minnesota, and Government Lot 6, Section 16, Township 121 North, Range 46 West, Big Stone County, Minnesota, lying westerly of the centerline of the new Minnesota River channel and lying easterly of the following described line:

Commencing at the Southwest corner of the Southwest Quarter of said Section 16; thence on an assumed bearing of South 89 degrees 43 minutes 27 seconds East, along the south line of said Southwest Quarter, a distance of 3644.94 feet to the point of beginning of the line to be described; thence North 22 degrees 36 minutes 42 seconds East a distance of 486.08 feet; thence North 35 degrees 53 minutes 34 seconds East a distance of 399.52 feet; thence South 84 degrees 23 minutes 47 seconds East a distance of 274 feet, more or less to said centerline of the new Minnesota /river channel.

Contains 7.3 acres, more or less.

Bearings based on Big Stone County Coordinate System, NAD 83 (2011 adj.)

200 0 200
Scale Feet

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Michael E. Cannon Lic. No. 40035

Date: _____

Sheet 1 of 1

DOC. NO. _____
FILED _____
AT _____ M. AND RECORDED
IN BOOK _____ OF _____
ON PAGE _____
ELAINE MARTIG
COUNTY RECORDER
BIG STONE COUNTY, MINNESOTA
BY _____ DEPUTY

LEGEND

- - Denotes Monument Found
- - Denotes Iron Pipe set w/ cap #40035



Houston Engineering Inc.

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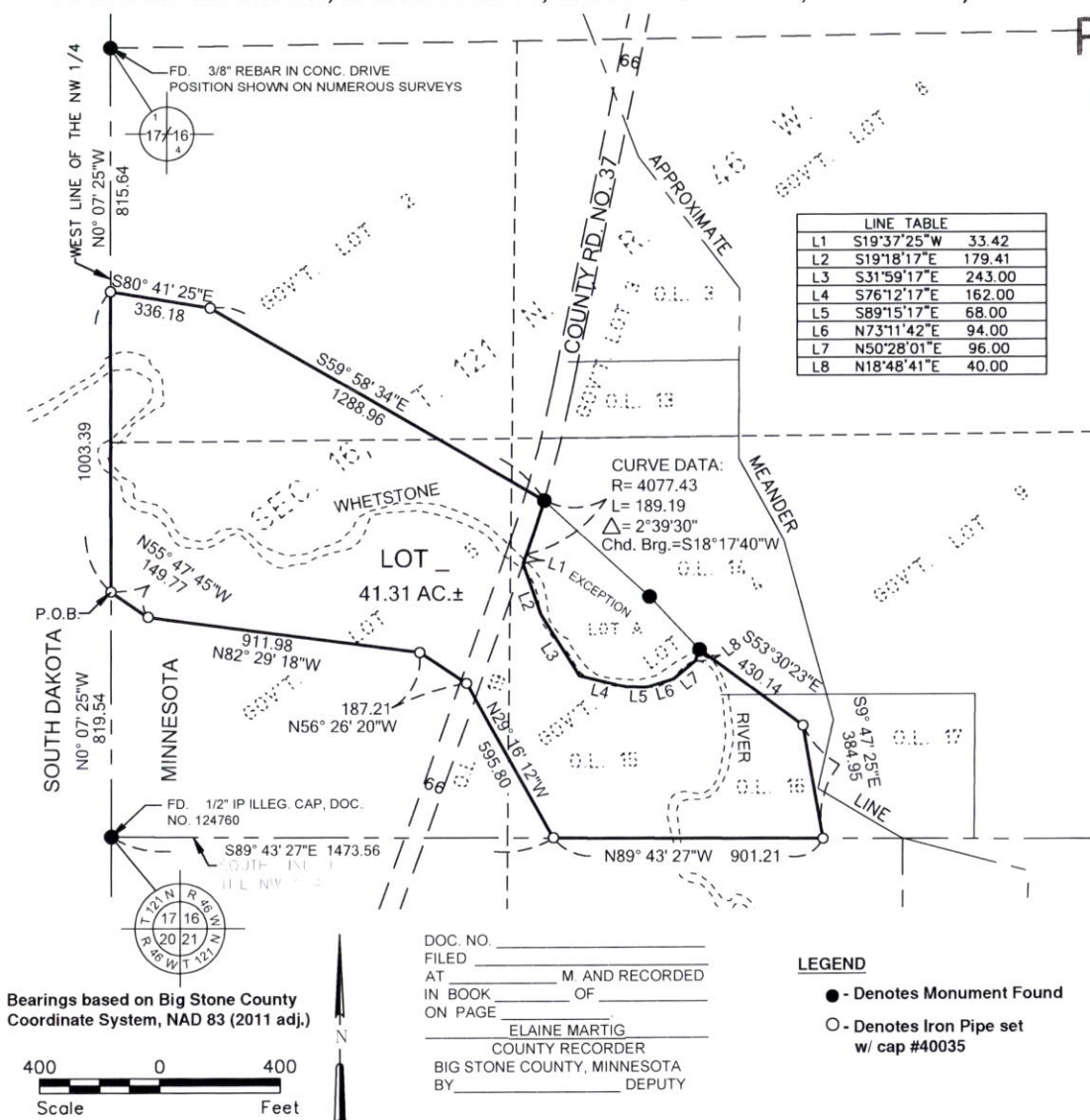
OUTLOT XX OF THE CITY OF ORTONVILLE, MINNESOTA

(BEING PARTS OF GOVERNMENT LOT 2, GOVERNMENT LOT 5, OUTLOTS 14, 15 AND 16 OF GOVERNMENT LOT 4 AND OUTLOT 19 OF GOVERNMENT LOT 5, SECTION 16, TOWNSHIP 121 NORTH, RANGE 46 WEST, BIG STONE COUNTY, MINNESOTA)

RECEIVED

FEB 05 2026

Water Rights Program



Lot Description:

Those parts of Government Lot 2, Government Lot 5, Outlots 14, 15 and 16 of Government Lot 4 and Outlot 19 of Government Lot 5, Section 16, Township 121 North, Range 46 West, originally in Lac qui Parle County, but by legislative enactment detached from said County and annexed to the County of Big Stone, Minnesota, described as follows:

Commencing at the Southwest corner of said Section 16; thence on an assumed bearing of North 0 degrees 07 minutes 25 seconds West, along the west line of the Southwest Quarter of said Section 16, a distance of 819.54 feet to the point of beginning of the parcel to be described; thence continuing North 0 degrees 07 minutes 25 seconds West along said west line a distance of 1003.39 feet; thence South 80 degrees 41 minutes 25 seconds East a distance of 1288.96 feet to the most northerly corner of Lot A of Outlot 14 to the City of Ortonville, as shown on the plat filed in Book 5 of Plats page 347 and the easterly right of way of County Road No. 37; thence southerly 189.19 feet along said easterly right of way on a non-tangent 4077.43 foot radius curve, concave to the west, having a central angle of 2 degrees 39 minutes 30 seconds and a chord bearing of South 18 degrees 17 minutes 40 seconds West; thence South 19 degrees 37 minutes 25 seconds West, tangent to the last described curve, a distance of 33.42 feet; thence South 19 degrees 18 minutes 17 seconds East a distance of 179.41 feet; thence South 31 degrees 59 minutes 17 seconds East a distance of 243.00 feet; thence South 76 degrees 12 minutes 17 seconds East a distance of 162.00 feet; thence South 89 degrees 15 minutes 17 seconds East a distance of 68.00 feet; thence North 73 degrees 11 minutes 42 seconds East a distance of 94.00 feet; thence North 50 degrees 28 minutes 01 seconds East a distance of 96.00 feet; thence North 18 degrees 48 minutes 41 seconds East a distance of 40.00 feet; thence South 53 degrees 30 minutes 23 seconds East a distance of 430.14 feet; thence South 9 degrees 47 minutes 25 seconds East a distance of 384.95 feet to the south line of said Section 16; thence North 89 degrees 43 minutes 27 seconds West, along said south line, a distance of 901.21 feet; thence North 29 degrees 16 minutes 12 seconds West a distance of 595.80 feet; thence North 56 degrees 26 minutes 20 seconds West a distance of 187.21 feet; thence North 82 degrees 29 minutes 18 seconds West a distance of 911.98 feet; thence North 55 degrees 47 minutes 45 seconds West a distance of 149.77 feet to the point of beginning.

Subject to County Road No. 37 right of way.
 Contains 41.31 acres, more or less.

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Michael E. Cannon Lic. No. 40035

Date: 7-7-15

Sheet 1 of 1



6901 East Fish Lake Road, Suite 140
 Maple Grove, Minnesota 55369
 Phone: 763.493.6966 Fax: 763.493.5572
 Web: www.houstoneng.com

RECEIPT

WATER RIGHTS PROGRAM South Dakota Department of Agriculture and Natural Resources

Date February 17, 2026

RECEIVED OF Upper Minnesota River Watershed District 211 2nd Street SE Ortonville MN 56278

The following amount in fees for services rendered as provided for by law:

Fee for Application for Permit No. <u>FC39-3</u> to Appropriate Water, to construct and to put water to beneficial use	\$ <u>500.00</u>
Fee for Application for Permit No. _____ to Appropriate Water for Future use	\$ _____
Fee to retain Future Use Permit No. _____ after period of seven years.	\$ _____
Fee for Inspecting Constructed Works, confirming beneficial use and issuing Water License No. <u>FC39-3</u>	\$ <u>200.00</u>
Fee for Filing Transfer Form _____	\$ _____
Fee for _____	\$ _____
Fee for Issuing New Well Driller's License No. _____	\$ _____
Fee for Renewal of Well Driller's License No. _____	\$ _____
Fee for Issuing Well Pump Installer's License No. _____	\$ _____
Fee for Renewal of Well Pump Installer's License No. _____	\$ _____
(Any Other Work Provided by Law)	
TOTAL	\$ <u>700.00</u>

By Adam Mathewitz
Chief Engineer



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**RECOMMENDATION OF ACTING CHIEF ENGINEER FOR FLOOD CONTROL PERMIT
APPLICATION NO. FC39-3, Upper Minnesota River Watershed District**

Pursuant to SDCL 46-2A-2, the following is the recommendation of the acting Chief Engineer, Water Rights Program, Department of Agriculture and Natural Resources concerning Flood Control Permit Application No. FC39-3, Upper Minnesota River Watershed District, 211 2nd Street SE, Ortonville MN 56278.

The acting Chief Engineer recommends APPROVAL of Flood Control Permit Application No. FC39-3 with qualifications because 1) the project will not increase the likelihood or severity of flood damages, 2) the project will not endanger human life or property, 3) the project will not impair existing water rights, 4) the District will be required to acquire property or the necessary easements prior to any development of the project, and 5) it is in the public interest to provide flood control while restoring fish passage through the project with the following qualifications:

- 1) Flood Control Permit No. FC39-3 is subject to securing easements or acquisitions of any areas where construction activities are occurring or lands that may be flooded by development of this permit. Any easements must be filed with the Water Rights Program prior to development of the project.
- 2) The Water Management Board retains jurisdiction of Flood Control Permit No. FC39-3 in the event additional information shows this project causes an increase in the severity of flood damage in areas other than the project area.
- 3) The permit holder is responsible for operation and maintenance of the flood control works.
- 4) Senior water right holders, who in compliance with the laws of the State of South Dakota acquired a right to use water, may not be unlawfully impaired by this flood control permit.
- 5) Operation of the flood control structures may not impair management of Big Stone Lake by the U.S. Army Corps of Engineers.
- 6) Final plans and specifications must be submitted to and approved by the Water Rights Program, prior to licensing of this permit.

**RECOMMENDATION OF ACTING CHIEF ENGINEER FOR FLOOD CONTROL PERMIT APPLICATION NO.
FC39-3, Upper Minnesota River Watershed District**

- 7) Final plans and specifications for this project may not substantively change project design parameters as analyzed for this recommendation. Any changes in the finalized plans and specifications that may substantively change the design parameters as analyzed may require an amendment to this permit or a new application.

See report on application for additional information.



Adam Mathiowetz, PE
Acting Chief Engineer
Water Rights Program
June 15, 2026

****NOTE**** A low-flow bypass should be considered in final design plans at the diversion channel and historic channel confluence, to be utilized during extreme drought or low flow conditions into Big Stone Lake, in the event water needs to be bypassed from the historic channel and diverted through the channel constructed in the 1930's into the lake to prevent impairment of Water Right/Permit Nos. 1983-3 and 6253-3, pursuant to SDCL 46-2A-11.

Report to the Chief Engineer

On Flood Control Permit Application No. FC39-3

Upper Minnesota River Watershed District

June 12, 2026

Flood Control Permit Application No. FC39-3, submitted by the Upper Minnesota River Watershed District (UMRWD), proposes to restore ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 17-T121N-R46W and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930's, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake. Diverting flows back to the historical river channel will be accomplished by constructing a weir (with crest elevation at approximately 972.2 feet [NAVD 88]) on the bypass channel in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ of Section 17-T121N-R46W. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and the Minnesota River via the existing bypass channel. If constructed, this project will reduce flooding around Big Stone Lake by reducing flood flows entering the lake with downstream measures implemented, including levee construction and road enhancements/reconfiguration, to mitigate flooding risks to downstream property. Project works are located along the southeastern edge of Big Stone City, South Dakota in the SE $\frac{1}{4}$ of Section 17-T121N-R46W in Grant County and into Minnesota.

All elevations referenced in this report are using the North American Vertical Datum of 1988 (NAVD 1988) unless stated otherwise.

This report and the supporting information from Houston Engineering, Inc., for this application often refer to floods by probability (i.e. 1% flood or 10% flood). This terminology refers to the probability or return period of a certain flood flow occurring in any given year. So, the 1% flood has a 1% chance of occurring in any given year. Older terminology with often call this the 1 in 100-year flood. Commonly used flood recurrence intervals are summarized in Table 1. Therefore, a 100-year levee is intended to protect an area for flood events up to the 1% chance of exceedance per year flood event.

Table 1. Recurrence Intervals and Probabilities of Occurrence (USGS, 2008)

Recurrence intervals and probabilities of occurrences

Recurrence interval, in years	Probability of occurrence in any given year	Percent chance of occurrence in any given year
100	1 in 100	1
50	1 in 50	2
25	1 in 25	4
10	1 in 10	10
5	1 in 5	20
2	1 in 2	50

South Dakota Codified Law (SDCL) 46-2A-11

Pursuant to SDCL 46-2A-11, “A permit for flood control works may be issued only if the project will reduce the damage from flooding or erosion in the area proposed to be benefited, the project will not increase the likelihood or the severity of flood damages in areas other than the project area or the area proposed to be benefited, the project will not endanger human life or property and the project will not impair existing water rights, except to the extent that such rights are extinguished or compensated through agreement or exercise of the power of eminent domain.”

History of Big Stone Lake

In South Dakota, Big Stone Lake is a natural glacial lake. In the 1930's, the Whetstone River was diverted into the lake by constructing a new channel (indicated as the diversion channel in this report) and a levee to increase water levels during times of drought. The Whetstone River is an approximately 35-mile-long tributary of the Minnesota River. Discharges leaving the lake are controlled by a dam structure that is operated with guidance from a manual provided by the United States Army Corps of Engineers (USACE) revised in August of 1987 (USACE, 1987). The intended use of the dam is not for flood control, but the structure does hold back water due to physical constraints which has resulted in increased flooding issues for the area since the 1950's. Local petitions requesting measures to reduce flood damage and risk were submitted by the public following flood events in 1997, 2001, and 2010. These events identified the need for better management of flows from the Whetstone River into Big Stone Lake. In 2015, the UMRWD hired Houston Engineering to find alternatives to manage the increase in flows from the Whetstone River into Big Stone Lake (Deutshman and Odens, 2015; Houston Engineering, 2026).

Since the diversion of the Whetstone River into Big Stone Lake, the elevation of the diversion channel bottom has lowered an estimated 4.5 feet, based on survey data collected for the project proposed by this application and the current invert in elevation of the historic channel in relation to the diversion channel. Erosion in the diversion channel is thought to be from shortening the river reach by constructing the diversion channel and levee in the 1930's, which increased the channel slope and the energy of the flowing water, in addition to land use changes over time increasing discharges into the Whetstone River upstream of Big Stone Lake (Deutshman and Odens, 2015).

Summary of Proposed Project

The UMRWD is the owner of the Whetstone River Restoration Project, and is coordinating with the USACE, Minnesota's Department of Natural Resources (MN DNR), South Dakota's Departments of Agriculture and Natural Resources and Game Fish and Parks (SD DANR and SD GFP), and Houston Engineering Inc., to reduce the amount of water flowing into Big Stone Lake. The UMRWD proposes to return perennial flows to the historic channel (around one mile long) that begins south of Big Stone City, SD and ends after its confluence with the Minnesota River south of Ortonville, MN. The 30% engineering design plans completed by Houston Engineering and an environmental review completed by the MN DNR were submitted with the

application. The UMRWD indicated that Preferred Alternative 2B is what is being proposed for construction (Deutshman and Odens, 2015; Houston Engineering, 2021).

Since 2022, the UMRWD has been working to obtain the required permits through the local (Big Stone and Grant Counties floodplain ordinances), state (through MNDNR and SDDANR) and federal (through USACE) agencies. Public meetings (in 2015 and 2025) and notices (in 2022 and 2025) have provided opportunity for comment on the 30% design plans (with other public comment periods to occur through future permitting). The project is funded through state and federal grants (awarded between 2019 to 2025) and land purchases have been completed with around 254 acres remaining to be bought. Obtaining temporary easements for the construction period as well as flowage easements for any newly inundated land (~105 acres planned) is needed as the proposed project will alter the area inundated by the 1% chance of exceedance per year flood event. Approximately one acre of permanent right-of-way or easement needs to be obtained to provide access to the proposed weirs for future maintenance (Deutshman and Odens, 2015; Houston Engineering, 2021 and 2026).

Figure 1 displays the site of interest for Flood Control Permit Application No. FC39-3 including the channel that currently diverts water into Big Stone Lake, the dam structure that controls discharges from the lake into the Minnesota River, and the historic Whetstone River channel proposed to be restored (modified from Deutshman and Odens, 2015). Mapped data for roads and cities was only available for SD. A more detailed map is provided in Appendix A.

To bypass the physical constraints of the dam structure and reduce the amount of water flowing into the lake, the proposed project intends to divert all discharges up to the approximately 2-year Whetstone River flow events (50% chance per year flood events) to fully pass through the restored historic channel without operational intervention of the dam. The 2-year events (50% chance per year flood events) are approximately 72% to 87% of the peak discharge of 1,100 cubic feet of water per second (cfs) measured for the Whetstone River before entering Big Stone Lake and 94% to 98% of the 30-day volume of the lake (Deutshman and Odens, 2015; Houston Engineering, 2026). USGS Stream Gage No. 05291000 measures discharge in the Whetstone River near Big Stone, SD upstream of the lake and is operated in coordination with the UMRWD and East Dakota Water Development District (USGS, 2026).

This engineering analysis submitted with this report proposes adding a weir in the diversion channel (downstream of the confluence with the historic channel), adding an inlet weir (at the confluence of the diversion and historic channels), excavating the embankment that currently blocks diversion channel flow from entering historic channel, floodplain construction along the historic channel, widening the bridge crossing at SD County Road (CR) 47, removing the MN County and State Highway (CSAH) 15 crossing (to reduce runoff and improve connectivity between the Whetstone and Minnesota Rivers), adding business and residential levees (protected up to 1% chance exceedance per year) and agricultural levees (protected up to 10% chance exceedance per year), modifying transportation features by raising and improving CR47, removing vegetation to improve lateral connectivity, and restoring native plants (Deutshman and Odens, 2015). Locations of these proposed components to restore flow back to the historic channel are displayed in Appendix B (modified from Deutshman and Odens, 2015).

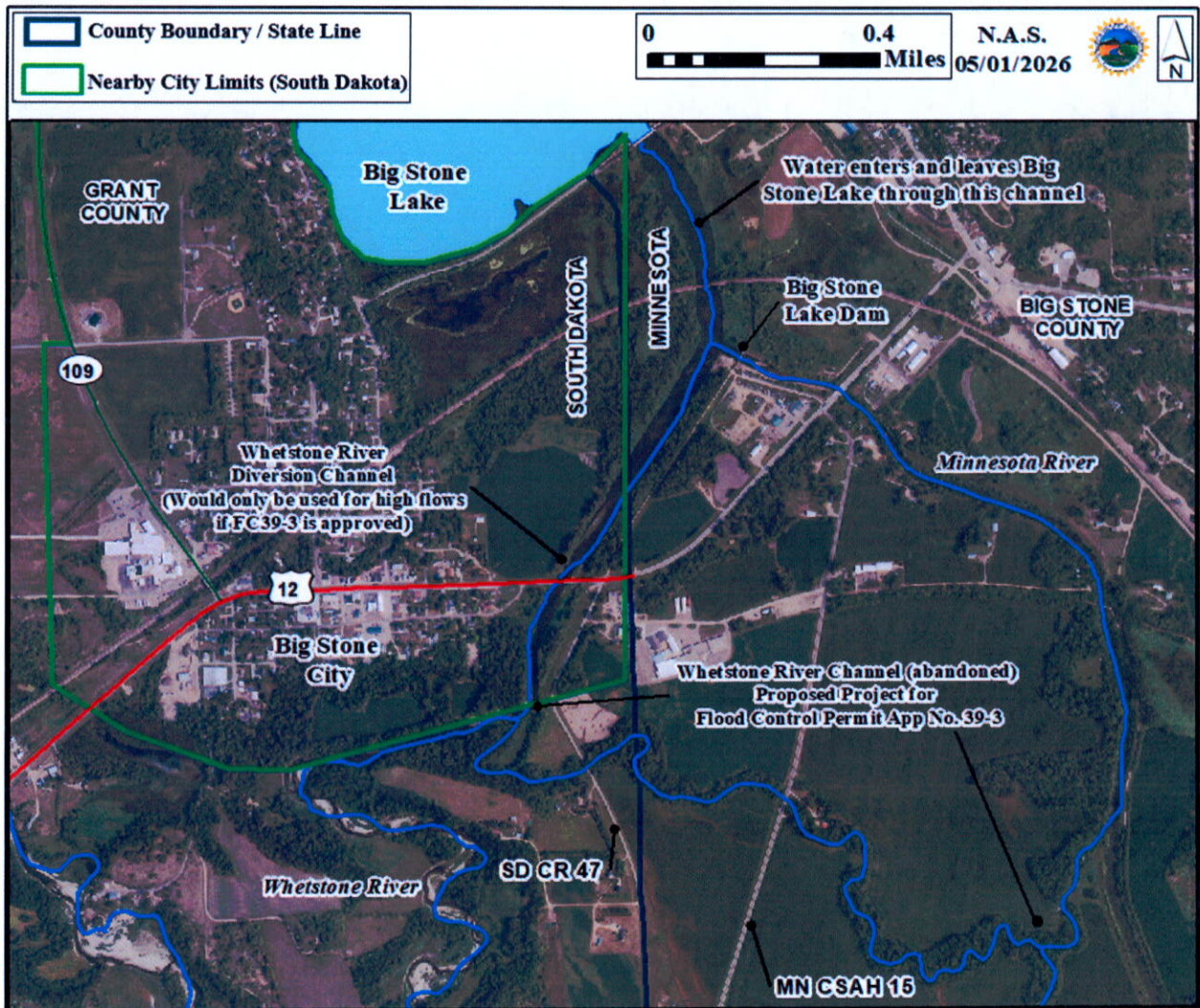


Figure 1. Site of interest for Flood Control Permit Application No. FC39-3 with the Whetstone River channel that diverts water into Big Stone Lake, the dam structure that controls discharge from lake, and the historic channel proposed to be restored (modified from Deutshman and Odens, 2015). Mapped data for roads and cities was only available for South Dakota.

The components controlling the amount of water that could be routed from diversion channel into the historic channel (if restored) are the elevation of the weir proposed to be constructed in diversion channel (i.e., the amount of "head" created), the cross sectional area and elevation of the excavated portion of the historic channel, and the effect of the downstream structures under CR 47 and CSAH 15, and water levels in the Minnesota River located downstream of the diversion and historic channels (Deutshman and Odens, 2015).

A sheet pile weir (identified as the diversion weir) is proposed in the diversion channel to be located downstream of the confluence with the historic channel to raise the water level in the diversion channel and constructed at a crest elevation of approximately 972.2 ft to only allow large flows (higher than a 2-year event/50% chance exceedance per year flood event) to pass over the top and flow into Big Stone Lake (schematic of weir shown in Appendix B). The

elevation of the bottom of diversion channel at the proposed diversion weir site is currently 965.0 ft (Deutshman and Odens, 2015).

Return flows up to the 2-year event (50% chance exceedance per year flood event) remaining in the historic channel results in a portion of the existing diversion channel not being utilized unless a high-water event occurs. This may result in stagnant water that could become environmental and aesthetic concerns. The analysis indicated the final design may include consideration of an operational gate to allow minimum flows (5 cfs) to pass through the diversion weir thus providing the UMRWD (operator of dam structure) with the ability to address stagnant water issues. Low flow operations gates already exist at the silt barrier and dams that could be used (Deutshman and Odens, 2015).

A second sheet pile weir (identified as the inlet weir) is proposed to be added after removal of the embankment (likely constructed around the time Whetstone River was diverted to Big Stone Lake) that blocks flow from the diversion channel from entering the historic channel. Constructing the inlet weir near the entrance of the historic channel creates a "hard point" to ensure grade control at the confluence between the two channels which is proposed to be constructed at a crest elevation of approximately 965.2 ft (schematic of weir shown in Appendix B). The historic channel is proposed to be restored to the elevation of 966.4 ft at the connection to the diversion channel with appropriate slopes to tie-in to the existing channel downstream of MN CSAH 15. The crest elevation of the inlet weir may be adjusted in final design, as design of the open channel and diversion weir is optimized (Deutshman and Odens, 2015).

Deutshman and Odens (2015) indicated all crossings (discussed below) and weir structures have been designed to enable fish passage. The crossings on the historic channel were designed as bridges spanning the channel or with one culvert recessed. The weir structures are to be embedded in riprap that is sloped on either side to connect with the channel bottom. Final design plans will analyze removing an interior weir and may include adding arched rapids to the historic channel.

A floodplain bench is proposed to be constructed along the historic baseflow channel (the narrower, deeper inner portion of the channel) to maintain channel capacity and floodplain connectivity. Design plans indicated the bench starting at the inlet to the historic channel at an elevation of 971.5 ft and continuing at a slope of 0.12% for approximately 2,300 feet to tie-in to the existing floodplain (Deutshman and Odens, 2015).

A bank full cross-sectional area of approximately 150 square feet within riffles and 300 square feet in pools was recommended by the MN DNR. Historic aerial photos from 1938 and 1955 display several breakout reaches (that no longer routinely carry flow) which may have reduced the discharge historically flowing through parts of the Whetstone River. A cross-sectional area of 150 square feet was utilized at the upstream end, with the excavated floodplain bench above this channel. The total cross-sectional area of the bank full channel and floodplain bench at the historic channel inlet is approximately 375 square feet. As the channel and floodplain bench continue downstream, they tie-in to the existing channel and floodplain bench, which has been left relatively unaltered. Survey information for several locations along the historic Whetstone

River channel upstream from the Minnesota River indicates a typical top-of-bank to top-of-bank cross sectional area of approximately 290 square feet which is likely acceptable based on the recommendation provided by the MN DNR. The engineering analysis submitted with the application noted that a stable cross section will be determined in the final design and the final cross sectional area of the excavated portion of the historic channel will include a floodplain bench that is anticipated to pass the 1.5-year to 2-year discharge rates (~800 to ~1,100 cfs) (Deutshman and Odens, 2015).

A corrugated metal arch culvert is the current crossing along SD CR 47 on the historic channel. The proposed plan includes replacing this culvert crossing with a 140-foot span bridge with a total waterway area of 1,140 square feet. This proposed bridge crossing will allow the largest reasonable discharge to be diverted to the historic Whetstone River channel, which is expected to provide the greatest impact in regard to reconnecting the floodplain during high water events and redevelop wetlands in the area (Deutshman and Odens, 2015).

A concrete pipe is the current crossing along CSAH 15 on the historic channel. After preliminary discussions with both the Grant County Highway Superintendent and Big Stone County Engineer, the UMRWS determined that the redundant section of CSAH 15 could be demolished (approximately 500 feet) (while maintaining of portion of CSAH 15 for access to the residence). This eliminates the need for a second large crossing over the historic channel. The portion of CSAH 15 south of the historic channel to CR 47 will be reclaimed (1,950 linear feet) and a new turf surface established south of the Whetstone River to the CR 47 connection (Deutshman and Odens, 2015).

Many agricultural levees providing flood protection exist along the historic channel, with more pronounced levees downstream of CSAH 15. The engineering analysis recommends breaching these existing levees (no less than 500 feet), then using the removed material in the new levees. Removing these levees allows the water, once returned to the restored historic channel, to be stored in the adjacent floodplain to provide lateral connectivity between the open channel and riparian area. Tillable land beyond the setback agricultural levees is planned to be protected up to 10% chance exceedance per year flood event with an estimated 10,000-feet of agricultural levees expected to be needed. One levee segment will be south of the historic channel from SD CR 47, extending south to tie-in with existing levees within U.S. Fish and Wildlife lands. The north segment will extend from the Dwyer ring dike to the east to tie-in with existing agricultural levees along the Minnesota River (each segment shown in Figure 2). The agricultural levees are located at a minimum offset distance of 250 feet (recommended by MN DNR) from the historic channel centerline. Business and residential levees have been designed to be protected up to the 1% chance exceedance per year flood event with three feet of freeboard and identified as the ring dike in Figure 2. An additional 2,300 linear feet of business/residence levees between CR 47 and CSAH 15 on the north side of the historic channel is proposed to protect several businesses south of Mill Road in MN (Deutshman and Odens, 2015).

The historic channel is overgrown with vegetation in many places and clearing debris (mainly trees) is required in the area below normal water levels along nearly the entire length of the

channel. The removed material is planned to be stockpiled and used as protection at select locations in the site of interest (Deutshman and Odens, 2015).

The MN DNR maintains a "natural heritage database" that stores information on rare plant species in MN. The presence of two rare vascular plant species (*Myosotis Vema*, Forget-Me-Not; *Alopecurus Carolinianus*, Carolina Foxtail) were indicated between the setback levees on the west side of the Minnesota River. No construction related work is planned for this area, but there is some potential for disruption during construction. Numerous rare plant species are located on the east side of the Minnesota River, outside of the site of interest. The UMRWD expects the likelihood of adverse impacts to be low because much of the area within the project area is already tilled and disrupted (Deutshman and Odens, 2015).

Several mapped wetlands by the National Wetland Inventory are along or near the historic channel. This project is expected to be a self-mitigating restoration project (therefore, no cost for mitigation is included). Around 156 acres between the setback levees are expected to be purchased and planted with native vegetation. The land interior to the levees will be subject to periodic flooding resulting in wetlands redeveloping adjacent to the historic channel and reestablishing a riparian corridor that allows animal species to freely migrate along the open channel between the Whetstone and Minnesota Rivers (Deutshman and Odens, 2015).

Expected project benefits include restoring fish passage between the Minnesota River to the Whetstone River (currently impeded by the dam structure), improving water quality in Big Stone Lake (reduce Total Phosphorus and Total Suspended Solids by 68% on average) by adding a floodplain bench (also reduces flood risk and sidewall erosion in channel), and providing a bypass during high-flow water events from the dam structure for Big Stone Lake at the confluence of the diversion channel and the Minnesota River. In conjunction with other projects, the restoration proposed by this application is also expected to improve spearfishing opportunities for the Sisseton Wahpeton Oyate of the Lake Traverse Reservation (Deutshman and Odens, 2015; Houston Engineering, 2026).

Discussion on Flood Control Permit Conditions

Pursuant to SDCL 46-2A-11, flood control permits may only be approved so long as the permit will reduce the damage from flooding or erosion in the area proposed to be benefited. Restoring flow to the historic channel will change the location of the floodplain and lands affected. In general, a considerable portion of the flow from the Whetstone River (i.e., 21% of the peak discharge for the historic floods) will no longer reach Big Stone Lake, reducing flood elevations on Big Stone Lake (Deutshman and Odens, 2015). Further details from Houston Engineering are provided in Appendix C. Flood Control Permit No. FC34A-3 (approved in January of 2026) is associated with the Browns Valley Flood Mitigation Project (BVFMP) which amended an existing flood control permit (FC34-3) held by the UMRWD to improve fish passage through existing authorized flood control works that convey flood waters around the City of Browns Valley using an inlet channel, diversion dam, and floodway. Approval of amended FC34-3 resulted in an approximate 0.4-foot increase to the water level in Big Stone Lake. Gate operation qualifications to offset this increase were included in the approval recommendation for FC34A-

3. Approval of Flood Control Permit Application FC39-3 would benefit the BVFMP as less water would be diverted to Big Stone Lake which would assist with mitigating the 0.4-foot increase as a result of FC34A-3 (Water Rights, 2026).

The next qualification pursuant to SDCL 46-2A-11 states the project cannot increase the likelihood or the severity of flood damage in areas other than the project area or the area proposed to be benefited. Figure 2 displays the flood inundation map produced by Houston Engineering that depicts the 100-year flood inundation extent with and without the effects of the proposed project for Flood Control Permit Application No. FC39-3. The blue inundation shown on the map in Figure 2 displays what would be flooded with or without the changes proposed in this application, during the 100-year flood event. The red inundation shown on the map in Figure 2 displays what lands would be flooded during the 100-year flood event with the restoration of the historic channel. The additional flooding expected with the project appears to be negligible in relation to what would already be flooded without the modifications. Design plans indicated purchasing flood easements for newly inundated areas during the 1% per year chance exceedance per year flood event to offset adverse flooding impacts in these areas. Floodplain maps will need to be updated and submitted to FEMA following construction (Deutshman and Odens, 2015).

Reconnecting the historic channel to the Minnesota River will alter the timing and routing of flows that currently enter Big Stone Lake; thus, modestly increasing peak downstream discharge rates to downstream flood control systems and federal infrastructure. As part of the USACE Section 408 permitting, which is a permission that is required to modify, alter, or occupy any USACE-constructed civil works project, such as levees, dams, or navigation channels, a hydrologic and hydraulic (H&H) assessment was conducted to evaluate potential impacts to downstream flood control systems and federal infrastructure. Federal flood control projects downstream of the site of interest include the Highway 75 Dam and reservoir, Lac qui Parle Dam and Reservoir, Marsh Lake Reservoir, the Montevideo Levee System, and Granite Falls Flood Protection. From 2021 to 2025, the UMRWD has been coordinating with USACE to ensure the modeling, assumptions, and evaluation metrics meet federal framework. These modeling efforts are summarized in Odens (2025), included in the application submittal. On February 12, 2024, the USACE formally concluded that the project does not result in injurious impacts to federal reservoirs and the 408 authorization is limited to a technical review process on the H&H impacts (Deutshman and Odens, 2015; Odens, 2025; Houston Engineering, 2026). Odens (2025) additionally indicated that Houston and UMRWD are already coordinating with FEMA and MN DNR on any needed updates to floodplain maps, expected as a part of this project.

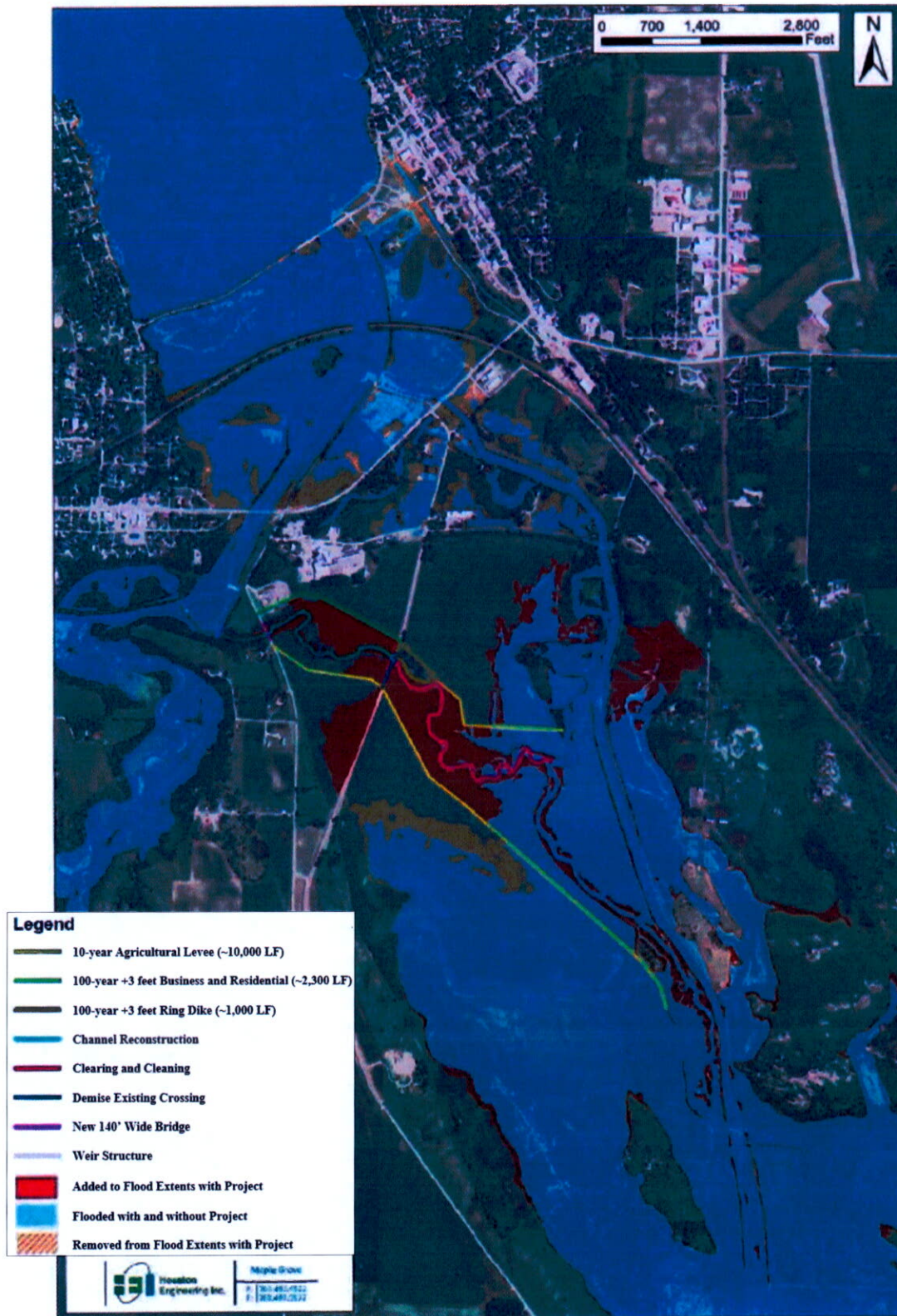


Figure 2. One percent chance exceedance per year flood inundation extent produced by Houston Engineering (Deutschman and Odens, 2015) with and without the effects of the project proposed for Flood Control Permit Application No. FC39-3

The H&H assessment was evaluated using Hydrologic Engineering Center's River Analysis System (HEC-RAS) and Hydrologic Modeling System (HEC-HMS). The modeling assessed downstream discharges, overtopping potential, water surface elevations, flood frequencies, levee freeboard, overtopping potential, and system performance for significant historical events (such as 1997 flood of record and annual peaks from 2010 to 2022). Downstream of the Laq Qui Parle Dam, the USACE's Corps Water Management System (CWMS) HEC-RAS model was modified to reflect completed flood control features. Post-project peak discharges were applied to assess changes in stage, freeboard, velocities, and closure operations. The increased discharges yielded minimal changes in water-surface elevation, generally between 0.02 to 0.21 feet. These changes are within the available excess freeboard at downstream levee systems. No modeled scenarios resulted in significant operational conflicts or impacts that would alter levee certification. The USACE acknowledged a completeness determination on January 22, 2026 (Deutshman and Odens, 2015; Houston Engineering, 2026).

The next qualification pursuant to SDCL 46-2A-11 states that the project will not endanger human life or property. After the 1997 flood, the lower floor of 172 inhabited structures on the Minnesota side of the Big Stone Lake were surveyed. Of the 172 inhabited structures 76 were measured to be below the 100-year flood elevation and would be at risk of flooding. HEC-RAS modeling shows the proposed project reduces the at-risk structures by around 50 inhabited structures thus lowering the chance to endanger human life or property during the 100-year flood event. Additionally, land purchases (in 2018) and agreements (exercised in 2021) have been carried out by the UMRWD in MN to reduce the chance of land becoming inhabited post project. The proposed weir structures are designed to provide safe passage for canoeists (Deutshman and Odens, 2015; Houston Engineering, 2026).

The last qualification to meet the criteria for issuance of a flood control permit states, the project cannot impair existing water rights, except to the extent that such rights are extinguished or compensated through agreement or exercise of the power of eminent domain. Otter Tail Power Company holds two South Dakota water rights/permits, Nos. 1983-3 and 6253-3 to appropriate a combined maximum of 8,000 acre-feet of water annually from Big Stone Lake. Table 2 lists the diversion qualifications for Otter Tail Power Company which were authorized as part of Water Permit No. 6253-3. The lake elevations that qualified the diversion rates for Water Right/Permit Nos. 1983-3 and 6253-3 were measured using the original Big Stone Lake Project Datum (Water Rights, 2026).

Table 2. Qualifications for Otter Tail Power Company from staff report for Water Permit No. 6253-3. Elevations are referenced to the original project datum (Water Rights, 2026)

Qualifications/Diversion Rates		
Time Period	Lake Elevation (Feet)	Diversion Rate
May-September	>967	110 cfs
May-September	≤967	No Diversion Without Permission of SD & MN Boundary Water Commission
October-April	<965	No Diversion Without Permission of SD Water Management Board
October-April	>965 and <966	Restricted to 10 cfs or Daily Acre-feet Equivalent
October-April	>966 and <967	35 cfs or Daily Acre-feet Equivalent not Exceeding 460 Acre-feet any Consecutive 7 Day Period
October-April	>967	110 cfs
Note: Acre-feet/day = cfs x 1.9834 10 cfs = 19.8 Acre-feet/day 35 cfs = 69.4 Acre-feet/day		

The elevations in Table 2 were converted to NAVD88 in Table 3 below to be consistent with the updated use of the NAVD88 datum used in this application.

Table 3. Qualifications/diversion rates for Otter Tail Power Company's Big Stone Lake water rights/permits, with elevations converted from the original project datum (PD) to NAVD88 (Water Rights, 2026)

Time Period	Lake Elevation (Project Datum)	Lake Elevation (NAVD88) (fmsl)	Diversion Rate
May-September	> 967	> 965.45	110 cfs
May-September	≤ 967	≤ 965.45	No diversion without permission of SD & MN Boundary Water Commission
October-April	< 965	< 963.45	No diversion without permission of SD Water Management Board
October-April	≥ 965 and ≤ 966	≥ 963.45 and ≤ 964.45	Restricted to 10 cfs or daily acre-feet
October-April	> 966 and <967	> 964.45 and < 965.45	35 cfs or daily acre-feet equivalent not exceeding 460 acre-feet any consecutive 7 day period
October-April	≥ 967	≥ 965.45	110 cfs

The water rights/permits held by the Otter Tail Power Company collectively authorize a maximum diversion of 110 cfs during the summer provided that Big Stone Lake has elevations greater than 965.45 feet. The UMRWD controls the dam structure with seasonal operating levels of Big Stone Lake maintained at 965.45 feet in the winter (crest of the silt barrier), and 966.2 feet in the summer (as mitigated through Flood Control Permit No. FC34-3). The normal summer operating levels in Big Stone Lake are approximately one foot higher than the elevation set forth by the qualifications for maximum diversion from the lake. In 2026, an acknowledgment (submitted with the application) from Otter Tail Power Company was provided to the UMRWD, stating they have no concerns so long as the project does not change the normal water level in Big Stone Lake or impact their water use permit or limit their ability to draw from the lake in any way. The acknowledgment was submitted with this application. The proposed project is unlikely to impact Big Stone Lake water levels during drought or low flow conditions as the manual provided by USACE does not currently mandate maintaining Big Stone Lake at any specific

elevation during drought conditions, and requires all Whetstone River discharges to bypass the lake and be released downstream (no less than 90 cfs) when the lake is at or below an elevation of 965.6 (NGVD 29) which is the flood pool elevation provided by the manual where only surcharge storage is allowed (Deutshman and Odens, 2015; USACE, 1987; Water Rights, 2026). In the event of extreme drought or low flow conditions into Big Stone Lake, the historic channel may need to be bypassed, and water diverted through the diversion channel constructed in the 1930's to prevent impairment of Water Right/Permit Nos. 1983-3 and 6253-3 pursuant to SDCL 46-2A-11. A means of blocking flow to the historic channel to allow a low-flow bypass should be considered in final design plans. Approval of this application is not expected to unlawfully impair existing water rights/permits.

CONCLUSIONS:

1. Flood Control Permit Application No. FC39-3, submitted by the UMRWD, proposes to restore ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930's, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake.
2. Diverting flows back to the historical river channel will be accomplished by constructing a weir (with crest elevation at approximately 972.2 [NAVD 88]) on the bypass channel. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and the Minnesota River via the existing bypass channel. The proposed project works are located along the southeastern edge of Big Stone City, SD and into western MN.
3. To issue a flood control permit pursuant to SDCL 46- 2A-11, the following is required: 1) Reduction in damage from flooding or erosion in the area proposed to be benefited; 2) Not increase the likelihood or the severity of flood damages in areas other than the project area or the area proposed to be benefited; 3) Not endanger human life or property; and 4) Not impair existing water rights unless exceptions are met.
4. If constructed, the proposed project will reduce flooding around Big Stone Lake by reducing the amount of water entering the lake with downstream measures implemented, and mitigate flooding risks to downstream property through levee construction and road enhancements/reconfiguration, Approval of this application would benefit the BVFMP located upstream of this project site, as less water would be diverted to Big Stone Lake and mitigate the 0.4-foot increase that is a result of approving FC34A-3 in 2025.
5. Reconnecting the historic Whetstone River channel to the Minnesota River will alter the timing and routing of flows that currently enter Big Stone Lake; thus, modestly increasing peak downstream discharge rates to downstream flood control systems and

federal infrastructure. In 2024, the USACE formally concluded that the project does not result in injurious impacts to federal reservoirs and the 408 authorization is limited to a technical review process on the H&H impacts. No modeled scenarios in the H&H assessment resulted in significant operational conflicts or impacts that would alter levee certification. The USACE acknowledged a completeness determination on January 22, 2026.

6. The additional flooding expected with the project appears to be negligible in relation to what would already be flooded without the modifications. Design plans indicated purchasing flood easements for newly inundated areas during the 1% per year chance exceedance per year flood event to offset adverse flooding impacts in these areas. HEC-RAS modeling shows the proposed project reduces the at-risk structures by around 50 inhabited structures and lowers the chance to endanger human life or property during the 100-year flood event. Additionally, land purchases and agreements have occurred in MN to reduce the chance of lands becoming inhabited post project. The proposed weir structures are designed to provide safe passage for canoeists. The proposed project includes adding business and residential levees (protected up to 1% chance exceedance per year flood) and agricultural levees (protected up to 10% chance exceedance per year flood) to reduce flood risk.
7. Approval of this application is not expected to unlawfully impair existing water rights/permits. In 2026, the UMRWD received an acknowledgment (submitted with the application) from Otter Tail Power Company, the permit holder authorized to divert water from Big Stone Lake, stating they have no concerns so long as the proposed project does not change normal water levels in the lake and does not affect their water permits or limit their ability to draw from the lake in any way. The proposed project is unlikely to impact Big Stone Lake water levels during drought or low flow conditions as the manual provided by USACE does not currently mandate maintaining Big Stone Lake at any specific elevation during drought conditions, and requires all Whetstone River discharges to bypass the lake and be released downstream (no less than 90 cfs) when the lake is at or below an elevation of 965.6 (NGVD 29) which is the flood pool elevation provided by manual where only surcharge storage is allowed.
8. A low-flow bypass should be considered in final design plans at the diversion channel and historic channel confluence, to be utilized during extreme drought or low flow conditions into Big Stone Lake, in the event water needs to be bypassed from the historic channel and diverted through the channel constructed in the 1930's into the lake to prevent impairment of Water Right/Permit Nos. 1983-3 and 6253-3.

9. To uphold the criteria set forth in SDCL 46-2A-11, the following qualifications are recommended if this application is approved:
 - a. The permit holder is responsible for operation and maintenance of the flood control works.
 - b. If approved, the Water Management Board retains jurisdiction of Flood Control Permit No. FC39-3 in the event that conditions change that would affect the permit qualifications.
 - c. Operation of the flood control structures may not impair management of Big Stone Lake by the U.S. Army Corps of Engineers.

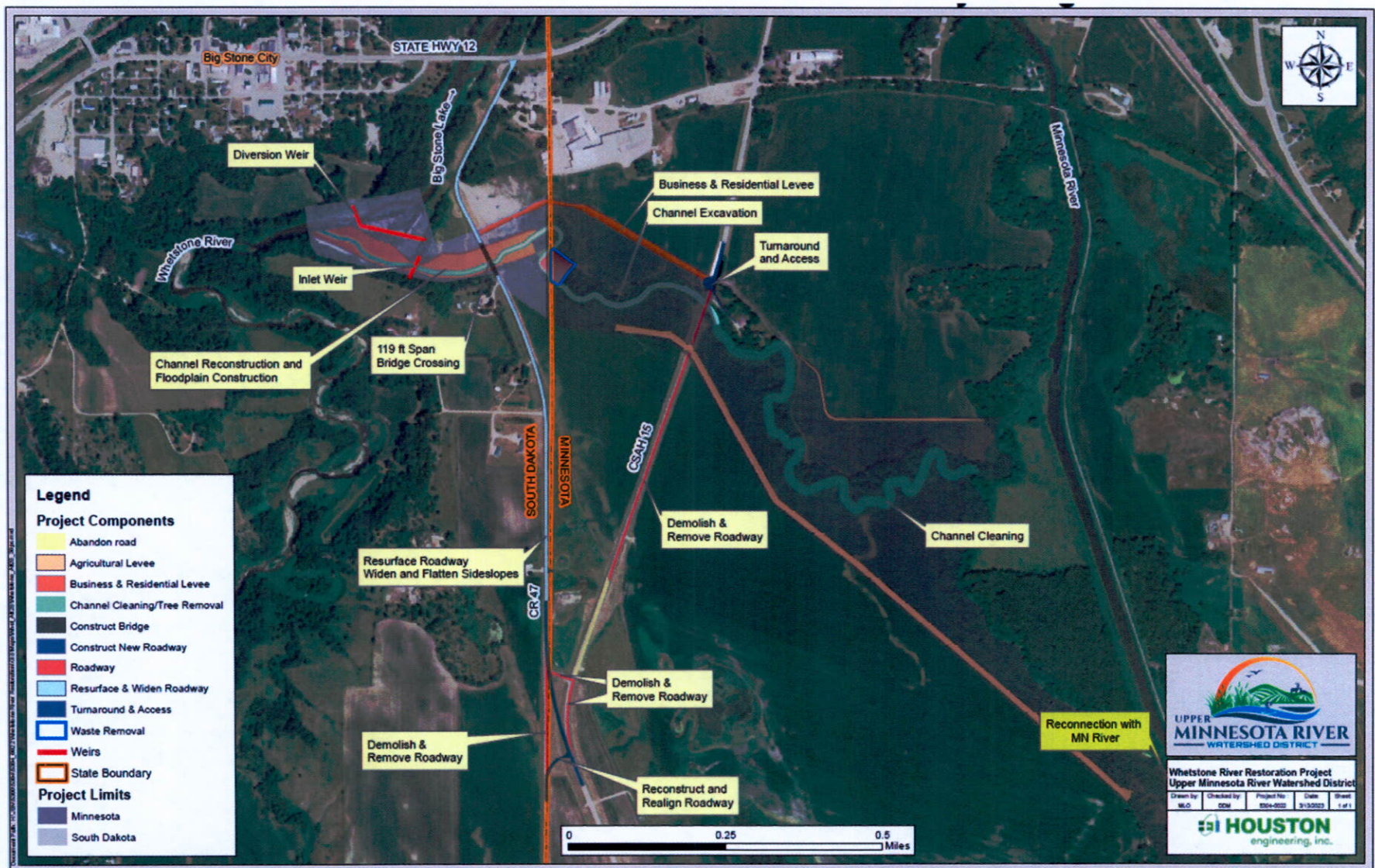
Nakaila Steen

Nakaila Steen
Natural Resources Engineer III
SD DANR - Water Rights Program

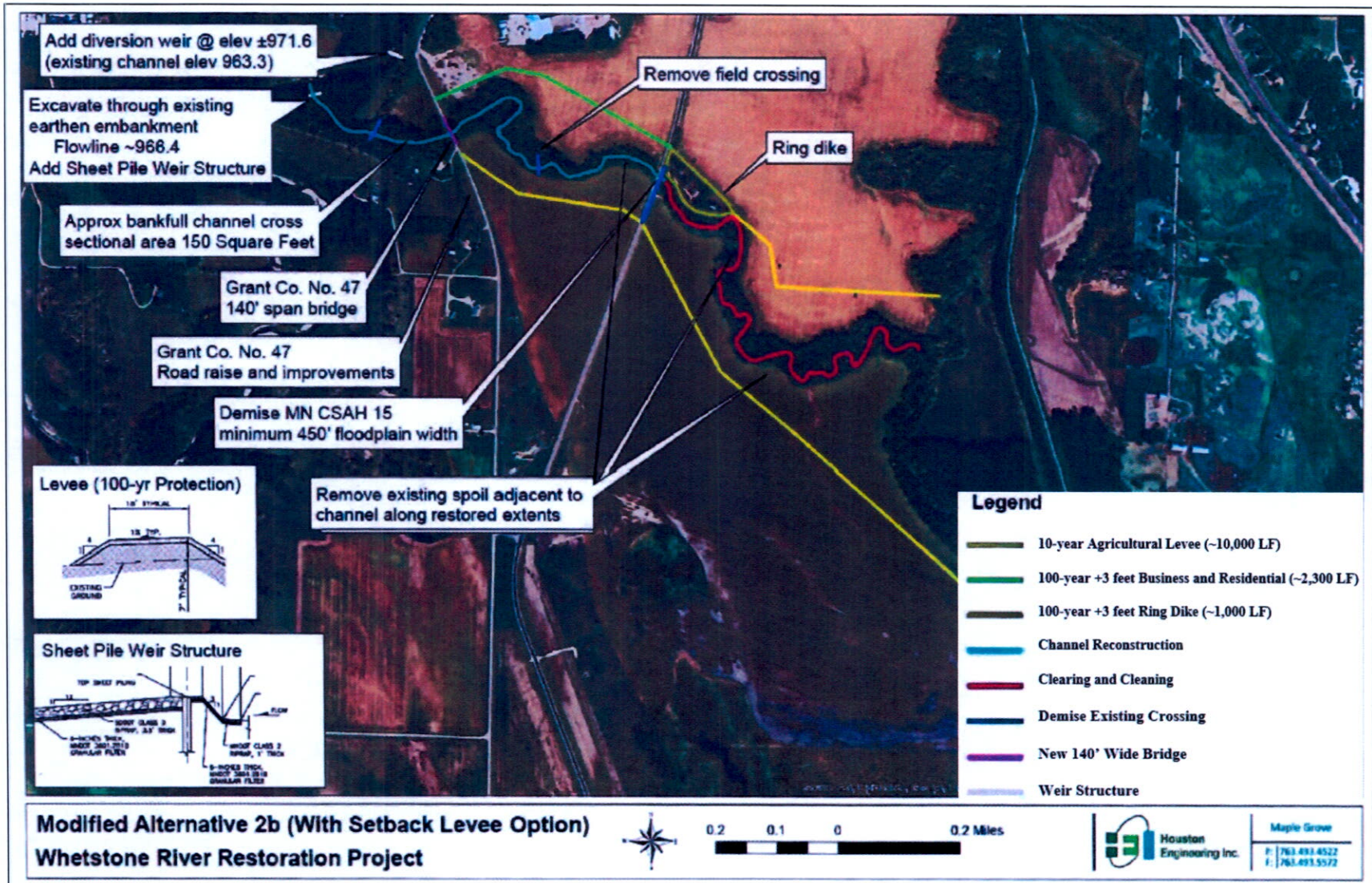
References

- Houston Engineering Inc, 2021. 30% Preliminary Design Plans for Upper Minnesota River Watershed District's Whetstone River Restoration Project, Ortonville and Maple Grove, Minnesota. Application for Flood Control Permit.
- Houston Engineering Inc, 2026. Project Narrative PowerPoint for the Upper Minnesota River Watershed District's Whetstone River Restoration Project, Ortonville and Maple Grove, Minnesota. Completed February 12, 2026. Application for Flood Control Permit.
- Deutschman, M, PE., and Odens, L, PE., 2015. Technical Memorandum and Addendum for the Whetstone River Restoration Project, Modified Alternative 28 Hydrologic and Hydraulic Final Functional Design and Updated Analysis Application for Flood Control Project within South Dakota, submitted by Houston Engineering, Inc. Maple Grove, Minnesota.
- Odens, L, PE. 2025. Whetstone River Restoration Project: Downstream Impact Analysis- Montevideo and Granite Falls (USACE 408 Supplementary Documentation). Houston Engineering, Inc. Maple Grove, Minnesota.
- USACE, 1987. US Army Corps of Engineers St. Paul District with the South Dakota-Minnesota Boundary Waters Commission and the Upper Minnesota River Watershed District. Proposed Operation of Control Works. Big Stone Lake Control Works at Ortonville, Big Stone County, Minnesota. Revised August 1987.
- USGS. 2008. United States Geological Survey. Recurrence Table. Floods: Recurrence intervals and 100-year floods.
- USGS. 2026. United States Geological Survey, National Water Information System – Stream Gaging Station Network for South Dakota.
- Water Rights. 2026. Water Right/Permit Files. SD DANR Water Rights Program. Joe Foss Building. Pierre, South Dakota.

Appendix A: Detailed Overview from Houston Engineering (Deutschman and Odens, 2015)



Appendix B: Proposed locations of the two sheet pile weirs and the embankment to be excavated, a schematic of a sheet pile weir, locations of the bridge and levees to be constructed, and locations of the bridge and vegetation to be removed (modified from Deutschman and Odens, 2015)



Appendix C: Additional Project Flow and Effect Information from Houston Engineering

Table B1: Peak Flows Restored to Whetstone Historic Channel (Deutschman and Odens, 2015)

Return Period	Estimated Total Whetstone River Flow (cfs)	Modified Alternative 2B	
		Estimated Peak Discharge to Restored Whetstone (cfs)	% of Peak Discharge Diverted
2-year	1119	806	72%
10-year	4780	1816	38%
100-year	12225	3873	32%
These flow splits assume no ice at the Highway 12 bridge			

Table B2: Effect of Selected Alternative (2B) for Historic Flood Events in 1997 and 2010 (Deutschman and Odens, 2015)

Year of Historic Flood	Existing Conditions	Modified Alternative 2B	
Big Stone Lake Maximum Elevations*			
	Maximum Elevation	Maximum Elevation	Change
1997	973.94	972.07	-1.87
2010	972.38	971.38	-1.00
Highway 75 Peak Discharge			
	Peak Discharge (cfs)	Peak Discharge (cfs)	Change (cfs)
1997	9,335	10,886	1,551
2010	10,640	12029	1,389
Highway 75 60-Day Volume**			
	Total Volume (acre-feet)	Total Volume (acre-feet)	Change (acre-feet)
1997	463,473	471,772	8,299
2010	396,055	403,683	7,627
Highway 75 Maximum Elevations			
	Maximum Elevation	Maximum Elevation	Change
1997	957.98	958.34	0.36
2010	958.33	958.65	0.32
Diversion Split Peak Flow			
	Peak Whetstone Flow (cfs)	Peak Flow Restored to Historical Whetstone (cfs)	% of peak to Historical Whetstone
1997	6,593	2,570	39%
2010	6,394	2,300	36%
Diversion Split 60-Day Volume			
	Total Whetstone Volume (acre-feet)	Total Volume Restored to Historical Whetstone (acre-feet)	% of total volume to Historical Whetstone
1997	150,134	81,546	54%
2010	103,755	65,427	63%
* The existing 100-year floodplain elevation for Big Stone Lake established by FEMA is 972.1 (NAVD88, effective April 17, 2006).			
**If the model was run for a long enough period of time, such that areas with storage (such as Big Stone Lake) were allowed to find the same equilibrium at their initial starting condition and ending condition, these volumes would be equal for all alternatives. These volumes indicate that the timing of volumes is changed dependent on the alternative.			

Lisa Odens

From: Fladhammer, Erik <efladhammer@otpc.com>
Sent: Monday, December 29, 2025 12:56 PM
To: Amber Doschadis
Subject: RE: Ottetail - Whetstone Acknowledgement

Amber,

Big Stone Plant does not believe this will impact lake level or the ability for us to pull water from the lake per our existing permit. As long as those items are correct then we have no concerns with the project.

Thanks,
Erik

From: Amber Doschadis <Amber@umrwd.org>
Sent: Monday, December 22, 2025 8:24 AM
To: Fladhammer, Erik <efladhammer@otpc.com>
Subject: RE: Ottetail - Whetstone Acknowledgement

This Message Is From an Untrusted Sender

You have not previously corresponded with this sender.

Hi Erik,

Thank you your response regarding the Whetstone River Restoration Project. We appreciate Otter Tail Power's confirmation that there are no concerns related to your water rights permit/ operations on Big Stone Lake.

As a related effort, I wanted to let Ottetail know of another project we have going on: **Fish Passage Improvements within the Browns Valley Flood Mitigation Project (Diversion)** on the Little Minnesota River.

The Browns Valley Flood Mitigation Project (Diversion around Browns Valley) was constructed in 2011 to reduce flood risk to the City of Browns Valley. Since construction, upstream interests have reported reduced fish migration. In response, the *Little Minnesota River Assessment of Fish Migration* was completed in April 2019, which identified targeted modifications to improve fish passage while maintaining the original flood protection intent of the project.

These modifications have been further refined in coordination with USFWS, South Dakota Game Fish and Parks, and the Minnesota DNR.

The proposed fish passage improvements are designed to:

- Improve spring fish migration (including walleye, sturgeon, and shiner),
- Maintain existing flood protection for the City of Browns Valley,
- Preserve existing flow volumes during all events,
- Avoid changes to peak water surface elevations on Big Stone Lake, including during the 100-year flood event.

Modeling shows no meaningful change to lake elevations or flood flows, and flow splits during large events remain essentially unchanged. While minor timing shifts may occur during baseflow or very small events, no impacts to Big Stone Lake levels or Otter Tail's water use are anticipated.

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FEB 05 2026

Water Rights
Program

Given Otter Tail Power's water rights on Big Stone Lake, we wanted to confirm whether you have any concerns or comments related to this fish passage improvement effort, similar to our coordination on the Whetstone project.

Since this is a newer project, we would be happy to provide a walkthrough of the project scope with your team.

Thank you again for your time and coordination.

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278

Phone: (320) 839-3411

Website: umwrld.org

From: Fladhammer, Erik <efladhammer@otpc.com>

Sent: Monday, December 22, 2025 8:00 AM

To: Amber Doschadis <Amber@umrwd.org>

Subject: RE: Ottertail - Whetstone Acknowledgement

This message may be from an external email source.

Do not click links or open attachments unless you recognize the sender and know the content is safe. Report all suspicious emails to Big Stone County IT.

Amber,

Big Stone Power Plant is aware of the Whetstone River Restoration Project. We have no concerns with the project due to our understanding that it will not change normal lake level, our water use permit, or our ability to draw from the lake in any way. Let me know if you need anything else from the plant on this.

Thank you,



Erik Fladhammer, P.E.

Plant Manager
Big Stone Power Plant

Direct: 605-862-6386
Cell: 605-467-3274

RECEIVED

FEB 05 2026

Water Rights
Program



From: Amber Doschadis <Amber@umrwd.org>
Sent: Tuesday, December 9, 2025 7:34 AM
To: Fladhammer, Erik <efladhammer@otpc.com>
Subject: Ottertail - Whetstone Acknowledgement

This Message Is From an Untrusted Sender

You have not previously corresponded with this sender.

Hi Erik,

I hope you're doing well. I'm reaching out regarding our ongoing Whetstone River Restoration Project.

As part of the permitting process, the SD DANR has requested confirmation that Otter Tail Power Company is aware of and <hopefully still> supportive of the proposed project modifications.

To help move this forward, we're hoping to gather any input Ottertail may have on our project. Our Engineers and I would be happy to provide a summary of the project details and/or visit via Teams with Ottertail staff to walk through the scope.

Ultimately, because Ottertail has an existing water permit on BSL, the SD DANR would like a brief statement acknowledging Ottertail's awareness of the proposed work and noting any concerns or support from your perspective.

Please let me know what you need on your end.

Best,

Amber Doschadis

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278
Phone: (320) 839-3411
Website: umwrd.org

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Water Rights
Program

Minnesota River

Business & Residential Levee

Channel Excavation

Turnaround
and Access

Inlet Weir

119 ft Span
Bridge Crossing

Construction and
Maintenance

Big Stone Lake

SOUTH DAKOTA

MINNESOTA

CSAH 15

Demolish &
Remove Roadway

Channel Cleaning

Resurface Roadway
Widen and Flatten Sideslopes

CR 47

Demolish &
Remove Roadway

Demolish &
Remove Roadway

Reconnection with
MN River

Rodriguez, Rachel

From: Amber Doschadis <Amber@umrwd.org>
Sent: Tuesday, February 17, 2026 9:14 AM
To: Dewell, Amanda; Lisa Odens
Cc: Rodriguez, Rachel
Subject: RE: [EXT] Whetstone Restoration Project
Attachments: Whetstone Contacts.xlsx; D0431LDV4-WhetstoneFloodControlApplication_signed.pdf; Presentation_Whetstone_2026_feb_12.pdf

Good morning,

Attached is the signed permit application, pdf presentation from our Teams Meeting last week and an excel sheet with contacts we've been working with/ will be working with on this project.

Please let me know if you have any questions/ concerns.

Thank you,

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278

Phone: (320) 839-3411

Website: umrwd.org

From: Dewell, Amanda <Amanda.Dewell@state.sd.us>
Sent: Tuesday, February 17, 2026 8:24 AM
To: Amber Doschadis <Amber@umrwd.org>; Lisa Odens <lodens@houstoneng.com>
Cc: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Subject: FW: Whetstone Restoration Project

You don't often get email from amanda.dewell@state.sd.us. [Learn why this is important](#)

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Good morning, I'm looping back on this since I don't have any record of receiving the signed application or payment after our meeting the other day. I'm also including Rachel, with our Program.

Thank you,

Amanda Dewell
DANR - Water Rights Program
Permitting Administrator
Main Phone: 605 773-3352
Website: danr.sd.gov



From: Dewell, Amanda
Sent: Thursday, February 12, 2026 12:09 PM
To: Amber Doschadis <amber@umrwd.org>
Cc: Lisa Odens <lodens@houstoneng.com>
Subject: FW: [EXT] Whetstone Restoration Project

Could you please sign the application – thank you.

Additionally, I do not have record of receipt of fees, which would total \$700.00. Fees can be received by either calling our Fiscal Office and submitting payment over the phone (605) 773-5559 or by mailing a check (payable to SD Water Rights) to: DANR – Water Rights, 523 E Capitol Ave, Pierre SD 57501.

Amanda Dewell
DANR - Water Rights Program
Permitting Administrator
Main Phone: 605 773-3352
Website: danr.sd.gov



From: Amber Doschadis <Amber@umrwd.org>
Sent: Thursday, February 5, 2026 7:29 AM
To: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>; Lisa Odens <lodens@houstoneng.com>; Dewell, Amanda <Amanda.Dewell@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>
Cc: Dennis McAlpine <dmcalpine@houstoneng.com>
Subject: RE: [EXT] Whetstone Restoration Project

Good morning,

Attached is our SD Flood Control Application along with the accompanying project narrative for the Whetstone River Restoration Project.

The link below provides access to additional files that were not included in our previous pre-application submittal.

 [2026_02_04 SD Flood Control Application Files.zip](#)

These materials contain a significant amount of information, as they consolidate nearly a decade of analysis and project work. To help streamline the review process, we have scheduled a meeting with DANR staff where we plan to provide a summary of the project and walk through the data. A comprehensive review of the full submittal will likely be more efficient after that presentation; however, reviewing the project narrative beforehand may help facilitate discussion.

With these materials, I believe we have submitted a complete application; however, please let me know if an application fee is required or if any additional steps are needed.

Thank you,

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278

Phone: (320) 839-3411

Website: umwrwd.org

From: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>

Sent: Friday, January 30, 2026 11:07 AM

To: Lisa Odens <lodens@houstoneng.com>; Dewell, Amanda <Amanda.Dewell@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>

Cc: Amber Doschadis <Amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: RE: Whetstone Restoration Project

From: Dewell, Amanda <Amanda.Dewell@state.sd.us>

Sent: Tuesday, November 4, 2025 11:07 AM

To: Lisa Odens <lodens@houstoneng.com>

Cc: Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: RE: Whetstone Restoration Project

[External Email]

Lisa,

Our Program has put together a “draft application” for the flood control permitting required for this project. Please feel free to use the attachment as a template for the final application you will submit. One concern that we have that may curb processing of an application in the immediate future, are the multiple alternatives. Before we would be able to advertise/public notice the application, we would need those narrowed down. Otherwise, how would member of the public petition/oppose a plan that may or may not be the final intent?

Additionally, South Dakota statutes would require public notice of this project for areas effected in South Dakota (ie Grant County). You might check with Minnesota to see if they will have any requirements for Big Stone County in MN.

I hope this is helpful. Once you’ve gotten farther in the planning, feel free to reach out with any additional questions.

Amanda Dewell

DANR - Water Rights Program

Permitting Administrator

Main Phone: 605 773-3352

Website: danr.sd.gov



From: Lisa Odens <lodens@houstoneng.com>

Sent: Tuesday, October 28, 2025 12:50 PM

To: Dewell, Amanda <Amanda.Dewell@state.sd.us>; Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>; Hullinger, Brittan <Brittan.Hullinger@state.sd.us>

Cc: Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: [EXT] Whetstone Restoration Project

I'm using Mimecast to share large files with you. Please see the attached instructions.

Good Afternoon,

Thank you for meeting with us yesterday to discuss the Whetstone River Restoration Project, it was nice to meet all of you!

As requested, attached are the 30% plans and addendums to the original Engineer's Report. Please feel free to reach out with any questions. We would be looking to make the March meeting, and would like to know about any concerns you have about the completeness of the plans or about the project impacts, so we can make a timely and complete application.

Thank you,

Rodriguez, Rachel

From: Rodriguez, Rachel
Sent: Monday, February 23, 2026 2:05 PM
To: Amber Doschadis
Subject: RE: [EXT] Whetstone Restoration Project
Attachments: Permitting Process PDF.pdf

Good Afternoon Amber,

Thanks for the map, no we do not need the MN map. I have processed the application the application, it will be assigned to an engineer to write a report. They have 60 days to complete the report. Once completed, I will contact you again regarding the public notice. Also, attached is a guideline for the permitting process.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us



From: Amber Doschadis <Amber@umrwd.org>
Sent: Thursday, February 19, 2026 7:39 PM
To: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Subject: Re: [EXT] Whetstone Restoration Project

Hi Rachel,

Attached is a basic drawing of project features in SD. Would you like the map to include MN as well?

Thank you,

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278
Phone: (320) 839-3411
Website: umwrw.org

From: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Sent: Wednesday, February 18, 2026 2:37 PM
To: Amber Doschadis <Amber@umrwd.org>
Subject: FW: Whetstone Restoration Project

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Good afternoon,

I see a few maps in the documentation that was sent to Amanda. However, I do not see a map of the location of the project (SE 1/4 Sec 17-T121N-R46W). Attached is a map of the proposed project, please confirm if it is the whole SE 1/4, if not, then please outline the area or let me know where I can find it in the documentation sent.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us



From: Amber Doschadis <Amber@umrwd.org>
Sent: Tuesday, February 17, 2026 9:14 AM
To: Dewell, Amanda <Amanda.Dewell@state.sd.us>; Lisa Odens <lodens@houstoneng.com>
Cc: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Subject: RE: [EXT] Whetstone Restoration Project

Good morning,

Attached is the signed permit application, pdf presentation from our Teams Meeting last week and an excel sheet with contacts we've been working with/ will be working with on this project.

Please let me know if you have any questions/ concerns.

Thank you,

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278

Phone: (320) 839-3411

Website: umwr.org

From: Dewell, Amanda <Amanda.Dewell@state.sd.us>

Sent: Tuesday, February 17, 2026 8:24 AM

To: Amber Doschadis <Amber@umrwd.org>; Lisa Odens <lodens@houstoneng.com>

Cc: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>

Subject: FW: Whetstone Restoration Project

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Good morning, I'm looping back on this since I don't have any record of receiving the signed application or payment after our meeting the other day. I'm also including Rachel, with our Program.

Thank you,

Amanda Dewell

DANR - Water Rights Program

Permitting Administrator

Main Phone: 605 773-3352

Website: danr.sd.gov



From: Dewell, Amanda
Sent: Thursday, February 12, 2026 12:09 PM
To: Amber Doschadis <amber@umrwd.org>
Cc: Lisa Odens <lodens@houstoneng.com>
Subject: FW: [EXT] Whetstone Restoration Project

Could you please sign the application – thank you.
Additionally, I do not have record of receipt of fees, which would total \$700.00. Fess can be received by either calling our Fiscal Office and submitting payment over the phone (605) 773-5559 of by mailing a check (payable to SD Water Rights) to: DANR – Water Rights, 523 E Capitol Ave, Pierre SD 57501.

Amanda Dewell
DANR - Water Rights Program
Permitting Administrator
Main Phone: 605 773-3352
Website: danr.sd.gov



From: Amber Doschadis <Amber@umrwd.org>
Sent: Thursday, February 5, 2026 7:29 AM
To: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>; Lisa Odens <lodens@houstoneng.com>; Dewell, Amanda <Amanda.Dewell@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>
Cc: Dennis McAlpine <dmcalpine@houstoneng.com>
Subject: RE: [EXT] Whetstone Restoration Project

Good morning,

Attached is our SD Flood Control Application along with the accompanying project narrative for the Whetstone River Restoration Project.

The link below provides access to additional files that were not included in our previous pre-application submittal.

 [2026_02_04 SD Flood Control Application Files.zip](#)

These materials contain a significant amount of information, as they consolidate nearly a decade of analysis and project work. To help streamline the review process, we have scheduled a meeting with DANR staff where we plan to provide a summary of the project and walk through the data. A comprehensive review of the full submittal will likely be more efficient after that presentation; however, reviewing the project narrative beforehand may help facilitate discussion.

With these materials, I believe we have submitted a complete application; however, please let me know if an application fee is required or if any additional steps are needed.

Thank you,

Amber

Amber Doschadis | Director



211 2nd Street SE, Ortonville, MN 56278

Phone: (320) 839-3411

Website: umwr.org

From: Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>

Sent: Friday, January 30, 2026 11:07 AM

To: Lisa Odens <lodens@houstoneng.com>; Dewell, Amanda <Amanda.Dewell@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>

Cc: Amber Doschadis <Amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: RE: Whetstone Restoration Project

From: Dewell, Amanda <Amanda.Dewell@state.sd.us>

Sent: Tuesday, November 4, 2025 11:07 AM

To: Lisa Odens <lodens@houstoneng.com>

Cc: Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: RE: Whetstone Restoration Project

[External Email]

Lisa,

Our Program has put together a “draft application” for the flood control permitting required for this project. Please feel free to use the attachment as a template for the final application you will submit. One concern that we have that may curb processing of an application in the immediate future, are the multiple alternatives. Before we would be able to advertise/public notice the application, we would need those narrowed down. Otherwise, how would member of the public petition/oppose a plan that may or may not be the final intent?

Additionally, South Dakota statutes would require public notice of this project for areas effected in South Dakota (ie Grant County). You might check with Minnesota to see if they will have any requirements for Big Stone County in MN.

I hope this is helpful. Once you’ve gotten farther in the planning, feel free to reach out with any additional questions.

Amanda Dewell

DANR - Water Rights Program

Permitting Administrator
Main Phone: 605 773-3352
Website: danr.sd.gov



From: Lisa Odens <lodens@houstoneng.com>

Sent: Tuesday, October 28, 2025 12:50 PM

To: Dewell, Amanda <Amanda.Dewell@state.sd.us>; Kilts, Whitney (DENR) <Whitney.Kilts@state.sd.us>; Duvall, Ron <Ron.Duvall@state.sd.us>; Hullinger, Brittan <Brittan.Hullinger@state.sd.us>

Cc: Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>

Subject: [EXT] Whetstone Restoration Project

I'm using Mimecast to share large files with you. Please see the attached instructions.

Good Afternoon,

Thank you for meeting with us yesterday to discuss the Whetstone River Restoration Project, it was nice to meet all of you!

As requested, attached are the 30% plans and addendums to the original Engineer's Report. Please feel free to reach out with any questions. We would be looking to make the March meeting, and would like to know about any concerns you have about the completeness of the plans or about the project impacts, so we can make a timely and complete application.

Thank you,



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, ST. PAUL DISTRICT
332 MINNESOTA STREET, SUITE E1500
ST. PAUL, MN 55101-1323

MARCH 27, 2026

Engineering and Construction Division

Amber Doschadis
Upper Minnesota River Watershed District
211 2nd Street SE
Ortonville, MN 56278

Section 408 Request Number: 2023-0003

Dear Ms. Doschadis:

The U.S. Army Corps of Engineers (USACE) St. Paul District (MVP) has completed its review of your request for authorization to alter one or more federal civil works projects pursuant to Section 14 of the Rivers and Harbors Act of 1899, codified at 33 USC § 408 (Section 408). From your application, the proposed project would alter the timing of downstream flows to the Highway 75 Dam, the Marsh Lake Dam, and the Lac qui Parle Dam ("USACE projects") as part of a larger effort to restore 9,000-feet of the historic Whetstone River channel between Big Stone Lake and the confluence with the Minnesota River.

Based on the evaluation of the materials provided, your project would not impair the usefulness of the USACE projects. Further, in accordance with Assistant Secretary of the Army (Civil Works) guidance to ease the regulatory burden on the public, MVP has concluded no Section 408 permission will be required for your project.

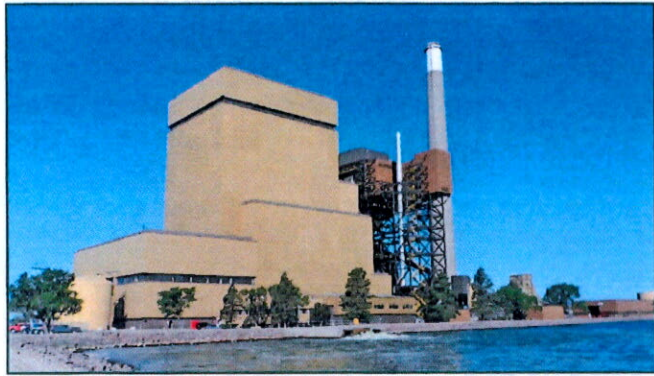
We appreciate your cooperation throughout the review process. Please note that our decision on your Section 408 request does not relieve you of your responsibility to obtain other USACE permits that may be applicable under the Clean Water Act or Rivers and Harbors Act. If you have any questions, please feel free to reach out to my point of contact, Michelle Prosser, at michelle.e.prosser@usace.army.mil or at 651-290-5373.

Sincerely,

A handwritten signature in black ink that reads "Kari Hauck".

Digitally signed by Kari
Hauck
Date: 2026.03.27 15:01:43
-05'00'

Kari Hauck
Chief, Engineering and Construction Division



BIG STONE PLANT

48450 144th Street, PO Box 218
Big Stone City, SD 57216-0218
(605) 862-6300

MONTANA-DAKOTA UTILITIES CO.
400 North Fourth Street
Bismarck, North Dakota 58501

OTTER TAIL POWER COMPANY
215 South Cascade Street
Fergus Falls, Minnesota 56537

NORTHWESTERN CORPORATION
3010 West 69th Street
Sioux Falls, South Dakota 57108

March 4, 2026

Upper Minnesota River Watershed District

211 2nd Street SE

Ortonville, MN 56278

Dear Amber Doschadis,

I'm writing to let you know that Big Stone Power Plant is aware of the Whetstone River Restoration Project. At this time, we have no concerns with the project due to our understanding that it will not change normal lake level, our water use permit, or our ability to draw from the lake in any way. Please let me know if you need anything else from the plant on this.

Sincerely,

Erik Fladhammer

Big Stone Plant Manager



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

March 27, 2026

Upper Minnesota River Watershed District
Amber Doschadis
211 2nd Street
Ortonville, MN 56278

RE: Whetstone River - diversion to historic channel
WRER ID 26-007

Dear Amber:

Thank you for submitting your application for the proposed Water Resource Enhancement or Restoration project. The Upper Minnesota River Watershed District is proposing to restore 9,000 feet of the historic Whetstone River channel from near Big Stone City, South Dakota, downstream to the confluence with the Minnesota River in Minnesota. This project will reestablish the downstream floodplain and floodplain wetlands along the historic Whetstone River channel.

The proposed project will enhance the ecological integrity of the historic Whetstone River channel while improving water quality and reducing flood impacts on Big Stone Lake.

The goal of the proposed project is to restore ecological services by reestablishing perennial flow to an estimated 9,000 feet of open channel within the historic Whetstone River channel. The portions of the historic Whetstone River channel being restored are generally located downstream of the Big Stone Dam and upstream of the U.S. Highway 75 dam, within western Minnesota. The proposed project diverts a portion of the water flow from the Whetstone River entering Big Stone Lake into a segment of the historic Whetstone River channel, downstream of the lake. The historic channel connects downstream to the Minnesota River. The South Dakota portion of this project is located primarily in Section 17, Township 121 North, Range 46 West, Grant County, South Dakota (45.286554, -96.45596).

Under Administrative Rules of South Dakota Chapter 74:51, the Whetstone River is classified and protected by the South Dakota Surface Water Quality Standards and Uses Assigned to Streams for the following beneficial uses:

- (5) Warmwater semipermanent fish life propagation waters;
- (8) Limited contact recreation waters;
- (9) Fish and wildlife propagation, recreation, and stock watering waters; and
- (10) Irrigation waters.

Protection of these beneficial uses require special construction measures and best management practices to ensure the daily maximum total suspended solids criterion of 158 mg/L and the 30-day average total suspended solids criterion of 90 mg/L or the dissolved oxygen criterion of 5.0 mg/L (minimum) are not exceeded or cause violations to other criteria associated with the uses of this waterbody.

Based on our review of the project application, the South Dakota Department of Agriculture and Natural Resources (SD DANR) grants project approval with conditions. These conditions will ensure that South Dakota water quality standards are met, and the health and integrity of South Dakota waterbodies are maintained.

- 1.) A Storm Water Construction Permit must be obtained from the South Dakota Department of Agriculture and Natural Resources if construction activities disrupt one or more acres of land. A copy of the general permit and the notice of intent (application) for coverage are available on DANR's website at: <https://danr.sd.gov/OfficeOfWater/SurfaceWaterQuality/stormwater/StormWaterConstruction.aspx>. Under the general permit, SD DANR requires that the project proponent prepare a Storm Water Pollution Prevention Plan for this project. The Storm Water Pollution Prevention Plan must include the required components as directed by the general permit and include construction site inspection frequency and post-construction inspection frequency to ensure erosion control is functional. This requirement is authorized under Administrative Rule of South Dakota (ARSD) 74:52:02:36 and South Dakota Codified Law (SDCL) 34A-2-36.
- 2.) During construction activities, Best Management Practices (BMPs), including erosion control and discharge prevention measures, must be installed to reduce work site erosion and sediment transport to the affected waterbodies. Construction activities and erosion must not cause downstream exceedances to water quality standards or impact other downstream uses. This condition is authorized under ARSD 74:51:01 and SDCL 34A-2-11.
- 3.) The project applicant or its contractors must provide a monthly observation report that includes pictures and summaries of the project progress, effectiveness of erosion/sediment control measures, and any other observations that may affect water quality or the aquatic environment for project work within South Dakota. The monthly report may be submitted only during months that project construction is occurring. Submit the report to Shannon.Minerich@state.sd.us.
- 4.) Excavated or dredged material must be disposed of in an upland location away from streams or wetlands. Return water from excavated or dredged material must not be allowed to re-enter waters of the state. This condition is authorized under ARSD 74:51:01:12 and SDCL 34-A-2-21.
- 5.) No excavated or dredged material may be deposited or stored, even on a temporary basis, below the waterbody's ordinary high-water mark. If a temporary storage pile is used above that elevation, no liquid or solid may be allowed to run off and re-enter the waterbody. This condition is authorized under ARSD 74:51:01:12 and SDCL 34-A-2-21.
- 6.) Methods shall be implemented to minimize the spillage of petroleum, oils, and lubricants used in equipment, machinery, and vehicles during construction activities. If a spill occurs during construction activity, that spill must be reported to SD DANR at (605) 773-3296 (605-773-3231

after hours). These materials may not be discharged or caused to be discharged into waters of the state per ARSD 74:51:01:06 and 74:51:01:10 and SDCL 34A-2-93.

- 7.) This approval does not authorize this activity or eliminate the need to meet other applicable local, state, tribal, or federal permits, approvals, or conditions. The US Army Corps of Engineers, SD Department of Game, Fish, and Parks, the Natural Resources Conservation Service, or other SD DANR programs may have additional requirements. It is the applicant's responsibility to ensure that all required approvals and permits are obtained. The activity may not occur until all required permits and approvals are issued.

This approval is valid through December 31, 2030. If the scope of this project is altered or the timeframe has been exceeded, a new approval must be obtained.

Thank you for all your cooperation in this project.

Sincerely,

A handwritten signature in black ink that reads "Shannon Minerich". The signature is fluid and cursive, with the first name "Shannon" being larger and more prominent than the last name "Minerich".

Shannon Minerich
Environmental Scientist
Water Quality Program

Cc: Jason Jungwirth, SD GFP
Janel Kaufman, Houston Engineering
STORMWATER@state.sd.us

Rodriguez, Rachel

From: Dewell, Amanda
Sent: Wednesday, June 10, 2026 11:38 AM
To: Rodriguez, Rachel
Subject: FW: [EXT] FC39-3

Are you able to get the email thread Nakaila mentioned to the file for FC39-3?

Amanda Dewell
DANR - Water Rights Program
Permitting Administrator
Main Phone: 605 773-3352
Website: danr.sd.gov



From: Steen, Nakaila <Nakaila.Steen@state.sd.us>
Sent: Wednesday, June 10, 2026 11:05 AM
To: Dewell, Amanda <Amanda.Dewell@state.sd.us>
Subject: FW: [EXT] FC39-3

The 2 most recent emails in this chain can be added to this permit file thanks Amanda

From: Lisa Odens <lodens@houstoneng.com>
Sent: Tuesday, June 9, 2026 7:50 AM
To: Steen, Nakaila <Nakaila.Steen@state.sd.us>; Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>
Subject: RE: [EXT] FC39-3

Nakaila,

The channel at the diversion weir is approximately 965.0 based on a surveyed cross section approximately 70 feet downstream. In the model there is a lower elevation shown, which is based on a combination of older survey, copied cross sections where survey was not available, and what appear to be revisions to have a more consistent channel bottom to help with model stability (similar to a pilot channel). Below is the cross section from survey.

Regarding the diversion channel inlet. The inlet weir is at an elevation of 965.20 while the inlet of the historic channel at the confluence with the diversion channel is 966.4. Below the elevations are circled on the profile.

Please feel free to reach out with any other questions. Thanks!



From: Steen, Nakaila <Nakaila.Steen@state.sd.us>

Sent: Wednesday, June 3, 2026 11:46 AM

To: Amber Doschadis <amber@umrwd.org>; Dennis McAlpine <dmcalpine@houstoneng.com>; Lisa Odens <lodens@houstoneng.com>

Cc: Adam Nies <anies@houstoneng.com>

Subject: Re: FC39-3

Yes it did, thank you. The report is almost through the review process and a recommendation from the Chief Engineer will be coming soon.

Can you please clarify two more elevations:

The elevation of the bottom of diversion channel (in the current Whetstone River channel, not historic) at the proposed diversion weir site is currently 963.3 ft.

The historic channel is proposed to be restored to the elevation of 966.4 ft at the connection to the diversion channel (or is this one same elevation as inlet weir?).

Thank you!
Nakaila Steen

From: Amber Doschadis <Amber@umrwd.org>

Sent: Monday, May 18, 2026 12:43 PM

To: Dennis McAlpine <dmcalpine@houstoneng.com>; Steen, Nakaila <Nakaila.Steen@state.sd.us>; Lisa Odens <lodens@houstoneng.com>

Cc: Adam Nies <anies@houstoneng.com>

Subject: Re: [EXT] FC39-3

Good afternoon Nakaila,

I'm checking in to see if Dennis' email below answered your questions.
Please let me know if you need any further clarification.

Thank you,

Amber

Amber Doschadis | Director



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

**NOTE: TO BE SURE OF PUBLICATION ON
THE CORRECT DATES, CONTACT
THE NEWSPAPERS RIGHT AWAY.**

June 15, 2026

Upper Minnesota River Watershed District
c/o Amber Doschadis
211 2nd Street SE
Ortonville MN 56278

Dear Ms. Doschadis:

Flood Control Permit Application No. FC39-3 has been examined and found to comply with the South Dakota Water Laws and applicable rules. A notice has been sent to the Grant County Review printed in Milbank SD (Ph # 605 432-4516) and the Public Opinion printed in Watertown (see attachment for contact number). You will need to contact the newspapers and authorize publication of this notice. For your information, a copy of the notice, the recommendation of the Acting Chief Engineer and report on the application are enclosed. Please review the notice prior to publication and notify this office, if you have any corrections or questions.

Be sure to contact the above newspapers to authorize publication of your Notice and to arrange for payment. Early contact with the papers can eliminate delays. Upon receiving authorization from you, the publishers have been instructed to publish your notice. The newspapers have also been instructed to send us the Proof of Publication. We must receive Proof of Publication before action can be taken on the application.

Sincerely,

Rachel Rodriguez

Rachel Rodriguez
Water Rights Program
(605) 773-3352

enclosures

NOTE: If you plan to contest any part of the Acting Chief Engineer's recommendation, you must file a petition pursuant to the procedures outlined in the attached notice of hearing. The Water Management Board will then consider your concerns during a hearing on the application.

NOTICE OF FLOOD CONTROL APPLICATION NO. FC39-3

Notice is given that the Upper Minnesota River Watershed District, 211 2nd Street SE, Ortonville MN 56278, has filed a flood control permit application for the Whetstone River Restoration Project (Preferred Alternative 2B). This project involves restoring ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning in the NE1/4 SE1/4 Section 17-T121N-R46W and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930's, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake. Diverting flows back to the historical river channel will be accomplished by constructing a weir (crest elevation approximately 972.2 feet mean sea level [NAVD 88]) on the bypass channel in the NE1/4 SE1/4 Section 17-T121N-R46W. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and Minnesota River via the existing bypass channel. If constructed, this project will reduce flooding around Big Stone Lake by reducing flood flows entering the lake with downstream measures implemented, including levee construction and road enhancements/reconfiguration, to mitigate flooding risks to downstream property. Project works are located along the southeastern edge of Big Stone City, South Dakota, in the SE1/4 Section 17-T121N-R46W and into Minnesota. A digital copy of Flood Control Application No. FC39-3, including submitted plans and specifications, is available by contacting the acting Acting Chief Engineer at the address or phone number provided below.

Pursuant to SDCL 46-2A-2, the Acting Chief Engineer recommends APPROVAL of Application No. FC39-3 with qualifications because 1) the project will not increase the likelihood or severity of flood damages, 2) the project will not endanger human life or property, 3) the project will not impair existing water rights, 4) the District will be required to acquire property or the necessary easements prior to any development of the project, and 5) it is in the public interest to provide flood control while restoring fish passage through the project. The Acting Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Amanda Dewell for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Acting Chief Engineer. A petition opposing the application shall be filed on a form provided by the Acting Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Acting Chief Engineer. The Acting Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Acting Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by July 6, 2026.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Acting Chief Engineer. The comment shall be filed on a form provided by the Acting Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Acting Chief Engineer at the address provided above. Filing a comment

does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by July 6, 2026.

If the applicant does not contest the recommendation of the Acting Chief Engineer and no petition to oppose the application is received, the Acting Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled, and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Published once at the total approximate cost of_

Rodriguez, Rachel

From: Gannett Legals Public Notices 4 <ganlegpubnotices4@gannett.com>
Sent: Monday, June 15, 2026 10:02 AM
To: Rodriguez, Rachel
Subject: RE: [EXT] 12414913 FC39-3 Upper Min River - Public Notice
Attachments: 12414913.pdf

Good Morning,

Please find your order confirmation and proof of ad attached.

Your ad is set to run in the Public Opinion on June 24. The order cost is \$72.80 which includes an affidavit, that will be mailed to you 7-10 business days after the last day of the ad printing.

Your notice is scheduled to run per your request and will publish unless you reply to this email requesting changes or to cancel.

Our invoicing is done on a monthly basis.

You will receive an invoice for this ad after the close of the month.

All orders are subject to a non-refundable 3.99% service fee. As an incentive for customers, we provide a discount off the order cost equal to the 3.99% service fee if you pay by ACH. Pay by ACH and Save! Final order cost provided at time of payment and via a receipt.

Thank you!

Brittany Grady
Public Notice Representative

USA TODAY CO.



844-254-5287

National voice. Local strength. Subscribe TODAY.

#TeamUSATODAY

Tell my boss I rock [HERE!](#)

From: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Sent: Monday, June 15, 2026 9:44 AM
To: SD-Watertown Legals <legals@thepublicopinion.com>
Subject: 12414913 FC39-3 Upper Min River - Public Notice

Attached is a notice to be published on June 24, 2026.

Upper Minnesota River Watershed District, c/o Amber Doschadis, 211 2nd Street SE, Ortonville MN 56278, 320-839-3411, amber@umrwd.org has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, Attn Rachel Rodriguez, 523 E Capitol Ave, Pierre SD 57501.

Let me know if you have questions. Please confirm receipt of this email.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us





Order Confirmation

Not an Invoice

Account Number:	1578963
Customer Name:	Upper Minnesota River Watershed District
Customer Address:	Upper Minnesota River Watershed District 211 2Nd ST SE Ortonville MN 56278-1537
Contact Name:	Amber Doschadis
Contact Phone:	
Contact Email:	amber@umrwd.org
PO Number:	

Date:	06/15/2026
Order Number:	12414913
Prepayment Amount:	\$ 0.00

Column Count:	1.0000
Line Count:	226.0000
Height in Inches:	24.8700

Print

Product	#Insertions	Start - End	Category
WAT The Public Opinion	1	06/24/2026 - 06/24/2026	Public Notices
WAT thepublicopinion.com	1	06/24/2026 - 06/24/2026	Public Notices

As an incentive for customers, we provide a discount off the total order cost equal to the 3.99% service fee if you pay with Cash/Check/ACH. Pay by Cash/Check/ACH and save!

Total Cash Order Confirmation Amount Due	\$72.80
Tax Amount	\$0.00
Service Fee 3.99%	\$2.90
Cash/Check/ACH Discount	-\$2.90
Payment Amount by Cash/Check/ACH	\$72.80
Payment Amount by Credit Card	\$75.70

Order Confirmation Amount	\$72.80
---------------------------	---------

Rodriguez, Rachel

From: Rodriguez, Rachel
Sent: Monday, June 15, 2026 9:42 AM
To: gcreview@itcmilbank.com
Subject: FC39-3 Upper Min River - Public Notice
Attachments: FC39-3 public.short_final.docx; FORM8.FRM.doc

Attached is a notice to be published on June 24, 2026.

Upper Minnesota River Watershed District, c/o Amber Doschadis, 211 2nd Street SE, Ortonville MN 56278, 320-839-3411, amber@umrwd.org has been notified to contact you to authorize publication and arrange for payment.

Please send the affidavit or return the attached Proof of Publication form ASAP to the Water Rights Program, Attn Rachel Rodriguez, 523 E Capitol Ave, Pierre SD 57501.

Let me know if you have questions. [Please confirm receipt of this email.](#)

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us



USA TODAY CO.



PO Box 630567 Cincinnati, OH 45263-0567

AFFIDAVIT OF PUBLICATION

Water Rights Program
Water Rights Program
523 E Capitol Ave
Pierre SD 57501

RECEIVED

JUN 30 2026

OFFICE OF
WATER

STATE OF SOUTH DAKOTA, COUNTY OF CODINGTON

The Watertown Public Opinion is, and during all the times hereafter mentioned was, a daily legal newspaper as defined in SDCL 17-2-2.1 through 17-2-2.4, as amended, published at Watertown, Codington County, South Dakota, by Watertown Public Opinion; that the notice, order or advertisement, a printed copy of which is attached, was published in said newspaper in the issue dated:

06/24/2026

and that the fees charged are legal.

Sworn to and subscribed before on 06/24/2026

Linda Furr

Legal Clerk

Kongmeng Yang
Notary, State of WI, County of Brown

9-3-28

My commission expires

Publication Cost: \$72.80

Tax Amount: \$0.00

Payment Cost: \$72.80

Order No: 12414913

of Copies:

Customer No: 1578963

1

PO #:

THIS IS NOT AN INVOICE!

Please do not use this form for payment remittance.

KONGMENG YANG
Notary Public
State of Wisconsin

**NOTICE OF FLOOD
CONTROL APPLICATION
NO. FC39-3**

Notice is given that the Upper Minnesota River Watershed District, 211 2nd Street SE, Ortonville MN 56278, has filed a flood control permit application for the Whetstone River Restoration Project (Preferred Alternative 2B). This project involves restoring ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning in the NE1/4 SE1/4 Section 17-T121N-R46W and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930's, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake. Diverting flows back to the historical river channel will be accomplished by constructing a weir (crest elevation approximately 972.2 feet mean sea level [NAVD 88]) on the bypass channel in the NE1/4 SE1/4 Section 17-T121N-R46W. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and Minnesota River via the existing bypass channel. If constructed, this project will reduce flooding around Big Stone Lake by reducing flood flows entering the lake with downstream measures implemented, including levee construction and road enhancements/reconfiguration, to mitigate flooding risks to downstream property. Project works are located along the southeastern edge of Big Stone City, South Dakota, in the SE1/4 Section 17-T121N-R46W and into Minnesota. A digital copy of Flood Control Application No. FC39-3, including submitted plans and specifications, is available by contacting the acting Acting Chief Engineer at the address or phone number provided below. Pursuant to SDCL 46-2A-2, the Acting Chief Engineer recommends APPROVAL of Application No. FC39-3 with qualifications because 1) the project will not increase the likelihood or severity of flood damages, 2) the project will not endanger human life or property, 3) the project will not impair existing water rights, 4) the District will be required to acquire property or the necessary easements prior to any development of the project, and 5) it is in the public interest to provide flood control while restoring fish passage through the project. The Acting Chief Engineer's recommendation with qualifica-

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JUN 30 2026

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WATER

tions, the application, and staff report are available at <https://danr.sd.gov/public> or contact Amanda Dewell for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Acting Chief Engineer. A petition opposing the application shall be filed on a form provided by the Acting Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Acting Chief Engineer. The Acting Chief Engineer's address is "Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605) 773-3352. The applicant's mailing address is given above. If contesting the Acting Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by July 6, 2026.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Acting Chief Engineer. The comment shall be filed on a form provided by the Acting Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605) 773-3352 or writing the Acting Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by July 6, 2026.

If the applicant does not contest the recommendation of the Acting Chief Engineer and no petition to oppose the application

is received, the Acting Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled, and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition. Published on June 24, 2026 at the total approximate cost of \$72.80 and may be viewed free of charge at www.sdpublishnotices.com

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JUN 30 2026

OFFICE OF
WATER

Printer's Affidavit of Publication

STATE OF SOUTH DAKOTA
COUNTY OF GRANT

} ss.

Holli Seehafer

of said County and State, being first duly sworn, on oath says that the Grant County Review is a legal weekly newspaper of general circulation, printed and published in Milbank, in said County of Grant and State of South Dakota, by Grant County Review, Inc., and has been such newspaper during the times hereinafter mentioned; that said newspaper is a legal newspaper; and that it has a bona fide circulation of more than two hundred copies weekly, and has been published within said County of Grant in the English language and has been admitted to the United States mail under second class mailing privilege, for at least one year next prior to the publication of the Notice herein mentioned, and has been printed wholly in an office maintained at the said place of publication, that I, the undersigned, _____ Owner _____ of said newspaper, in charge of the accounts receivable department thereof, have personal knowledge of all the facts stated in this affidavit; that the advertisement headed Notice of

Flood Control Application no. FC39-3,
Upper Minnesota River Water

_____ a printed copy of which, taken from the paper in which the same was published, is attached to this sheet and is made a part of this Affidavit, was published in said newspaper at least once each week for one successive week(s), on the day of each week on which the said newspaper was regularly published, to-wit:

<u>June 24</u>	<u>20</u>	<u>26</u>	<u>20</u>
_____	<u>20</u>	_____	<u>20</u>
_____	<u>20</u>	_____	<u>20</u>

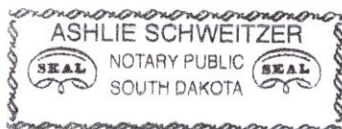
That \$ 56.24 being the full amount of the fee charged for the publication of said Notice, inures to the benefit of the publisher of the Grant County Review; that no agreement or understanding for the division thereof has been made with any person, and that no part has been agreed to be paid to any person whomsoever.

Holli Seehafer

Subscribed and sworn to before me this 24th day of June 20 26

Ashlie Schweitzer
Notary Public, Grant County, South Dakota

My Commission Expires:
September 21, 2027



Publication Fee \$ 56.24
Notarial Fee \$ _____
Total \$ 56.24

NOTICE OF FLOOD CONTROL APPLICATION NO. FC39-3

Notice is given that the Upper Minnesota River Watershed District, 211 2nd Street SE, Ortonville, MN 56278, has filed a flood control permit application for the Whetstone River Restoration Project (Preferred Alternative 2B). This project involves restoring ecological services, including fish passage, by returning flows to the historical Whetstone River channel beginning in the NE1/4SE1/4 Section 17-T121N-R46W and running approximately one mile to the Whetstone River's confluence with the Minnesota River. In the late 1930s, the historical river channel was cut off by diverting Whetstone River flows through a bypass channel to augment water levels in Big Stone Lake. Diverting flows back to the historical river channel will be accomplished by constructing a weir (crest elevation approximately 972.2 feet mean sea level [NAVD 88]) on the bypass channel in the NE1/4SE1/4 Section 17-T121N-R46W. The restored, historical Whetstone River channel is intended to carry all flow up to a 2-year return period precipitation event with flows greater than a 2-year event entering Big Stone Lake and Minnesota River via the existing bypass channel. If constructed, this project will reduce flooding around Big Stone Lake by reducing flood flows entering the lake with downstream measures implemented, including levee construction and road enhancements/reconfiguration, to mitigate flooding risks to downstream property. Project works are located along the southeastern edge of Big Stone City, South Dakota, in the SE1/4 Section 17-T121N-R46W and into Minnesota. A digital copy of Flood Control Application No. FC39-3, including submitted plans and specifications, is available by contacting the acting Acting Chief Engineer at the address or

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JUN 29 2026

OFFICE OF
WATER

Printer's Affidavit of Publication

and Attorney's Affidavit Ex-Rel. Fees

In _____ Court

STATE OF SOUTH DAKOTA
COUNTY OF GRANT

} ss.

Filed in the office of _____

_____ on the

_____ day of _____, 20____

Attorney for _____

phone number provided below.

Pursuant to SDCL 46-2A-2, the Acting Chief Engineer recommends APPROVAL of Application No. FC39-3 with qualifications because 1) the project will not increase the likelihood or severity of flood damages, 2) the project will not endanger human life or property, 3) the project will not impair existing water rights, 4) the District will be required to acquire property or the necessary easements prior to any development of the project, and 5) it is in the public interest to provide flood control while restoring fish passage through the project. The Acting Chief Engineer's recommendation with qualifications, the application, and staff report are available at <https://danr.sd.gov/public> or contact Amanda Dewell for this information, or other information, at the Water Rights Program address provided below.

Any person interested in opposing this application or recommendation shall allege that the application, upon approval, will cause injury to the person that is unique from any injury suffered by the public in general. The injury must concern a matter either within the regulatory authority found in SDCL 46-2A-9 for approval or denial of the application, or other matter concerning the application within the regulatory authority of the board to act upon as defined by SDCL 46-2-9 and 46-2-11, or both. Any person meeting the petitioner requirements and wishing to be a party of record in a contested case hearing shall file a written petition to oppose the application with BOTH the applicant and Acting Chief Engineer. A petition opposing the application shall be filed on a form provided by the Acting Chief Engineer. The petition form is available online at <https://danr.sd.gov/public> or by contacting the Acting Chief Engineer. The Acting Chief Engineer's address is

"Water Rights Program, Foss Building, 523 E Capitol, Pierre SD 57501" or call (605)773-3352. The applicant's mailing address is given above. If contesting the Acting Chief Engineer's recommendation, the applicant shall also file a petition. A petition filed by either an interested person or the applicant must be filed by July 6, 2026.

The petition shall include a statement describing the unique injury upon approval of the application on the petitioner, the petitioner's reasons for opposing the application, and the name and mailing address of the petitioner or the petitioner's legal counsel, if legal counsel is obtained.

Any interested person may file a comment on the application with the Acting Chief Engineer. The comment shall be filed on a form provided by the Acting Chief Engineer and is available online at <https://danr.sd.gov/public> or by calling (605)773-3352 or writing the Acting Chief Engineer at the address provided above. Filing a comment does not make the commenter a party of record or a participant in any hearing that may be held. Any comment must be filed by July 6, 2026.

If the applicant does not contest the recommendation of the Acting Chief Engineer and no petition to oppose the application is received, the Acting Chief Engineer shall act on the application pursuant to the recommendation with no hearing held before the Water Management Board. If a petition opposing the application or contesting the recommendation is filed, then a hearing will be scheduled, and the Water Management Board will consider this application. Notice of the hearing will be given to the applicant and any person filing a petition.

Published once at an approximate cost of \$56.24 and can be viewed free of charge at www.sdpublicnotices.com.

Rodriguez, Rachel

From: Rodriguez, Rachel
Sent: Monday, June 15, 2026 10:35 AM
To: Amber Doschadis
Subject: RE: [EXT] FC39-3 Upper Min River - Public Notice
Attachments: FC39-3 Upper Min River - Public Notice; FC39-3 Rec.pdf; FC39-3 Ltr.pdf; FC39-3 PubNotice.pdf; Watertown Info.pdf

Good Morning Amber,

Per your request, attached is a copy of the email sent to the Grant County Review. Also, attached is a copy of the report, chief engineer's recommendation, and information regarding the public notice for your flood control water permit application. As stated in the letter, please contact the paper(s) as soon as possible to authorize publication and arrange for payment. This information is also being mailed to you today.

Let me know if you have questions. Please confirm receipt of this email.

Thank you,

Rachel Rodriguez
DANR | Program Assistant
Rachel.Rodriguez@state.sd.us



From: Amber Doschadis <Amber@umrwd.org>
Sent: Monday, June 15, 2026 10:24 AM
To: Rodriguez, Rachel <Rachel.Rodriguez@state.sd.us>
Subject: Re: [EXT] FC39-3 Upper Min River - Public Notice

Hi Rachel,

Could you forward me the original email you sent to Holli, so I can add to my files?
I will reply to her to arrange payment.

Thanks so much,

Amber



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

September 3, 2026

Upper Minnesota River Watershed District
c/o Amber Doschadis
211 2nd Street SE
Ortonville MN 56278

Dear Ms. Doschadis:

Enclosed is Flood Control Permit No. FC39-3 as approved by the Water Management Board. If you have any questions pertaining to the permit, please contact this office.

Sincerely,

Adam Mathiowetz, PE
Chief Engineer
Water Rights Program
Department of Agriculture and Natural Resources

enclosure



**DEPARTMENT of AGRICULTURE
and NATURAL RESOURCES**

JOE FOSS BUILDING
523 E. CAPITOL AVE
PIERRE SD 57501-3182
danr.sd.gov

STATE OF SOUTH DAKOTA)
) SS
COUNTY OF HUGHES)

**Affidavit of Public Notice
Posting on DANR Website**

Pursuant to SDCL § 46-2A-4, public notice of the following application was posted on the DANR web site at <https://danr.sd.gov/public>. The posted public notice is the same notice as published in the pertinent newspaper(s) and a copy of the public notice is maintained in the application file. If the application is contested, the posting is moved to the DANR contested case website at <https://danr.sd.gov/public/ContestedCase.aspx> until final action is taken on the application pursuant to SDCL § 46-2A-4.

Application No.: FC39-3

Name of Applicant: Upper Minnesota River Watershed District, c/o Amber Doschadis

Date of Posting: 6/22/2026

Date of Removal: 9/3/2026

Amanda Dewell, Permitting Administrator

9/3/2026

Date

Subscribed and sworn to before me, a notary public, this 3rd day of Sept, 2026.

Notary Public - South Dakota

My commission expires:

Rachel Rodriguez
My Commission Expires
May 16, 2029

(SEAL)

