

# DESIGN REPORT

## MORGAN WETLAND BANK WETLAND RESTORATION PROJECT

REDWOOD COUNTY, MINNESOTA


May 20<sup>th</sup>, 2024

Project Number 2021-203

By  
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**5/20/2024**

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

By:  Date: May 20th, 2024  
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## **OVERVIEW:**

The following report information summarizes the proposed design for the Morgan Wetland Mitigation Bank (Project). The Project is located about 2 miles to the east of Morgan in Sections 13 of Morgan Township, Redwood County Minnesota. Currently, the site is predominantly in agricultural production and contains a large depressional wetland and some shallow upland wetlands that are extensively drained by a network of both public and private tile.

The Project's purpose is to restore drained wetlands and associated upland areas with the goal of providing multiple benefits to ground and surface waters with a focus on improved water quality and flood protection as well as providing critical habitat for pollinators and wildlife. The historic wetland communities that once existed and that are planned for restoration are typical for this area of the State and include type 2, 3 and 4 wetlands.

Included will be the acquisition of a perpetual conservation easement from the landowner who is participating in the Project. The easement has or soon will be secured through the state's Public Road Wetland Replacement Program. The scope and locations of this easement is depicted in the figures provided as part of the mitigation bank application. The current estimate of Project area to be secured under easement is 76 acres.

To facilitate the restoration of drained wetlands within the Project area, a petition to partially abandon and reroute part of JD 17 - Branch 6 and Branch 6D that extends into and through the site has been presented to the drainage authority.

This report will demonstrate that the restoration of planned wetlands within the site can successfully be accomplished while also protecting existing drainage benefits of adjoining, upstream properties. The report will also show that the Project will provide significant storage and treatment of incoming surface and subsurface runoff benefiting lands within and downstream of the JD 17 drainage system.

## **SUMMARY OF EXISTING CONDITIONS:**

Existing within the Project area are multiple subsurface drainage tile systems that drain and remove hydrology from former depressional wetland areas. Some reaches of tile extend upstream out of the Project area and provide drainage benefits to lands owned by the Project landowner as well as neighboring landowners. Important to the Project are design and construction strategies that provide for continued drainage benefits to those adjoining, non-Project areas.

A topographic survey of the existing site conditions within and in the vicinity of the Project has been completed using survey grade Trimble R10 equipment. The vertical and horizontal datums used for the survey are respectively NAVD 88 and NAD 83. The vertical datum is correlated to a known vertical geodetic monument.

Included as part of the prepared construction plans for the project is a detailed, scaled existing conditions map of the Project area. This map identifies pertinent project features including information relating to topography, existing tile and ditch drainage systems, road culverts, utilities, etc.

A contributing drainage area of approximately 208 acres provides runoff to Project wetlands. Drainage within the site occurs primarily through the JD 17 - Branch 6 which enters the site in the northwest corner as a 12-inch tile and exits the site on the east side as a 16-inch tile. In addition, JD 17 - Branch 6D enters the site from the west as a 6-inch tile and ties into JD 17 - Branch 6 as an 8-inch tile. Considering the size, depth, and storage available within the drained, depressional wetlands, it does not appear as though overground flow from the site ever occurs. Downstream of the Project area the JD 17 - Branch 6 continues to flow in easterly/northeasterly direction, under Terrace Avenue, into Brown County and eventually into the main open ditch portion of the JD 17 drainage system.

Lower elevation wetland soils within the site are predominantly Canisteo and Okoboji silty clay loams. Soils within higher elevation wetland fringe areas are generally comprised of Webster and Normania clay and silty clay loams. Upland areas within the site are composed of a variety of other loam and clay loam soils.

### Design Overview and Results of Hydrologic Modeling

Numerous grading and construction measures will be needed to disable existing drainage infrastructure and restore identified drained and altered wetlands within the Project.

As part of the design process, three main goals were considered. They are:

1. To develop a design that will successfully restore wetlands that, to the extent possible, mimic their historic condition.
2. To not cause adverse hydrologic impacts to adjoining, non-Project properties and other infrastructure.
3. To store and treat associated watershed runoff within the planned wetlands in attempt to provide improved wildlife habitat, water quality, flood control, and indirect drainage benefits to adjoining areas and downstream lands that are part of JD 17.

Following is a discussion of the work necessary to restore identified wetlands and to maintain drainage rights and protect adjoining lands from associated adverse hydrologic impacts. The identification, location, and scope of these wetlands along with requirements for construction are depicted in the prepared construction plans for the Project.

#### Wetland 1

Wetland 1 is a large historically type 4 deep marsh complex that is currently drained by JD 17 - Branch 6 and 6D tile along with other private tile systems. Once restored, this depressional wetland will have a normal water surface area of about 21.5 acres. Under normal conditions the maximum restored water depth will about 2.75 feet. In review of soils and topography, this planned wetland appears to be a little lower in elevation than what existed historically before drainage.

Being the most downstream wetland in the Project, the planned outlet for this wetland must receive and safely manage runoff from the entire upstream contributing watershed and safely pass discharges into the downstream JD 17 drainage system. To accomplish this, an inlet water level structure with adjustable stop logs will be used. To protect the water level control structure, it will be contained in a 48-inch square RCP catch basin. Discharges from the water level control structure will enter a new 15-inch dual-walled non-perforated pipe which will outlet into the existing 16-inch JD 17 - Branch 6 concrete tile (Sta. 74+66.5). Just upstream of this junction (Sta. 74+73), a new 30-inch collection manhole will be located. This collection manhole will allow the proposed JD 17 - Branch 6 12-inch re-route and junction with existing JD 17 - Branch 6 hookup. This collection manhole will also allow any overground surface runoff located on the downstream side of the proposed berm/embankment to safely enter JD 17 Branch 6 tile.

To ensure stated design goals were met, an in-depth design analysis was conducted for this wetland. A flood routing analysis was performed that determined peak flow rates, flood elevations, storage volumes and durations for a variety of storm events. Flood routing/modeling was performed using Hydro CAD Storm water Modeling software, Version 10, Build 22 along with the MSE 3, 24-Hr storm distribution. Modeling used the most current rainfall data for the site based on NOAA Atlas 14 Precipitation Frequency Atlas, Volume 8. Included in **Table 1** is the rainfall data used in this analysis that is specific to this location in the State.

The modeling assumed that evapotranspiration losses within ponded areas were negligible during flooding events. Where applicable, the modeling also assumed various flow depths over the planned outlets as the starting water surface elevation for wetland flood routing to simulate expected base flow conditions within this site.

**Table 1. Rainfall Amounts for Modeled Storm Events.**

24-Hour Storm Frequency	2 - Year	10 - Year	25 - Year	50 - Year	100 - Year
Rainfall Amount (inches)	2.70	3.95	4.90	5.72	6.61

Included in **Table 2** are the results of the hydrologic modeling for wetland 1. The data provided does not consider flood impacts that may result within this wetland and surrounding area should the downstream JD 17 main ditch experience out of bank flooding because of an excessively large runoff event within its larger watershed. Instead, the data presented focuses on predicted effects of various runoff events from the 208-acre watershed that directly contributes runoff to this site. The design of the outlet is intended to meter flows into the downstream JD 17 - Branch 6 tile. This, in combination with other planned wetland restorations within the site, will provide an overall reduction of peak flows into JD 17 and increased detention storage volumes and residence times of watershed runoff within the planned wetlands.

**Table 2. Hydrologic Modeling Results for Wetland 1.**

24-Hour Storm Event	Peak Stage (feet)	Peak Discharge (cfs)		Detention Storage Volume (ac-feet)	Detention Time Flood Pool is Above Elev. 1019.9
		Primary Outlet	Secondary Outlet		
None	1019.75 (NWL)	0.0		0	0
2 - Year	1020.71	1.7	0.0	18.8	7.6 days
10 – Year	1021.46	1.7	0.0	41.7	10.9 days
25 – Year	1021.95	1.7	0.0	63.3	12.9 days
100 - Year	1022.71	1.7	6.0	104.9	15.9 days

**Upland Wetland Areas**

These small shallow wetlands are all currently drained by private tile that flow tie into the JD 17 – Branch 6 Tile. These former depressional wetland areas are predominantly dependent on the private tile lines for drainage as they need to pond to a depth of about 0.5 feet before surface flows can occur. The contributing drainage area to these wetlands are small in size. Restoration of these wetland will consist of effectively blocking and removing tile in strategic areas. Overall ground natural outlets will control water levels for all three wetlands. The average depth of these restored wetlands will range from 0.5 – 0.75 feet. Once restored, these depressional wetlands will have a normal combined water surface area of about 1.7 acres.

**ADDITIONAL PROJECT NEEDS/ISSUES:**

Approval for the partial abandonment of the JD 17 Branch 6 and Branch 6D will be needed.

An NPDES permit will also be sought upon completion of the final construction plans.

No other permits or permissions appear necessary to complete the Project.

**ENGINEER’S FINDINGS AND RECOMMENDATIONS:**

This Project presents an excellent opportunity to restore identified wetlands within the Project area. The modeling analysis indicates that the proposed Project and its 208-acre contributing watershed will be able to perform as a multi-use wetland site providing significant flood control and water quality treatment benefits to the downstream JD 17 drainage system.

The proposed Project will not impair the utility of the JD 17 Tile system nor deprive the affected landowners of its benefit. In addition, the overall environmental impact of the Project will be positive as it will create a large block of desired wildlife habitat, will improve water quality, and reduce downstream sediment and nutrient loads.