NRCS Watershed Operations Program
Preliminary Investigation Findings Report (PIFR)

10 Mile Lake Water Management Project

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Contents

Abbreviations

CFR – Code of Federal Regulations (https://www.ecfr.gov/)

NECH – National Environmental Compliance Handbook

NWPH – National Watershed Program Handbook

NWPM – National Watershed Program Manual

USC – United States Code (US Code on House.gov)

References

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- ND Department of Environmental Quality (DEQ), NDDEQ Source Water Protection Areas, arcgis.com/home/webmap/viewer.html?webmap=293a6576bfca4b33bda08ab274e84202&extent=-104.1495,45.9117, -96.8545,49.0763

*See additional references noted in Appendix 4.

Summary

Barnes Water Resources District (WRD) approached NRCS with a project that had previously been planned and preliminary engineering completed, but for which adequate construction funding could not be secured to implement. The purpose of the 10 Mile Lake drainage project would be to alleviate road damage, restore reliable and efficient access for emergency services to rural residents, reduce groundwater flooding damages to homes and other structures, and increase agricultural production by constructing a water control structure to lower the lake elevation by 4 feet and building an outlet channel to Baldhill Creek, a tributary to the Sheyenne River. These purposes meet the PL-566 authorized purposes of Flood Prevention (flood damage reduction) and Agricultural Water Management. Installation of subsurface tile on cropland brought back into production around the lake would be necessary to avoid long term salinity issues, which would involve tiling the adjacent crop fields as well. Construction of the outlet channel would also provide opportunity for tiling cropland to both sides of the channel. Both the control structure at the lake and subsurface tile would be regulated to not allow releases of water downstream during flood conditions. Extensive wetland mitigation would be required for deep water and lacustrine wetland losses generated by lowering the lake level, as well as depressional wetland losses due to tiling crop fields and lands brought into production.

The project boundary encompasses 32,890 acres and is located in Barnes County North Dakota. 10 Mile Lake has expanded in size from zero acres of surface water in the North Dakota State Water Commission imagery dated 1957-1962, to 3,000 inundated acres in the 2022 imagery. In the 1957-1962 image, it appears there were approximately 680 acres in crop and/or hay, with the balance in pasture that is currently under water. The area has been labeled as a temporary and/or seasonal wetland for decades. A 30-year wet period in addition to changes in farming practices (increased field drainage, significant increase in soybean production and associated compaction due to land rolling) have led to the area's current condition. As a result, cropland and pasture acres which were at one time productive, are now under water. Furthermore, approximately 26 farmsteads, and 55 residences, and 16 other private and/or commercial structures in the community of Dazey are experiencing problems with septic systems and/or water in basements due to the raised water table. Approximately 2.5 miles of township roads have also been adversely affected by the high-water level. (See Exhibit 1)

The purpose of this Preliminary Investigation of Feasibility Report (PIFR) was to determine if insurmountable obstacles existed that would preclude feasibility of a PL-566 Watershed Plan. The potential benefit-cost ratio of the project (which is required to be at least 1:1) and the environmental impacts to wetlands and wildlife habitat were the two issues of concern with feasibility. During a previous state planning process completed ~20 years ago, it is reported that the U.S. Fish and Wildlife Service (USFWS) and ND Game and Fish Department (NDGF) were in concurrence with the project and identified wetland benefits on the Tolstad and Key Waterfowl Production Areas that would result from lowering the water depth in 10 Mile Lake. At that time, NRCS Wetland Compliance staff provided Barnes WRD with written agreement that the 4-foot proposed lowering of the lake correlated to 1985 average lake levels per off-site analysis. Therefore, no mitigation under the Swampbuster provisions of the Farm Bill would be required around the lake. The ND Department of Water Resources (ND DWR) both supported the project and approved state grant funding for construction at that time. No records of consultation with the U.S. Army Corps of Engineers (USACE) regarding permitting under the Clean Water Act are available, but local/state funded legal drain projects in ND often move through without USACE involvement. The project was not constructed at that time because the vote for the local tax assessment did not pass.

NRCS conducted an interagency meeting as a part of the PIFR planning process on February 15, 2024, including staff from USACE, USFWS, and ND DWR. The agencies identified several potentially serious environmental concerns with the proposed project, including the feasibility of finding the quantity of wetland mitigation that

would be required under Executive Order 11990 (E.O.11990), Bald Eagle impacts, aquatic nuisance transport from the Sheyenne River due to the outlet channel construction, downstream flooding and water quality concerns, and significant aquatic die off within and beyond 10 Mile Lake drained deepwater and wetland boundaries. The agencies came to an agreement with NRCS for methods to complete the preliminary categorization of deep water, lacustrine, and depressional wetland mitigation required for the project that were utilized in development of this PIFR (see Appendix 4).

Based on preliminary economic analysis (Appendix 4), the project was found to have a maximum potential benefit to cost ratio of 0.18:1. This is largely due to the extensive wetland mitigation required for the project, which federally funded projects are required to follow under E.O. 11990. Whether or not wetlands would be determined to be regulated by USACE under the Clean Water Act is irrelevant, given requirements of E.O. 11990 for federally funded projects. As a result, the project was found to be infeasible and will not proceed to a PL-566 Watershed Plan. In addition, even if the project had an adequate benefit to cost ratio, an adequate number of feasible sites for wetland mitigation could not be identified and significant environmental concerns are present.

Applicable Agency Authority and Authorized Purposes

The table below provides summary documentation for the project and indicates that it would meet statutory requirements of the Watershed Operations Program.

Describe the potential project watershed area; how does the area meet the requirements outlined in NRCS's National Watershed Program Manual (See 506.50 NWPM Glossary - TTT. Watershed).		
Response: The 10 Mile Lake Water Management Project has the potential to improve agricultural water management on approximately 12,749 acres of existing cropland, bring 580 acres of cropland currently too wet to farm back into production, and benefit to 26 rural homes and septic systems, 238 rural structures, 55 homes and 58 other structures within the town of Dazey, and 2.5 miles of roads through reduced groundwater flooding. The project would entail construction of a control structure and an 8.4-mile outlet channel to lower the elevation of 10 Mile Lake by 4 feet. Subsurface tile drainage, with drainage water management infrastructure, would be installed on 13,329 acres of cropland to increase yields and address salinity, some of which would be cropland restored from lowering the lake. The project would require extensive wetland mitigation sites; in total 1,254 acres of deep-water habitat, 539 acres of lacustrine fringe wetlands, and 1,612 acres of depressional wetlands would be required to be restored/created and protected by deed restrictions elsewhere in the Red River Basin.		
Will the project area exceed 250,000 acres in size? [1,2]	☐YES	■NO
If over 250,000 acres will it be divided into sub-watersheds in one plan?	☐YES	☐NO
Potential Project Area Size: 32,890 acres		
Will any single structure provide more than 12,500 acre-feet of floodwater detention capacity, or have a 25,000 acre-feet of total capacity?	☐YES[3]	■NO
How many recreational developments will be included in the project area? 0		
• One development in a project area less than 75,000 acres	☐YES	☐NO
• Two developments in a project area between 75,000 and 150,000 acres	☐YES	☐NO
• Three developments in a project area greater than 150,000 acres	☐YES	☐NO
Which authorized purposes will the project address? (Indicate only one purpose as primary):		
	Primary	Other
• Flood prevention	☐	■
• Watershed Protection	☐	☐
• Public Recreation	☐	☐

• Public Fish and Wildlife	☐	☐
• Agricultural Water Management	☒	☐
• Municipal or Industrial Water Supply	☐	☐
• Water Quality Management	☐	☐

Will the project produce substantial benefits to the general public, to communities, and to groups of landowners?	☒YES	☐NO[3]
Can the project be installed by individual or collective landowners under alternative cost-sharing assistance?	☐YES[3]	☒NO
Will the project have strong local citizen and sponsor support through agreements to obtain land rights, permits, contribute the local cost of construction, and carry out operation and maintenance.	☒YES	☐NO[3]
Will the project take place in a Special Designated Area? (if yes, check applicable area below.)	YES	☒NO

Appalachia	☐	Delaware River Basin	☐	Susquehanna River Basin	☐	Tennessee Valley	☐	

1- For specific appropriations, the 250,000 acres is waived except for watershed projects with the flood prevention purpose.
2- Watersheds exceeding 250,000 acres can be broken up into smaller sub-watersheds.
3- The project will not meet the statutory requirements.

Potential for 20% Agricultural (Rural) Benefits

The 10 Mile Lake Water Management Project would have the authorized PL-566 purposes of Agricultural Water Management and Flood Prevention. 100% of the project benefits would be considered rural.

Project Overview

Proposed Project Name	Ten Mile Lake Water Management Project
State	North Dakota
County/Parish	Barnes County
Congressional District	ND – 1 (statewide)
USGS Hydrologic Unit Code (HUC) and Watershed Name	Portions of the following 12-digit HUCs are included in the project area: Orren Slough 090202040103, Tomahawk Lake 090202040104, Silver Creek 090202030703, and Baldhill Creek 090202030808. (See Exhibit 2)
General Coordinates of the Watershed	47.133036N -98.390515W

Project Setting	Barnes County has a total area of 1,513.41 square miles and is located in east central North Dakota. Barnes county is bordered by Cass County to the east, Stutsman County to the west, Ransom and LaMoure to the South, and Griggs and Steele Counties to the north. (See Exhibit 3) Eastern North Dakota's climate consists of cold winters and hot summers. Average daily high temperatures range from 19°F in January, to 81°F in July. Average daily low temperatures range from -2°F in January and 56 °F in July. The growing season in this part of the state is approximately 130 days. Barnes county averages 20.6 inches of annual precipitation. The majority of the total land area (92.9%) in Barnes County is undeveloped land. There are 645,244 acres of prime and prime if drained cropland, 84,118 acres of pasture, and approximately 14,080 acres is water. Geologically, the area is characterized as a glacial till plain. The till plain was formed with the recession of the most recent ice age approximately 10,000 years ago. The community of Dazey was founded in 1883. It encompasses 0.38 square miles of land. According to the 2020 census, Dazey has 78 residents living in 55 households. There are two churches, a fire station, and a bar and grill. At the present time, there are no public schools and the U.S. Post Office is permanently closed.
Potential Project Area - Size	32,890 acres
Resource Information	
Soils	The watershed is located in the Central Black Glaciated Plains Major Land Resource Area (55B). Soils are deep, ranging from deep to moderately well drained to very poorly drained drainage regimes and varying textures from clayey to sandy. The project area includes 23,749 acres of prime, or prime if drained farmland which constitutes 72% of the project area. Approximately half of those acres may be eligible for drainage and will likely benefit from the installation of this project. (See Exhibit 4) Hydric soils are those that are saturated, flooded, or ponded for a significant portion of the growing season and develop anerobic conditions that support the growth and regeneration of hydrophytic vegetation (US Army Corps of Engineers Environmental Laboratory 1987). Soil surveys and individual components are consolidated as map units based on these unique properties and displayed in the range of 0 to 100 indicating nonhydric to hydric. (See Exhibit 5)

	The Crop Productivity Index (CPI) is a measure of the physical and chemical properties of a soil. The values range from low inherit productivity to moderately high inherent productivity in the watershed. CPI is independent from land management such as drainage and irrigation. See (Exhibit 6)
Water	The Area of Interest lies within the Sheyenne River Basin. The Sheyenne River confluences with the Red River at the eastern boundary of North Dakota. The Sheyenne River and several named tributaries run through Barnes County. (See Exhibit 2) Bald Hill Creek is a major tributary to the Sheyenne River. Both the Bald Hill Creek and the Sheyenne River are listed as Total Maximum Daily Load (TMDL) water bodies. The outlet channel to be constructed for this project will empty directly into the Bald Hill Creek which flows into the Sheyenne River above the Bald Hill Dam (Lake Ashtabula). The Area of Interest is underlined by the Spiritwood-Griggs aquifer. There are no public Wellhead Protection Areas within the project area. Project area lies within the Barnes Rural Water District service area. (See Exhibit 2 and Exhibit 12)
Air	The potential project area surrounds the community of Dazey and along some rural residences. Dust from any construction could negatively impact the public. The air quality of the watershed is consistent with other rural areas in the eastern part of North Dakota. There are no factories or industries within the watershed that would contribute point source of air pollutants. Potential air pollutants in the watershed are limited to agriculturally related non-point sources from crop and livestock operations.
Plants	There are no threatened, endangered, or candidate plant species listed in the project area (United States Fish and Wildlife Service, 2020). This information is preliminary and was obtained using the U.S. Fish and Wildlife Service's online mapper for informational purposes only.
Animals	A primary migration route for waterfowl and other migratory bird species passes through the proposed project area.
Energy	Cass County Electric services Barnes County, the power sources for which are 57% lignite coal, 34% wind, 7% hydro, and 2% other. The pumps that service existing privately owned subsurface drainage systems for cropland are typically electric.

Human	Demographics: The watershed is located within 1 census block group which is predominantly rural. The total population is 718 people within 242.6 square miles. The population is 96% white, 3% two or more races, and 1% Hawaiian/Pacific Islander. Metrics for this group are below the state and national average for Low Income. They are above the state average, but below the national average for Unemployment Rate, and Less than a high school education. (See Exhibit 13) Transportation: One East-West railroad (Canadian Pacific) runs along a portion of the southern border of the watershed. This Railroad is a freight line hauling primarily fuels, grains, and other agricultural products. North Dakota state highway 1 runs North-South through about a ¼ mile east of Dazey. North Dakota state highway 26 runs East-West in the eastern ¼ of the watershed. North Dakota state highway 9 runs East-West along portions of the southern border of the watershed. Barnes County highway 4 runs East-West bisecting the watershed, and Barnes County Road 7 runs North-South along portions of the western boundary. (See Exhibit 7) Recreation: The North Country Trail runs along the Sheyenne River through Barnes County. As does the Sheyenne River water trail. There are no described fisheries located within the watershed. Hunting for upland birds, waterfowl, white tailed deer, and fur bearers such as coyotes are the primary outdoor recreational activities in the area. The Ray Holland Marsh Wildlife Management Area and the Tolstad Waterfowl Production Area are publicly owned and open to hunting. Both are located within the AOI. There are several ND Game & Fish Private Lands Open to Sportsmen (PLOTS) tracts spread throughout the AOI that are also open to hunting. (See Exhibit 8)

Resources of Special Concern	
Clean Water Act	Silver Creek along with a tributary that begins within the watershed are listed as an impaired waters. Silver Creek is a tributary to Baldhill Creek which the proposed drainage channel empties into. Baldhill Creek is also listed as an impaired water. Additionally, Baldhill Creek empties into Lake Ashtabula (A reservoir on the Sheyenne River) which is listed as an impaired water. (See Exhibit 2) See wetlands section for additional Clean Water Act wetland information.
Clean Air Act	The air quality of the watershed is consistent with other rural areas in the eastern part of North Dakota. There are no factories or industries within the AOI that would contribute point source of air pollutants. Potential air pollutants in the watershed are limited to agriculturally related non-point sources from crop and livestock operations.

Coastal Zone Management	Not applicable in North Dakota
Coral Reefs	Not applicable in North Dakota
Cultural Resources	A review of the state Cultural Resource Information System identified 3 previous cultural resource surveys and 15 recorded archeological sites and structures within the proposed project area.
Endangered & Threatened Species	A USFWS IPac evaluation was completed for the 10 Mile Lake project area. There is potential for occurrence of three listed species. The Northern Long-eared Bat (*Myotis septentrionalis*) is an endangered species listed. The Dakota Skipper (*Hesperia dacotae*) is a threatened species that is listed. The Monarch Butterfly (*Danaus Plexippus*) is a candidate species that is listed. There are no critical habitats exist for any endangered, threatened, or candidate species.
Environmental Justice and Equity	One census block group encompasses the area (https://www.epa.gov/ejscreen). No populations were disproportionately represented within this group compared with the state, county or other nearby block groups. The project is located entirely within Barnes County. It is estimated that 15% of the project benefits will be experienced by individuals who are categorized as low income and 4% of whom are people of color. (See Exhibit 13)
Essential Fish Habitat	Not Applicable in North Dakota
Floodplain Management	FEMA has not completed any mapping in the watershed, and the ND Department of Water Resources Flood Risk Assessment mapping (NDRAM) indicates variable risk areas for surface water generated flooding within the watershed. Flood risk areas include pothole wetlands, lacustrine fringes, and riverine floodplains.
Invasive Species	Zebra Mussels and Curly Leaf Pondweed have been documented in Lake Ashtabula, making their presence in the Baldhill Creek likely. Several noxious weeds are commonly present in this region including Canada Thistle, Musk Thistle, Leafy Spurge and Absinthe Wormwood.
Migratory Birds/Bald & Golden Eagle Protection Act	Bald eagle nests are possible but have not been identified in the area. The lack of tall trees makes their presence unlikely. Other migratory birds listed as species of concern that may be found in the watershed throughout the year are Black Tern, Franklin's Gull, Lesser Yellow Legs, Northern Harrier, Pectoral Sandpiper, and Willet.

Natural Areas	The landscape within and surrounding the 10 Mile Lake project area is dotted with numerous natural areas. There are 7 US Fish & Wildlife Service (FWS) Waterfowl Production Areas – Key, Tolstad, Ohnstad, Wogsland, Walum, Mosher, and Ernie; 1 FWS Easement Refuge, Tomahawk; and 1 ND Game & Fish Dept. Wildlife Management Area – Ray Holland Marsh WMA located within 5 miles of 10 Mile Lake. (See Exhibit 8)
Prime and Unique Farmlands	72 percent of the farmland in the proposed project area (23,749 acres) is designated as prime farmland or prime if drained. (See Exhibit 4)
Riparian Area	The Baldhill Creek is located at the far eastern edge of the watershed; Baldhill Creek empties into the Sheyenne River downstream of the project area. Both are bordered by a mix of native herbaceous vegetation, crop and hay/pastureland There are numerous fresh water emergent wetlands within the project area intersected by large and small drains. The larger wetlands in the watershed are lined with native and introduced herbaceous vegetation. Smaller wetlands within the cropland are typically unbuffered. See Exhibits 2
Scenic Beauty	Except for Lake Ashtabula, the landscape is under intensive agricultural management.
Wetlands	According to US Fish & Wildlife Service National Wetland Inventory (NWI) data, wetlands comprise 22.8% (7,488.6 acres) of the total geographical area of the project area. The wetlands are broken down to 3,237.6 acres of Lacustrine wetlands, 4,025.9 acres of palustrine wetlands, and 225.6 acres of riverine wetlands. Of that, 1,368 basins totaling 1,611 acres (does not include 10 Mile Lake) are not protected by conservation easements, or in public fee-title ownership. This makes those wetlands potentially eligible for conversion to crop production through the installation of surface and subsurface drainage systems. If the project were to proceed to a full plan, field wetland delineation utilizing the USACE regional methodology would need to occur on an extensive area to get a realistic figure given that NWI is very approximate. (See Exhibit 9)
Wild and Scenic Rivers	Not Applicable in North Dakota

Proposed Project Purpose and Need Statement

The purposes of the proposed project are agricultural water management and flood prevention. Due to a 30-year wet period, in addition to changes in farming practices, 10 Mile Lake has expanded in size from zero acres in 1957-62 to 3,000 acres currently, negatively impacting agricultural production. Groundwater flooding impacts approximately 26 farmsteads and 55 homes in the community of Dazey, including damages to septic systems and/or water in basements due to the raised water table. High ground and surface water levels generates the

need for continual raising township roads, as well as re-surfacing and armoring road fills adjacent to new open water areas. Alternate routes taken because unsafe, or impassible roads have caused response times by emergency services to increase.

Resource Concerns

This section describes the resource concerns that may potentially be impacted by implementation of the proposed project. Positive effects of the proposed project can include opportunities for improvement or protection of existing resources. For the preliminary investigation findings report; resources are identified within, and adjacent to, the proposed project area. The summary also includes any regional or national impacts that may occur as a result of the projects implementation.

Potential Effects of Proposed Alternatives on SWAPA + E + H Resources and Resources of Special Concern

Use: ***+ - Positive Impact*** ***- - Negative Impact*** ***0 - No Impact***

	Alternative 1 – Control Structure, Channel, Maximize Cropland Benefits	Alternative 2 – Control Structure, Channel, Cropland Benefits Adjacent to Lake
Soil	**+**	**+**
Water	**+/-**	**+/-**
Air	**-**	**-**
Plants	**+/-**	**+/-**
Animals	**-**	**-**
Energy	**-**	**-**
Human	**+**	**+**
Clean Air Act	**0**	**0**
Clean Water Act/Waters of the U.S.	**-**	**-**
Coastal Zone Management	**0**	**0**
Coral Reefs	**0**	**0**
Cultural Resources/Historic Properties	**-**	**-**
Endangered & Threatened Species	**-**	**-**
Environmental Justice	**0**	**0**
Essential Fish Habitat	**0**	**0**
Floodplain Management	**0**	**0**
Invasive Species	**-**	**-**
Migratory Birds/Bald and Golden Eagle Protection Act	**-**	**-**
Natural Areas	**-**	**-**

Opportunities

Subsurface tile is present in the watershed already, discharging to road ditches and natural channels. Most producers are not implementing Drainage Water Management (DWM) currently. DWM is the process of managing timing and amount of water discharges from agricultural drainage systems and would be installed on the new cropland tile systems constructed through PL-566. DWM has been found effective in reducing nitrogen delivery to downstream water bodies and it allows adequate soil moisture to retained in the soil profile for crop needs during drought periods, while removing excess subsurface water when necessary for field operations/crop growth. Through this project, DWM would be incorporated into design of the PL-566 funded tiling systems, which could encourage operators of private systems to do the same. DWM helps producers achieve both production and water quality goals. Drainage water management may be implemented in conjunction with other conservation practices that improve nutrient management, soil health, etc. through various USDA-NRCS or Conservation District programs such as EQIP, CSP, etc. which could be implemented in a targeted effort with a PL-566 project in the watershed.

State, Tribal, Federal Stakeholder Engagement

As outlined in the summary section, state and federal agencies have been involved in planning for a drainage project on 10-Mile Lake prior to the involvement of NRCS. NRCS conducted an interagency meeting as a part of the PIFR planning process on February 15, 2024, including staff from USACE, USFWS, and ND DWR to discuss the potential project and hone in on a reasonable approach for estimating the mitigation needs for the project. Given that the results of the PIFR indicate that the project is not feasible to move forward, NRCS did not initiate consultation with Tribes for the State Historical Preservation Office. Copies of the final PIFR were sent to USACE, USFWS, and ND DWR for their information.

Alternatives

A previous design had been developed for the Barnes WRD on planning and design of the previous state funded project, it provided preliminary drawings for the proposed control structure and drain channel. NRCS reviewed and determined that the drain channel location did not meet E.O. 11990 requirements to minimize impacts to wetlands, therefore NRCS/Houston Engineering staff laid out an alternative route that would have less impact on wetlands. See Appendix 4 for further details. If the project were to move forward to a full watershed planning process, it is likely that many other route alternatives would be considered as well. During the previous state planning process, local landowners were highly involved in discussion/selection of route alternatives for the channel.

The intention of Barnes WRD with the project was to simply construct the control structure and outlet channel, with the expectation that private landowners would be responsible for their own tiling projects on cropland. NRCS did not feel that would be appropriate in the lands adjacent to 10 Mile Lake given the soils, therefore would require tile to be installed in at least those areas to prevent future salinity issues. Recognizing that the benefits from this minimal crop field tiling alternative (Alternative 2, Exhibit 11) were limited, NRCS then developed Alternative 1 (Exhibit 10) to evaluate an alternative that would maximize economic benefits from the project to assess which would have a higher benefit-cost ratio.

Alternatives	Possible Positive Impacts and Effects	Possible Adverse Impacts and Effects
Alternative 1 – Control Structure, Outlet Channel, and Maximize Cropland Drainage Water control structure would be placed at the lake outlet. An 8.35-mile outlet channel would be constructed to lower the level of 10 Mile Lake 4 feet. Tile drainage, with drainage water management systems, would be installed in cropland brought back into production around the lake to avoid salinity development and along the outlet channel to maximize project benefits. Mitigation requirements for the project would be 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wetland, and 1,612 acres of depressional wetlands. Estimated construction costs: $ 18,595,860 Estimated mitigation costs: $ 88,993,282 Total implementation costs: $ 110,374,462 Average annual cost: $ 4,133,855 Average annual benefits: $ 757,703 Benefit-to-Cost ratio: 0.18:1	• Increased production on 13,329 acres of cropland that would be tile drained with the project • 580 acres of cropland back into production that was formerly lake bottom or non-cropped uplands (included I the 13,329 acres of tile drainage noted above to avoid salinity build up) • Township roads would no longer be impacted by high water levels during wet periods. Significantly reducing avg. O&M costs. • Rural residences would no longer have chronic issues with water in basements, and damage to other farmstead infrastructure due to saturated soils during wet periods. • O&M of sewage system, roads, and other infrastructure reduced due to lower water table. • Soil compaction reduced due to viability of no-till practices under dryer soil condition • Soil salinity reduced due to lower water table and consistently lower lake level.	• Increased flows of chemicals and nutrients into the outlet channel would lead to decreased water quality in the Sheyenne River system. • Immediate and increased flows from drainage systems could strain floodwater storage in Lake Ashtabula, however timing of releases would be managed to ensure overland flooding would not occur from the channel. • The outlet channel would be a direct conduit to 10 Mile Lake for invasive species currently in the Baldhill Creek and Lake Ashtabula. • Loss of 1,243 acres of deepwater habitat, 539 acres of lacustrine fringe wetlands, and 1,612 acres of depressional wetlands would be mitigated for within the Red River Basin mitigation zone, however they would not be within this watershed. Mitigation sites may take decades to establish the same functions and values as existing wetlands. • An extensive quantity of high quality wildlife habitat would eliminated and not replaced within the 10 Mile watershed. • Most drainage systems would require electric pumps to discharge into the outlet channel. This will increase energy demands. • Critical habitat for migratory birds would be eliminated due to conversion of wetlands in the watershed.

Alternative 2 – Control Structure, Outlet Channel, Limited Subsurface Drainage Water control structure would be placed at the lake outlet. An 8.35-mile outlet channel would be constructed to lower the level of 10 Mile Lake 4 feet. Tile drainage, with drainage water management systems, would be in cropland brought back into production around the lake to avoid salinity development. Adjacent crop fields would also be tiled. Mitigation requirements for the project would be 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wetland, and 156 acres of depressional wetlands. Estimated construction costs: $ 5,832,420 Estimated mitigation costs: $ 59,873,282 Total implementation costs: $ 67,810,862 Average annual cost: $ 2,524,750 Average annual benefits: $ 260,778 Benefit-to-Cost ratio: 0.10:1	• 340 acres of cropland back into production that was formerly lake bottom or non-cropped uplands (would be tiled to avoid salinity build up) • Township roads would no longer be impacted by high water levels during wet periods. Significantly reducing avg. O&M costs. • Rural residences within the watershed would no longer have chronic issues with water in basements, and damage to other farmstead infrastructure due to saturated soils during wet periods. • O&M of sewage system, roads, and other infrastructure reduced significantly due to lower water table. • Soil compaction reduced due to viability of no-till practices under dryer soil condition • Soil salinity reduced due to lower water table and consistently lower lake level. Increased plant productivity due to lower lake level and lower water table.	• Increased flows of chemicals and nutrients into the outlet channel would lead to decreased water quality in the Sheyenne River system. • Immediate and increased flows from drainage systems would strain floodwater storage in Lake Ashtabula, however timing of releases would be managed to ensure overland flooding would not occur from the channel. • The outlet channel would be a direct conduit to 10 Mile Lake for invasive species currently in the Baldhill Creek and Lake Ashtabula. • Loss of 1,243 acres of deepwater habitat, 539 acres of lacustrine fringe wetlands, and 156 acres of depressional wetlands would be mitigated for within the Red River Basin mitigation zone, however they would not be within this watershed. Mitigation sites may take decades to establish the same functions and values as existing wetlands. • An extensive quantity of high-quality wildlife habitat would eliminated and not replaced within the 10 Mile watershed. • Most drainage systems would require electric pumps to discharge into the outlet channel. This will increase energy demands. • Critical habitat for migratory birds would be eliminated due to conversion of wetlands in the watershed.

Potential Economic Benefits

Economic benefits of the project were estimated for crop production and reduced costs from groundwater flooding for roads, residences, and the community of Dazey for both alternatives. Exhibits 10 and 11 illustrate

the measures to be installed and the benefit areas for each alternative. Appendix 4 provides further details of the economic benefits analysis, the results of which are summarized below.

Benefit Category	Alternative 1		Alternative 2	
	Quantity	Annual Benefits	Quantity	Annual Benefits
Production on newly created cropland (all would be tiled)	580 acres	$ 98,016	340 acres	$ 57,458
Increased production on existing cropland due to tiling	13,329 acres	$988,326	2,133 acres	$ 158,159
Reduced Road Maintenance Costs	2.5 mi	$ 61,243	2.5 mi	$ 61,243
Reduced Residential Costs	81 homes	$ 20,000	81 homes	$ 20,000
Reduced Municipal Costs	City of Dazey	$ 20,000	City of Dazey	$ 20,000
Total Annual Benefits		$ 1,187,585		$ 316,860

Potential Implementation Costs

An estimate of construction, mitigation, operation and maintenance, and other implementation costs were completed for both alternatives, as detailed in Appendix 4 and summarized below.

Alternative 1 Implementation Cost Summary

Cost Category	Total Cost	NRCS Share	Local Share
Drainage Project Construction	$18,595,860	$13,946,895	$4,648,965
Drainage Project Land Rights	$1,125,000	$0	$1,125,000
Utility Relocations	$215,000	$0	$215,000
Wetland Mitigation Construction/Land Rights	$88,993,282	$44,496,641	$44,496,641
Engineering Design	$816,192	$816,192	$0
Construction Engineering	$544,128	$544,128	$0
Sponsor Legal/Contract Admin	$85,000	$0	$85,000
Total	$110,374,462	$59,803,856	$50,570,606

Alternative 2 Implementation Cost Summary

Cost Category	Total Cost	NRCS Share	Local Share
Drainage Project Construction	$5,832,420	$4,374,315	$1,458,105
Drainage Project Land Rights	$1,125,000	$0	$1,125,000
Utility Relocations	$215,000	$0	$215,000
Wetland Mitigation Construction/Land Rights	$59,873,282	$29,936,641	$29,936,641
Engineering Design	$408,096	$408,096	$0
Construction Engineering	$272,064	$272,064	$0
Sponsor Legal/Contract Admin	$85,000	$0	$85,000
Total	$67,810,862	$34,991,116	$32,819,746

The PL-566 Watershed Plan for this project would require congressional approval, given that costs would exceed $25 million.

Facilitating Factors

The Barnes County WRD, Barnes County, and local landowners are in strong support of the project. Grant funding for a portion of the non-federal costs of the project would be available from ND DWR.

Obstructing Factors

Executive Order 11990 which requires federal agencies to avoid, minimize, and mitigate impacts to wetlands, in that order, could be a significant obstruction to development of a watershed plan. Although there are no other alternatives to meet the project purposes in this watershed, ND NRCS is unsure if simply minimizing and mitigating for wetland impacts while still maximizing economic benefits from cropland drainage, which is the primary purpose of the PL-566 project, would meet the policy. The PFIR assumes the "best case" scenario from an economic standpoint: 1) that the project could implement deep water and lacustrine fringe wetland mitigation through construction of a dam without impounding water on depressional or riparian wetlands, which would then require further mitigation and 2) restoration of deep water, lacustrine, and depressional wetlands would not take cropland out of production elsewhere in the region. Both of those assumptions are highly unlikely to be present, therefore in reality the benefit to cost ratio of this project would be even lower than that reported. Finding landowners within the Red River Basin willing to sell land rights for dam construction and wetland restoration on their property, to the degree required to implement this project, would likely be an insurmountable challenge. Currently developers struggle to find credit to purchase for even small (<2 acre) wetland mitigation needs. Given that the preliminary economic analysis indicated the project is not feasible, even in a "best case" economic scenario, no further work to explore these issues was warranted.

Sponsor

The project sponsor for this project has been identified as listed below:

Sponsor Will:	Assist in Planning	Land Rights / Eminent Doman	Local Cost Share	O/M Funds	Permits	Land Treatment	In-Kind MOU
Barnes County Water Resource District	Yes	Yes	Yes	Yes	Yes	N/A	N/A

Sponsor(s) will:

- Assist in the locally led planning effort.
- Obtain needed land rights including the use of power of eminent domain, if necessary.
- Provide local cost-share funds and/or in-kind services to provide the required portion of total project costs.
- Provide funds for continuing operation and maintenance actions.
- Obtain required permits and approvals at sponsor cost:
- Provide leadership to help ensure adequate conservation land treatment measures are maintained on at least 50% of the watershed area above retention reservoirs.
- Before being credited with the value of any in-kind contribution for any in-kind services and/or acquisition of land rights, sponsor will sign a Memorandum of Understanding (MOU) with NRCS.

Notifications

If a preliminary investigation findings report is undertaken, the STC must notify in writing the Governors concerned, the U.S. Fish and Wildlife Service, the National Oceanic Atmospheric Administration National Marine Fisheries Service, the U.S. Army Corps of Engineers, and all other Federal agencies concerned with a decision to

initiate any survey or field investigation involving water resources development work and furnish them with appropriate information regarding the scope, nature, status, and results of such survey or investigation (Executive Order 10584 Section 3).

	Method and Date Notified
Governor	ND DWR represents the Governor of ND on water resource projects in the state. ND DWR participated in an interagency meeting on 2/15/24 and were mailed the final PIFR 9/2024.
National Oceanic Atmospheric Administration National Marine Fisheries Service	Not applicable in North Dakota
U.S. Fish and Wildlife Service	USFWS participated in an interagency meeting on 2/15/24 and were mailed the final PIFR 9/2024.
U.S. Army Corps of Engineers	USACE was invited to the interagency meeting on 2/15/24 and were mailed the final PIFR 9/2024.

Estimated Project Implementation Timeline

The project was found to be infeasible to proceed to implementation.

Recommendation

This preliminary investigation findings report has been completed and submitted for approval to Dan Hovland, ND STC, by the State Conservation Engineer and State Resource Conservationist.

It has been determined that this potential PL-566 watershed operations project:

Does	Does Not	
■	☐	… meet the statutory acreage, volume/capacity of structure and recreational limit requirements;
■	☐	… meet the requirements of one or more Watershed Operations authorized purposes;
■	☐	… have the potential for a minimum of 20% agricultural, or rural, benefits;
■	☐	… have one or more viable alternatives;
■	☐	… have potential project sponsor(s) that meet and agree to all terms of responsibilities;
■	☐	… have apparent insurmountable obstacles.

State Conservation Engineer/
Watershed Program Manager

Signature: CHRISTI FISHER Digitally signed by CHRISTI FISHER Date: 2024.09.09 15:25:35 -05'00'

State Resource Conservationist Signature: RICHARD WEBB Digitally signed by RICHARD WEBB Date: 2024.09.09 15:32:03 -05'00'

X	Not recommended for planning funding
	Accepted and recommended for Planning Funding

State Conservationist Signature: DANIEL HOVLAND Digitally signed by DANIEL HOVLAND Date: 2024.09.10 08:47:52 -05'00'

Glossary

Rural – All territories of a State that are not within the outer boundary of any city or town that has a population of 50,000 or more according to the latest decennial census of the United States (2010 Census Urban and Rural Classification and Urban Area Criteria). [Source Title 390 – NWPM Part 506.50 Glossary, MMM]

Appendices

- Appendix 1: Exhibits
  - Exhibit 1: Watershed Project Area
  - Exhibit 2: Water Resources
  - Exhibit 3: 10 Miles Lake Project Setting
  - Exhibit 4: Farmland Classification of Soils
  - Exhibit 5: Hydric Soils
  - Exhibit 6: Cropland Productivity Index
  - Exhibit 7: Transportation Infrastructure
  - Exhibit 8: Recreational Lands
  - Exhibit 9: National Wetland Inventory
  - Exhibit 10: Alternative 1
  - Exhibit 11: Alternative 2
  - Exhibit 12: HEI 10 Mile Lake Watershed
  - Exhibit 13: EJScreen Community Report
- Appendix 2:
  - Sponsor Letter of Request
  - Sponsor Declaration Forms
- Appendix 3: Preliminary Environmental Evaluation (CPA 52)
- Appendix 4: Technical Analysis

Appendix 1: Exhibits

Exhibit 1: Watershed Project Area

Exhibit 2: Water Resources

Exhibit 3: 10 Miles Lake Project Setting

Exhibit 4: Farmland Classification of Soils

Exhibit 5: Hydric Soils

Exhibit 6: Cropland Productivity Index

Exhibit 7: Transportation Infrastructure

Exhibit 8: Recreational Lands

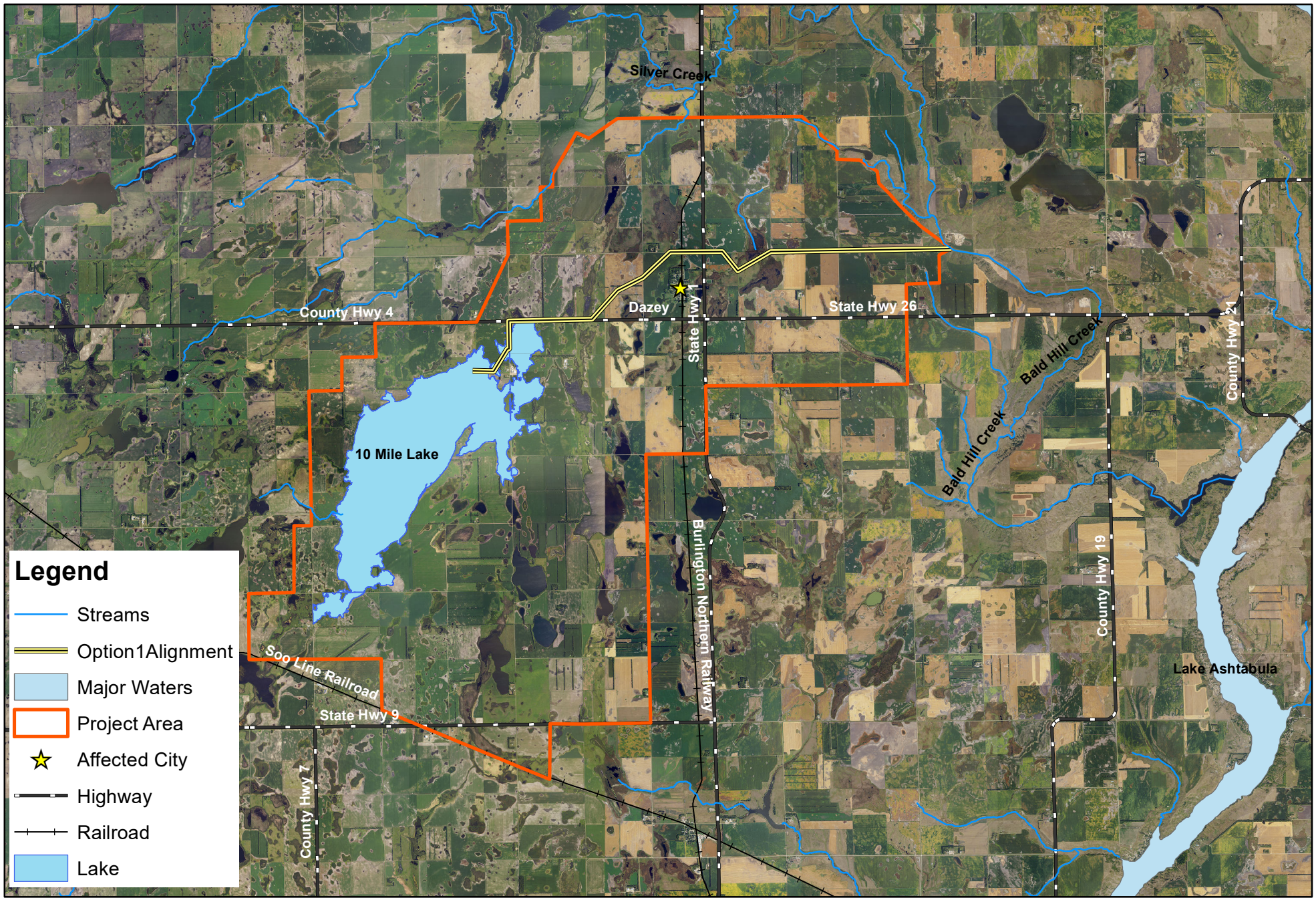
Exhibit 9: National Wetland Inventory

Exhibit 10: Alternative 1

Exhibit 11: Alternative 2

Exhibit 12: HEI 10 Mile Lake Watershed

Exhibit 13: EJScreen Community Report



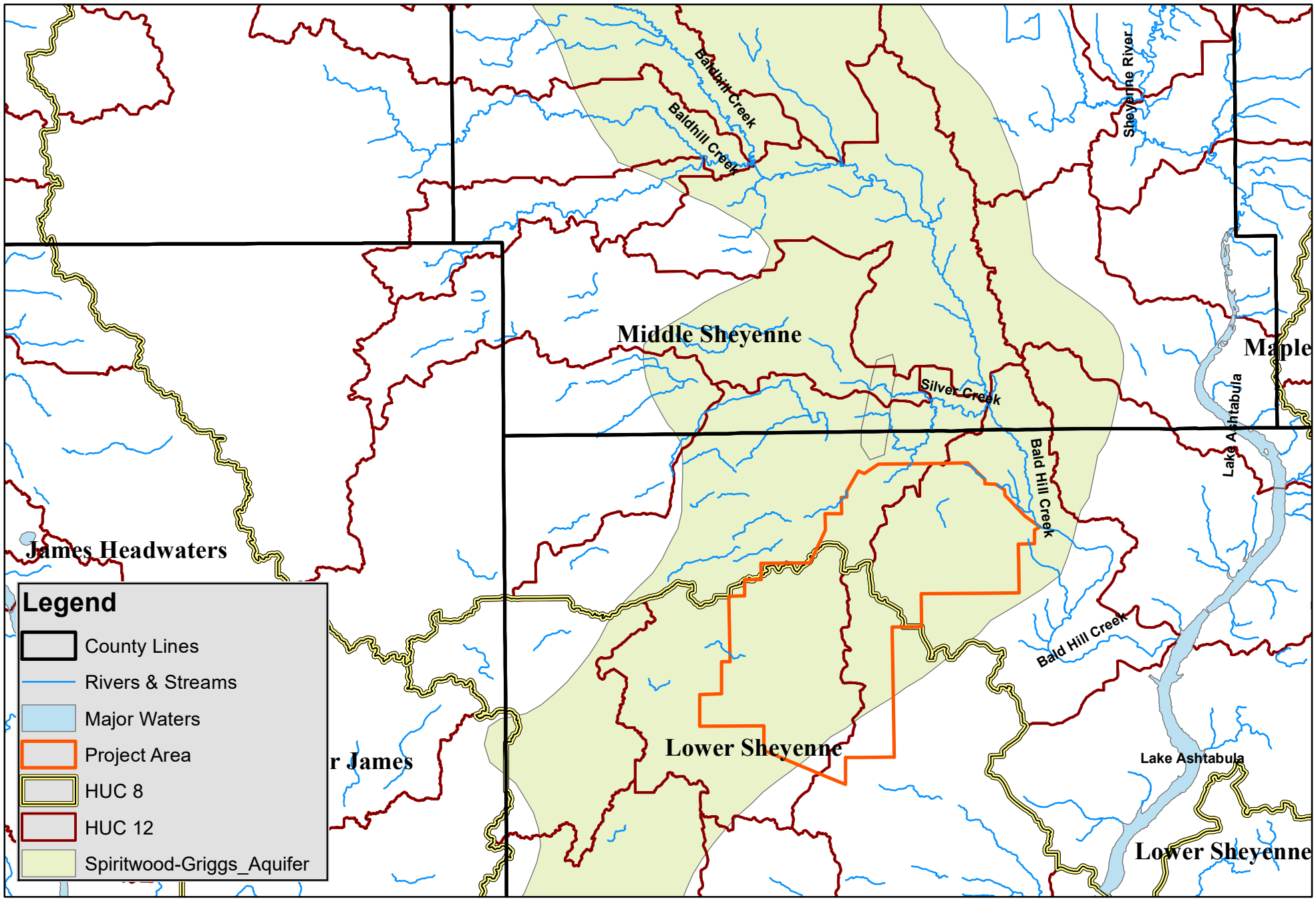
USDA United States Department of Agriculture

Exhibit 1

Watershed Project Area

Miles
0 0.5 1 2 3 4

N



USDA United States Department of Agriculture

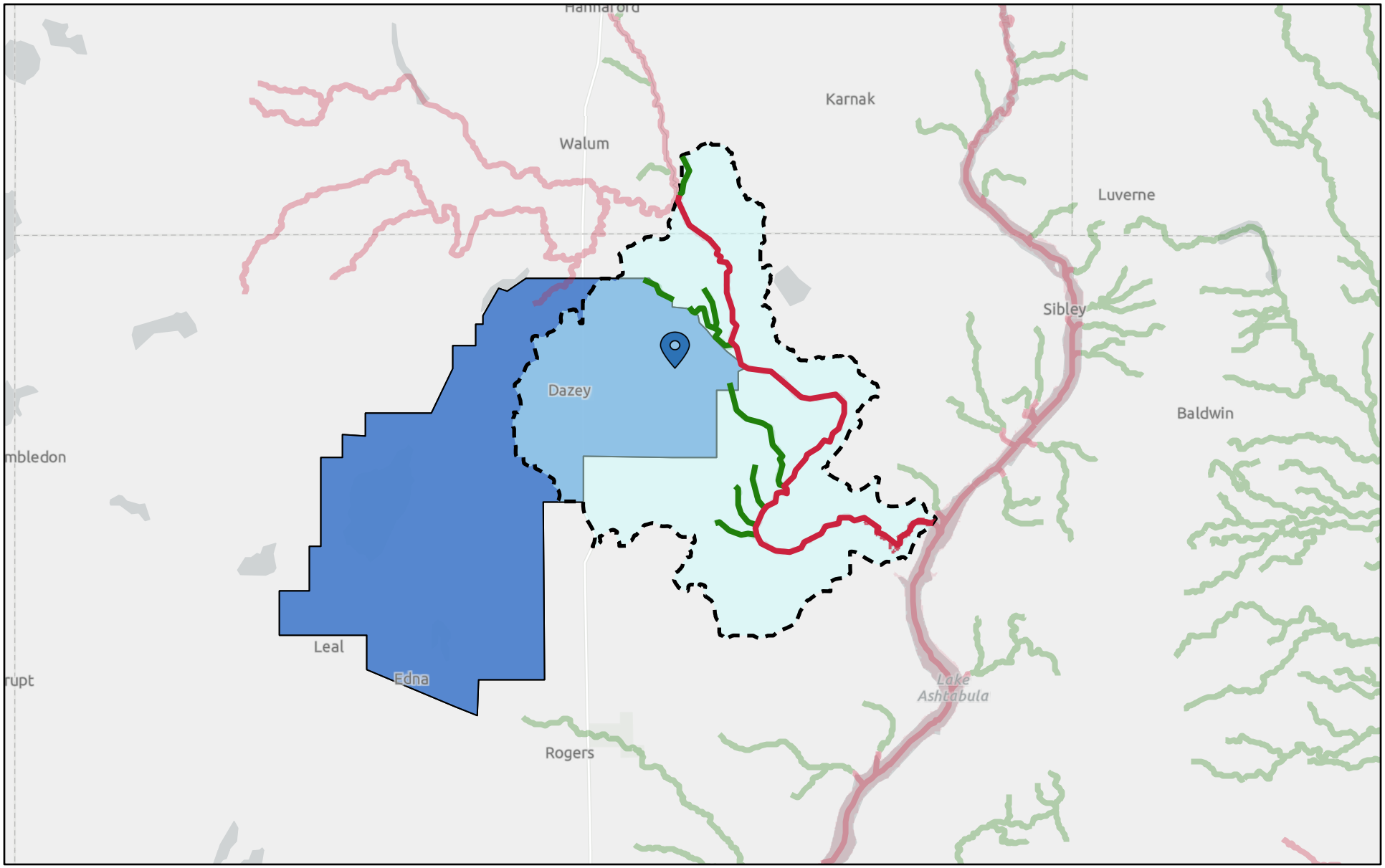
Exhibit 2

Water Resources
(HUC, Rivers, Aquifers)

0 1 2 4 6 8 Miles

N

Clean Water Act 303d



7/10/2024

Waterbody: Good

Waterbody: Impaired

Waterbody: Condition Unknown

HUC12 Boundaries

Project Area

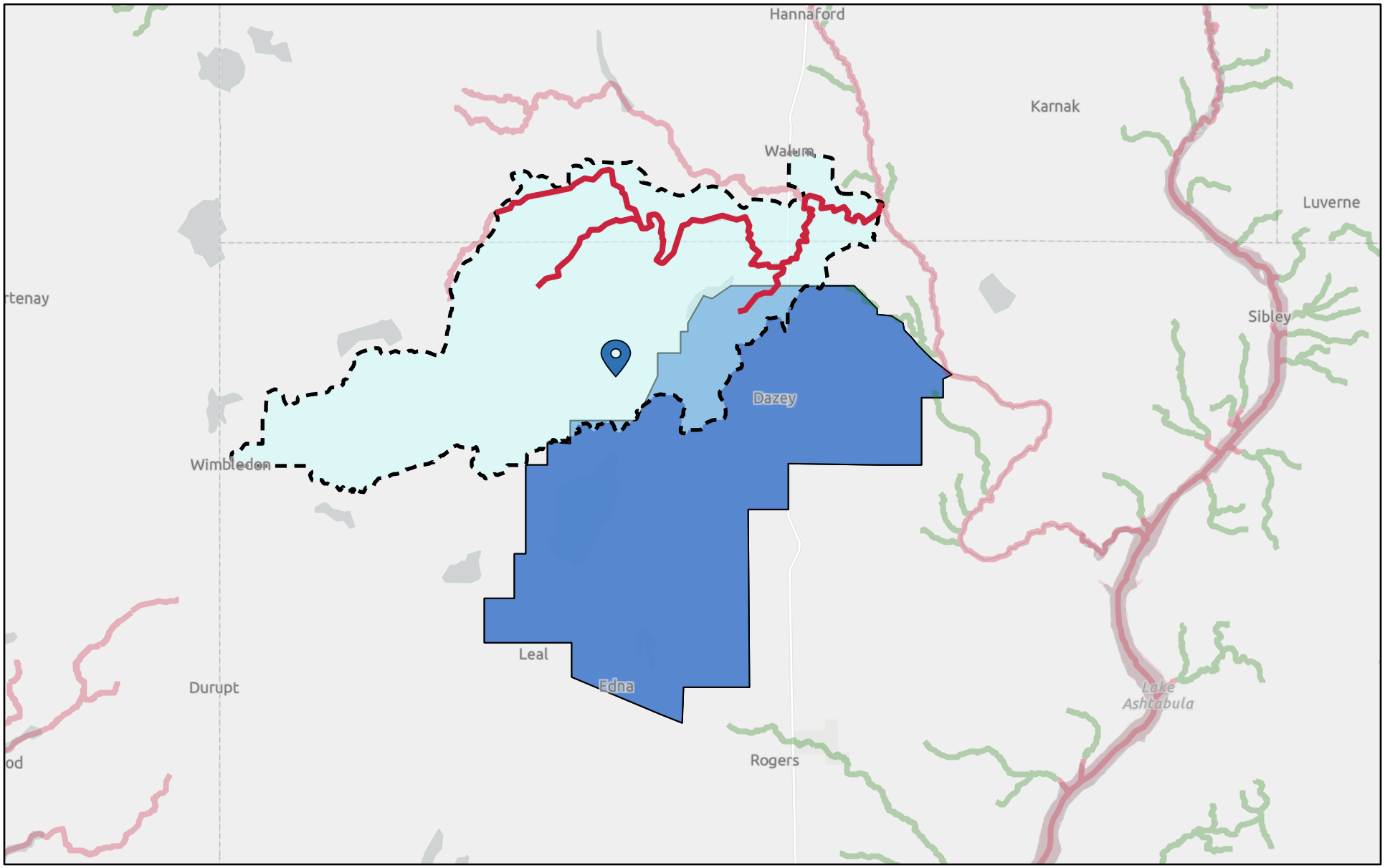
1:288,895

0 1.5 3 6 mi

0 2.5 5 10 km

State of North Dakota, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, USFWS

Clean Water Act 303d



7/10/2024

Waterbody: Good

Waterbody: Impaired

Waterbody: Condition Unknown

HUC12 Boundaries

Project Area

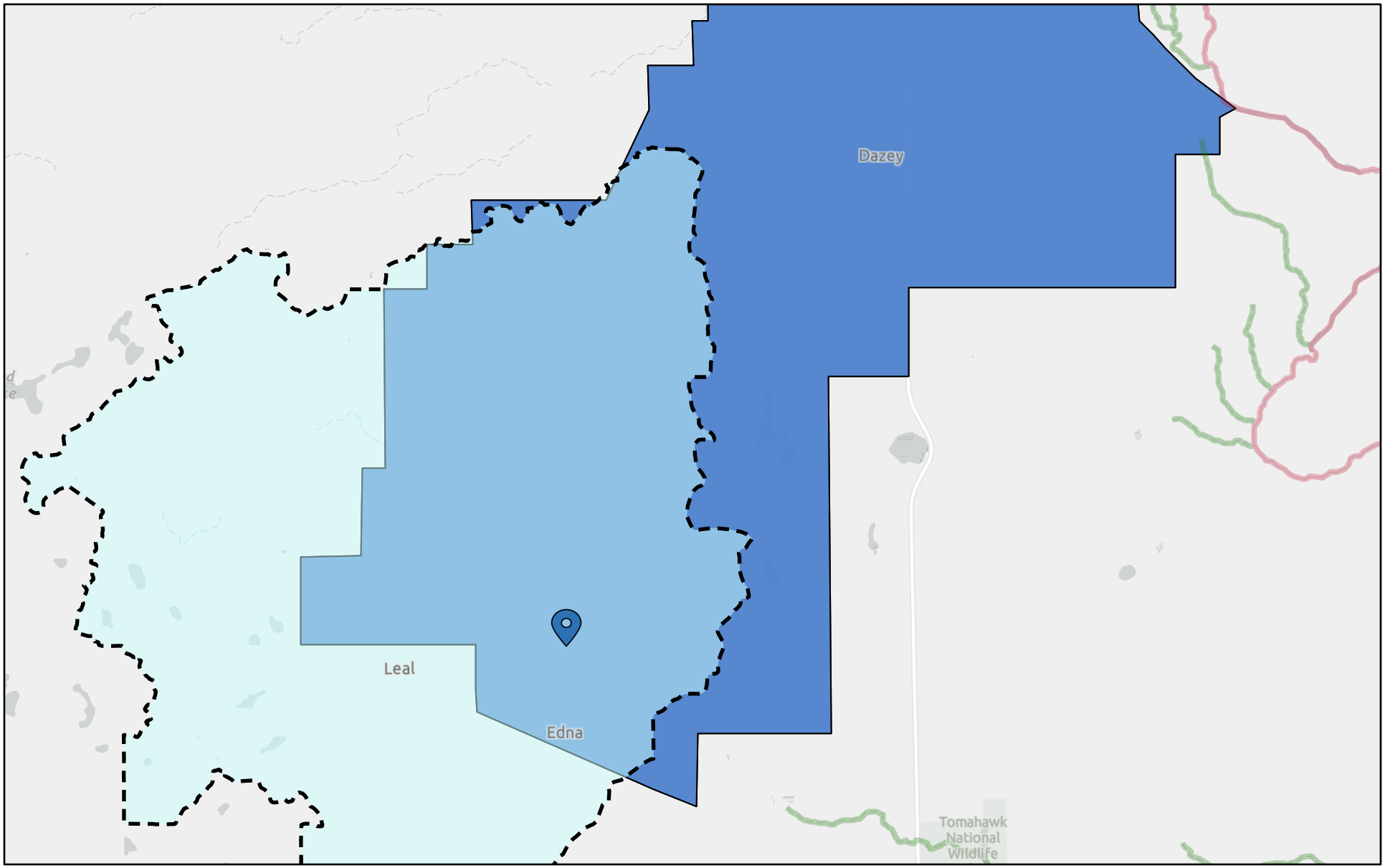
1:288,895

0 1.5 3 6 mi

0 2.5 5 10 km

State of North Dakota, Esri, TomTom, Garmin, SafeGraph, METI/NASA, USGS, EPA, NPS, USDA, USFWS

Clean Water Act 303d



7/10/2024

Waterbody: Good

Waterbody: Impaired

Waterbody: Condition Unknown

HUC12 Boundaries

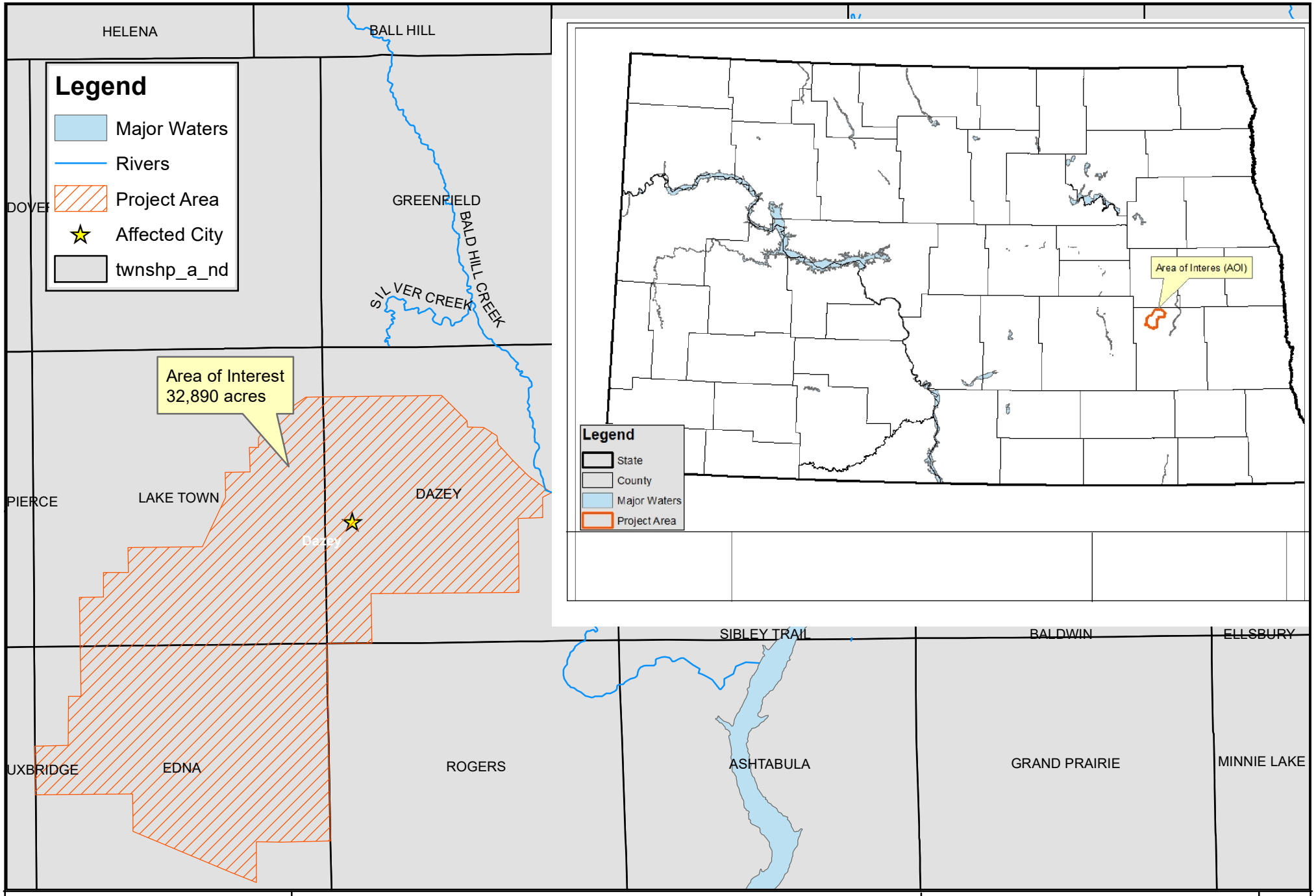
Project Area

1:144,448

0 0.75 1.5 3 mi

0 1.25 2.5 5 km

State of North Dakota, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, USDA, USFWS



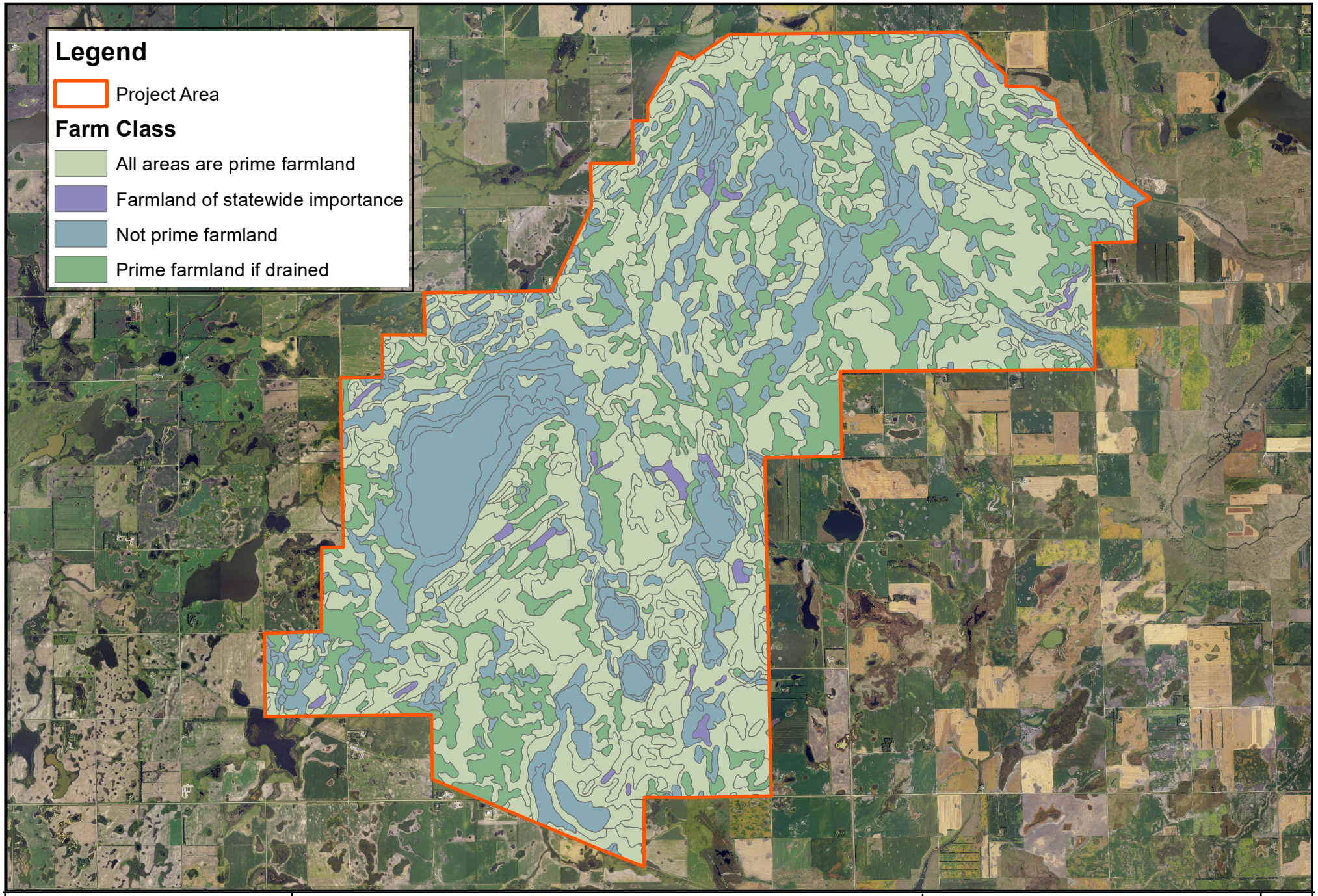
United States Department of Agriculture

Exhibit 3

Ten Mile Lake Project Setting

Miles
0 0.5 1 2 3 4

N



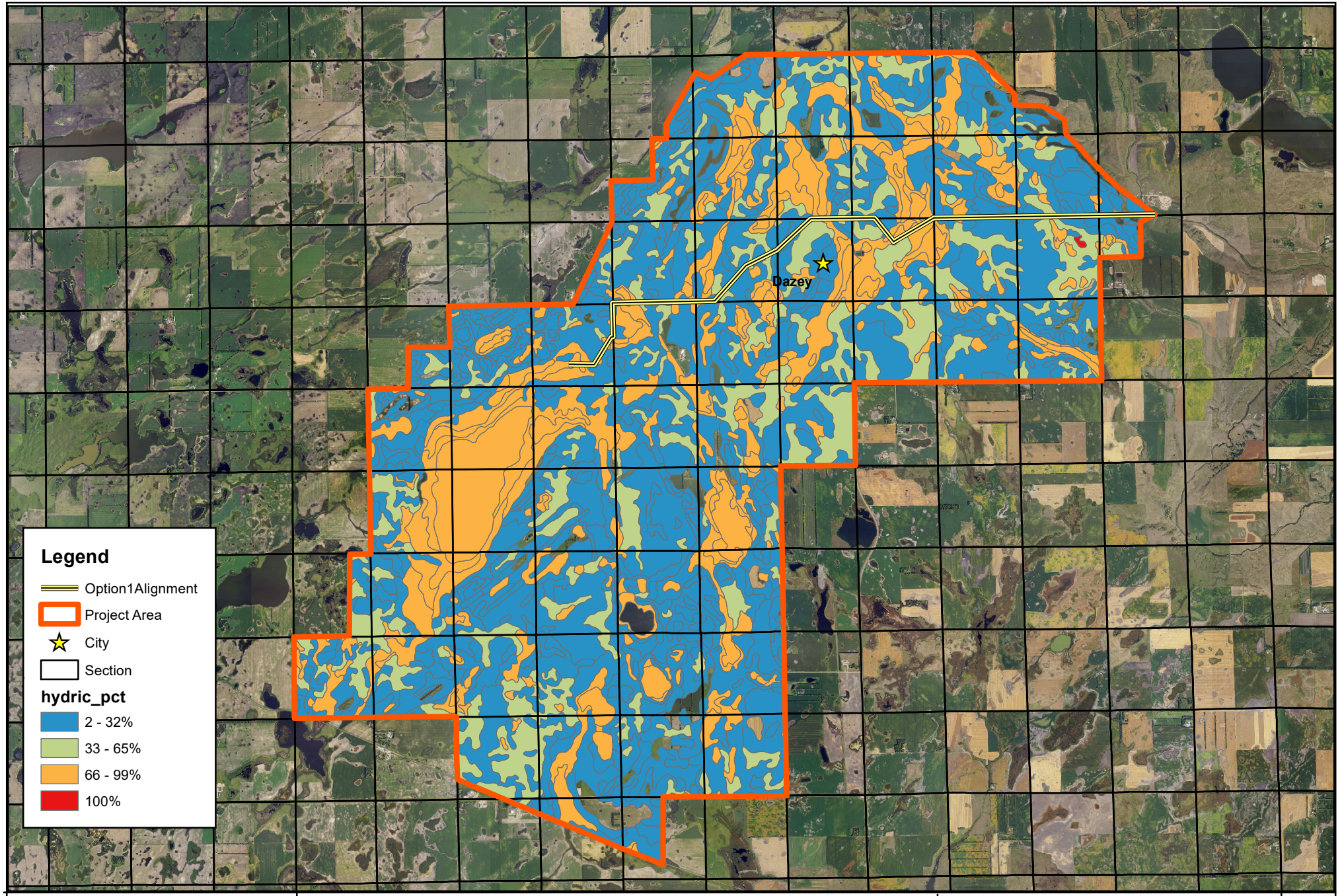
United States Department of Agriculture

Exhibit 4

Farmland Classification of Soils

Miles
0 0.4 0.8 1.6 2.4 3.2

N



United States Department of Agriculture

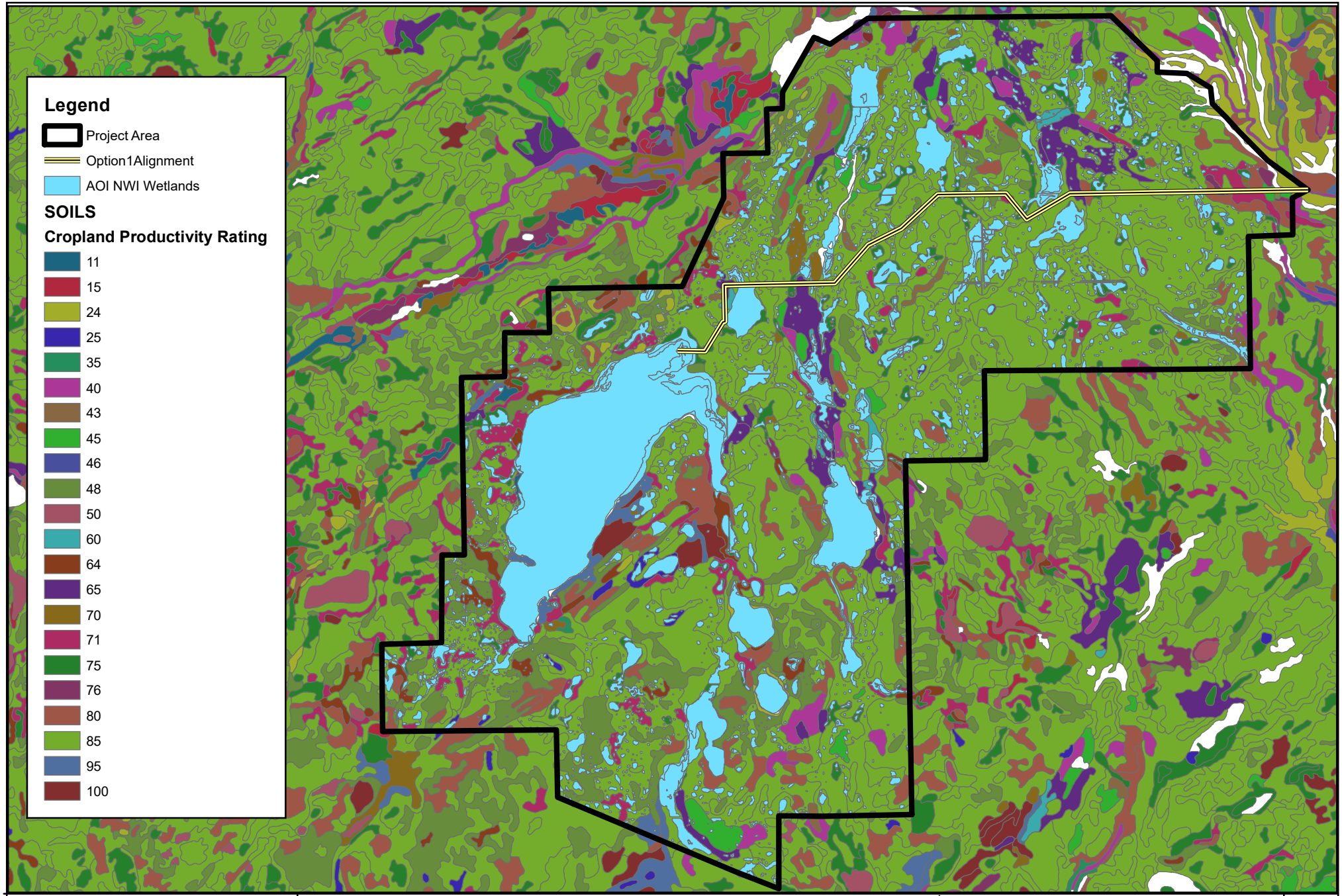
Exhibit 5

Hydric Soils

Miles

0 0.425 0.85 1.7 2.55 3.4

N



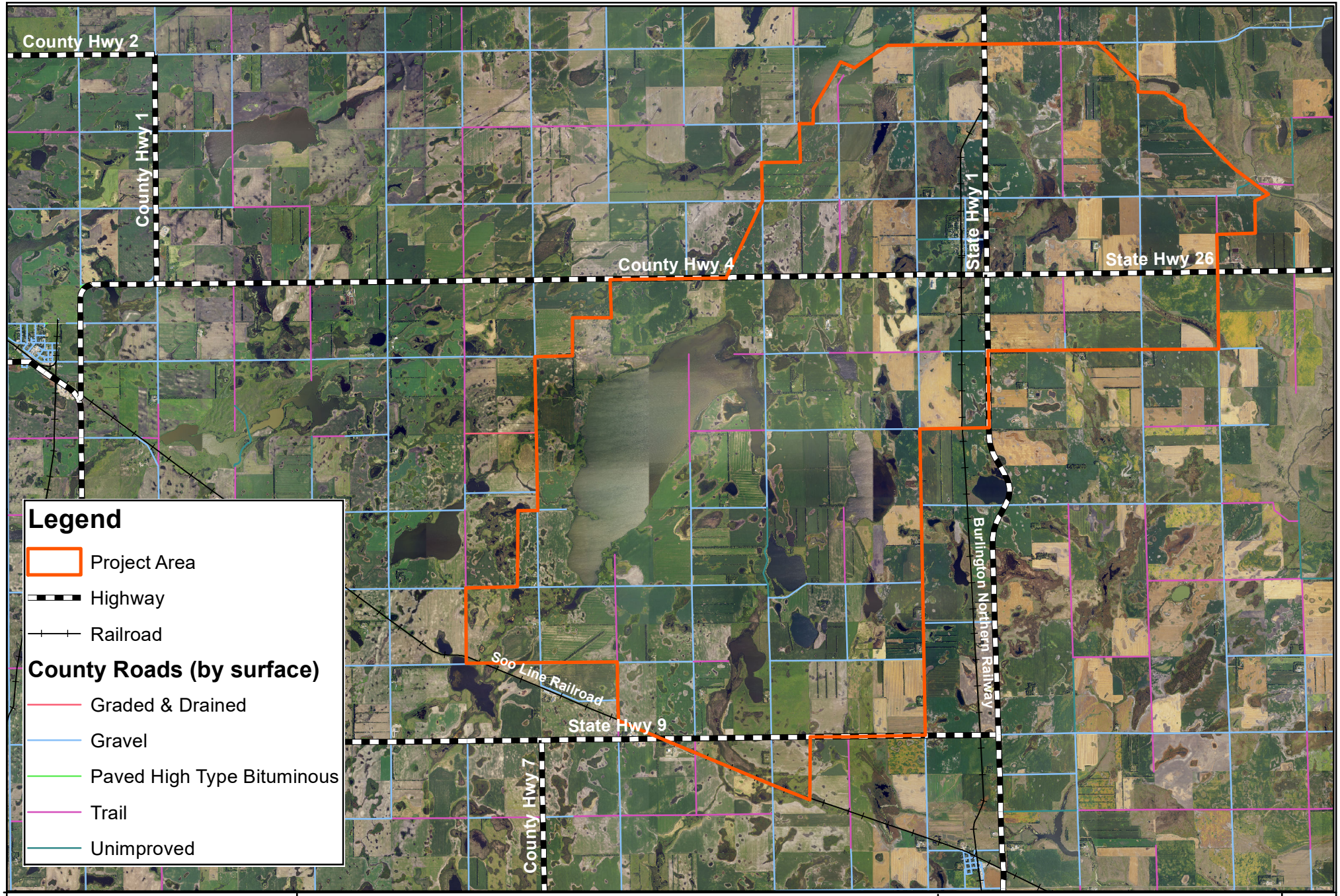
USDA United States Department of Agriculture

Exhibit 6

Cropland Productivity Index

Miles
0 0.4 0.8 1.6 2.4 3.2

N



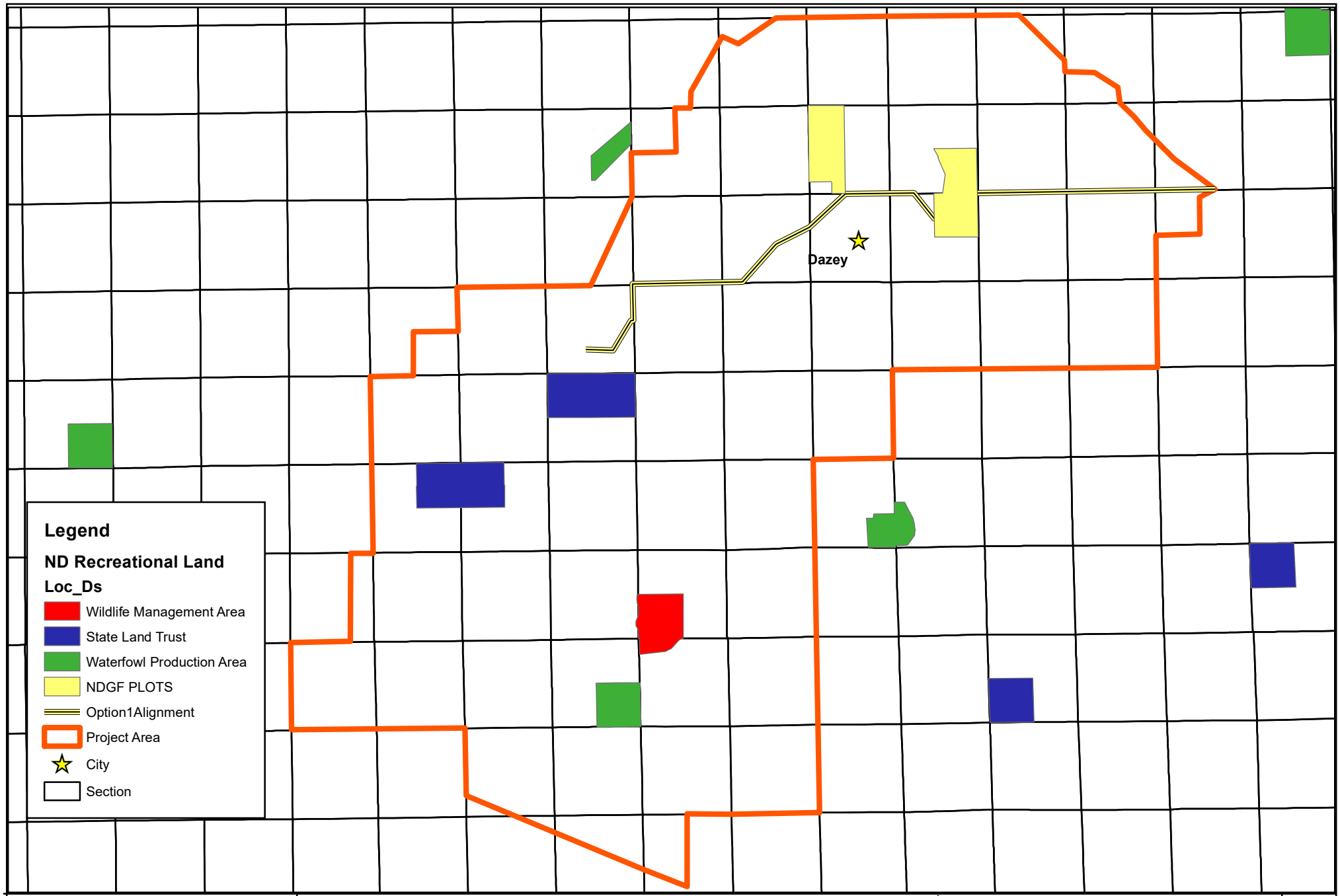
USDA United States Department of Agriculture

Exhibit 7

Transportation Infrastructure

Miles
0 0.45 0.9 1.8 2.7 3.6

N



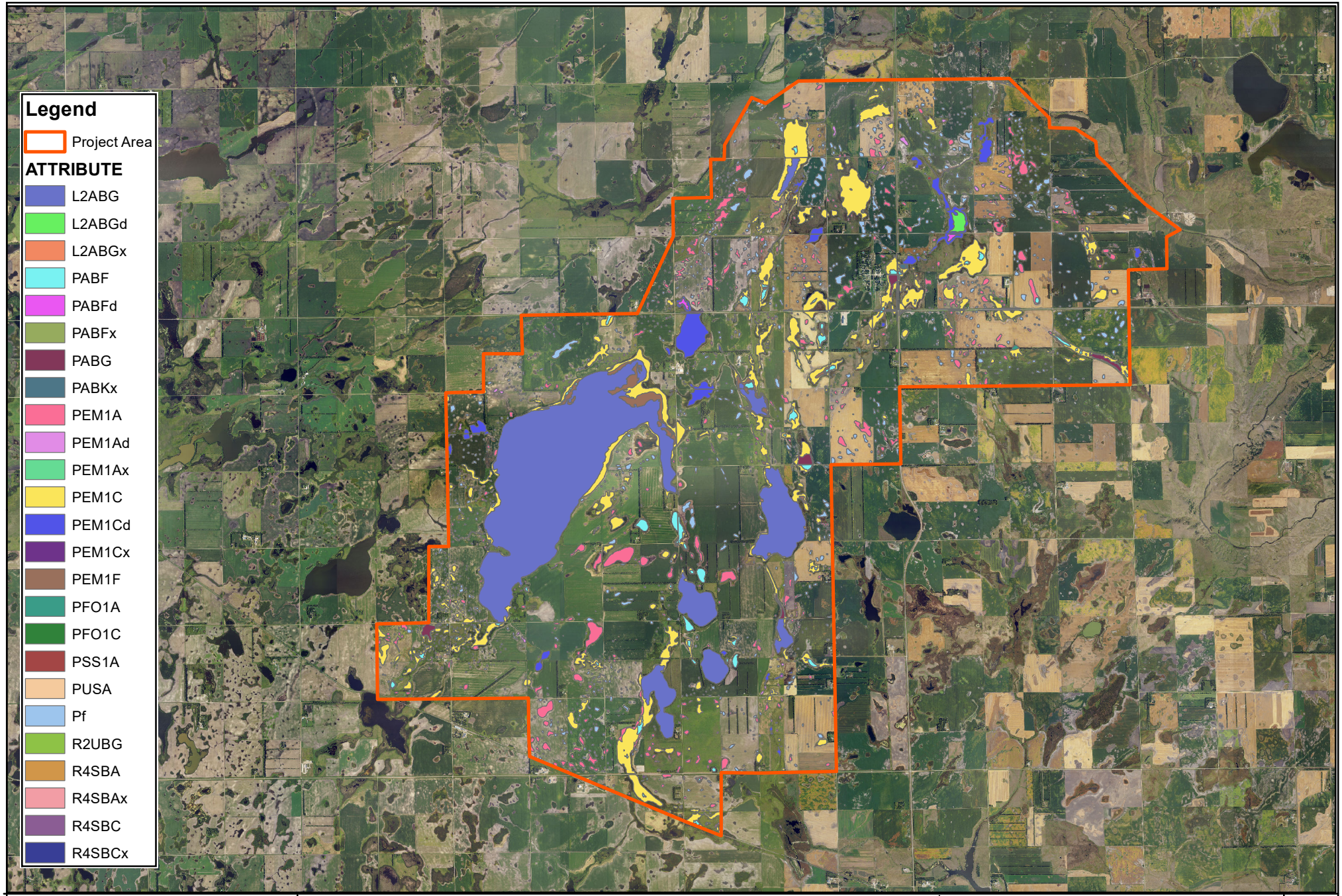
USDA United States Department of Agriculture

Exhibit 8

Recreational Lands

0 0.4 0.8 1.6 2.4 3.2 Miles

N



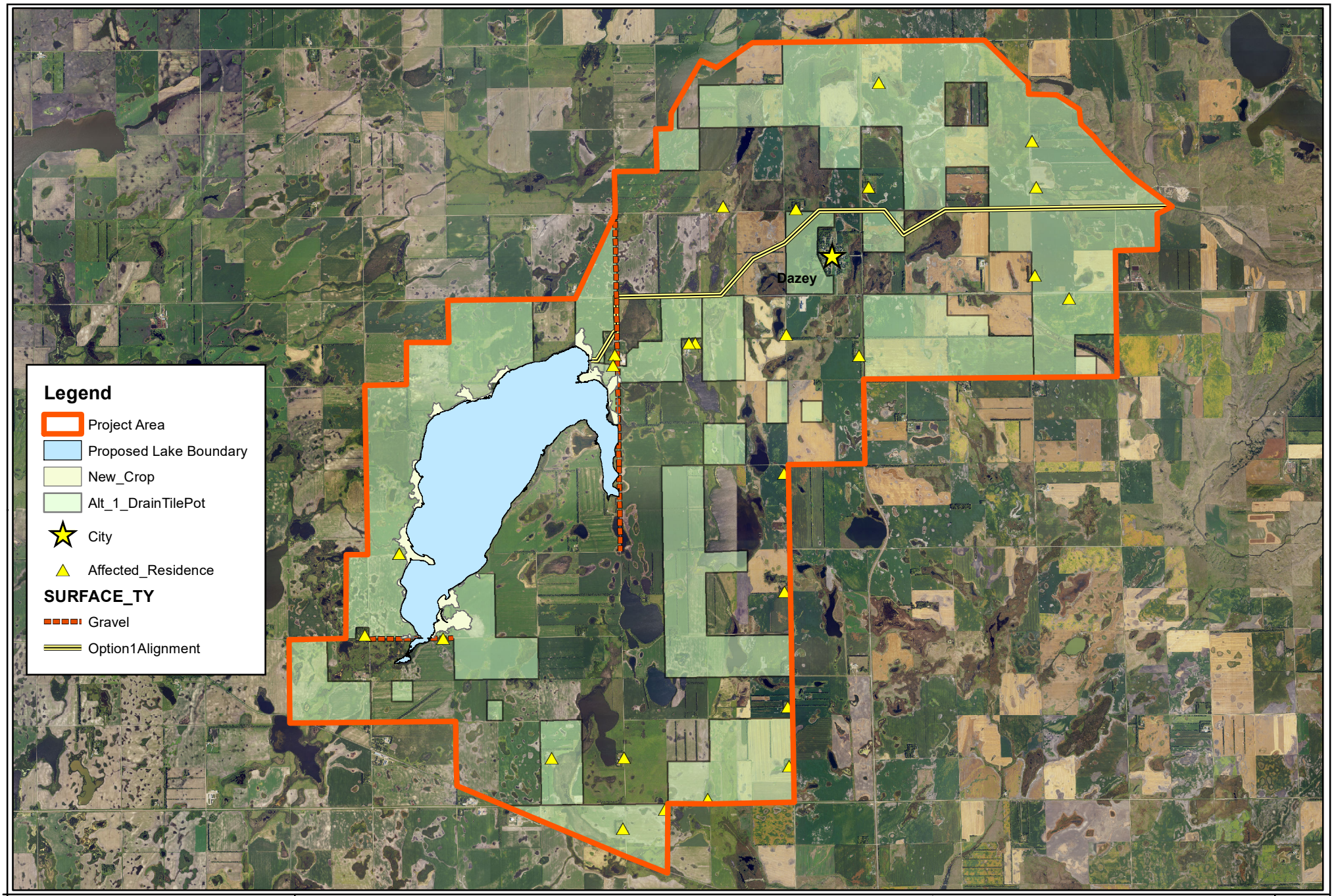
USDA United States Department of Agriculture

Exhibit 9

National Wetland Inventory (NWI)

0 0.45 0.9 1.8 2.7 3.6 Miles

N



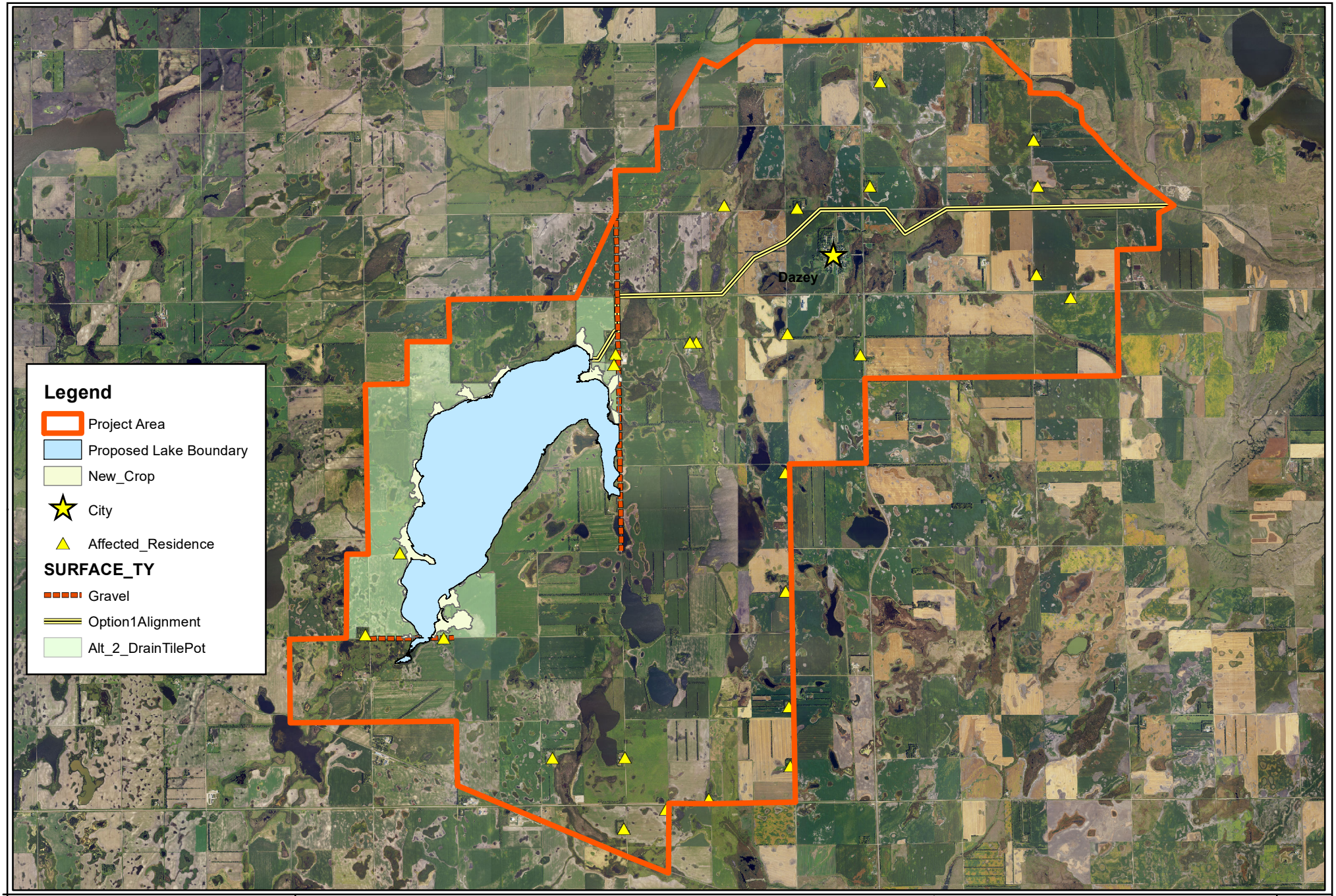
United States Department of Agriculture

Exhibit 10

Alternative 1 Features

0 0.425 0.85 1.7 2.55 3.4 Miles

N



USDA United States Department of Agriculture

Exhibit 11

Alternative 2 Features

0 0.425 0.85 1.7 2.55 3.4 Miles

N

Nogosek Twp.
Corinne Twp.
Dover Twp.
Bartley Twp.
Silver Creek
Baldhill Creek
Courtenay
Durham Twp.
Courtenay Twp.
Pierce Twp.
Lake Town Twp.
Dazey Twp.
Dazey
Wimbledon
Ten Mile Lake
Lake Ashtabula
Ashland Twp.
Gray Twp.
Uxbridge Twp.
Leal
Edna Twp.
Rogers Twp.
Rogers
Spiritwood Lake
Brimer Twp.
Rose Twp.
Anderson Twp.

Legend

- Road Crossing
- Project Alignment
- Ten Mile Lake Watershed
- HUC12 Watershed Boundary
- FWS Easements
- Lakes and Ponds
- Rivers and Streams

0 2 4 Miles

Exhibit 12: Watershed Project Area

Ten Mile Lake Proposed Outlet Location
NRCS PL-566 Watershed Program Application
Barnes County Water Resource District

Drawn by:	Checked by:	Project No :	Date:	Sheet:
ESN	MMO	6139-0004	2/22/2023	1 of 1

HOUSTON engineering, inc.

Document Path: H:\JBN\6100\6139\6139_0004_001_005\Watershed Planning\GIS\TenMile_Outlet_Displays.mxd

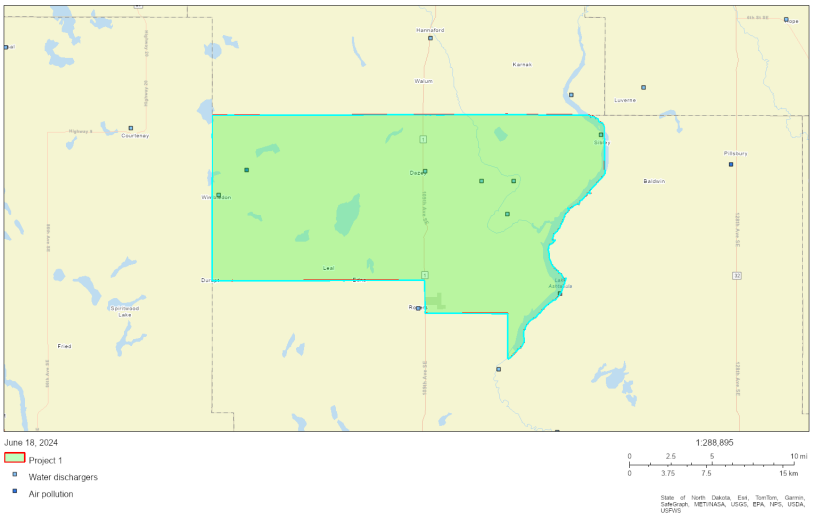
EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Barnes County, ND

Blockgroup: 380039680001
Population: 718
Area in square miles: 242.58

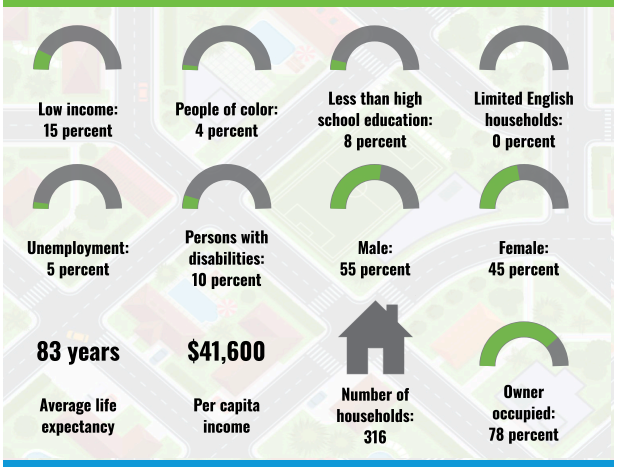
A3 Landscape



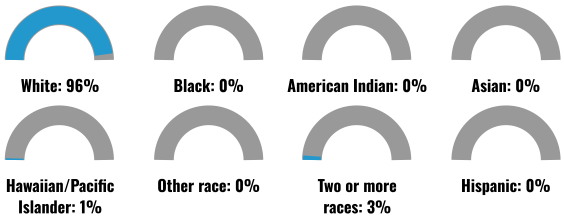
LANGUAGES SPOKEN AT HOME

LANGUAGE	PERCENT
English	99%
German or other West Germanic	1%
Total Non-English	1%

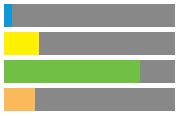
COMMUNITY INFORMATION



BREAKDOWN BY RACE



BREAKDOWN BY AGE



From Ages 1 to 4	5%
From Ages 1 to 18	20%
From Ages 18 and up	80%
From Ages 65 and up	18%

LIMITED ENGLISH SPEAKING BREAKDOWN

Speak Spanish	0%
Speak Other Indo-European Languages	0%
Speak Asian-Pacific Island Languages	0%
Speak Other Languages	0%

Notes: Numbers may not sum to totals due to rounding. Hispanic population can be of any race.
Source: U.S. Census Bureau, American Community Survey (ACS) 2017 -2021. Life expectancy data comes from the Centers for Disease Control.

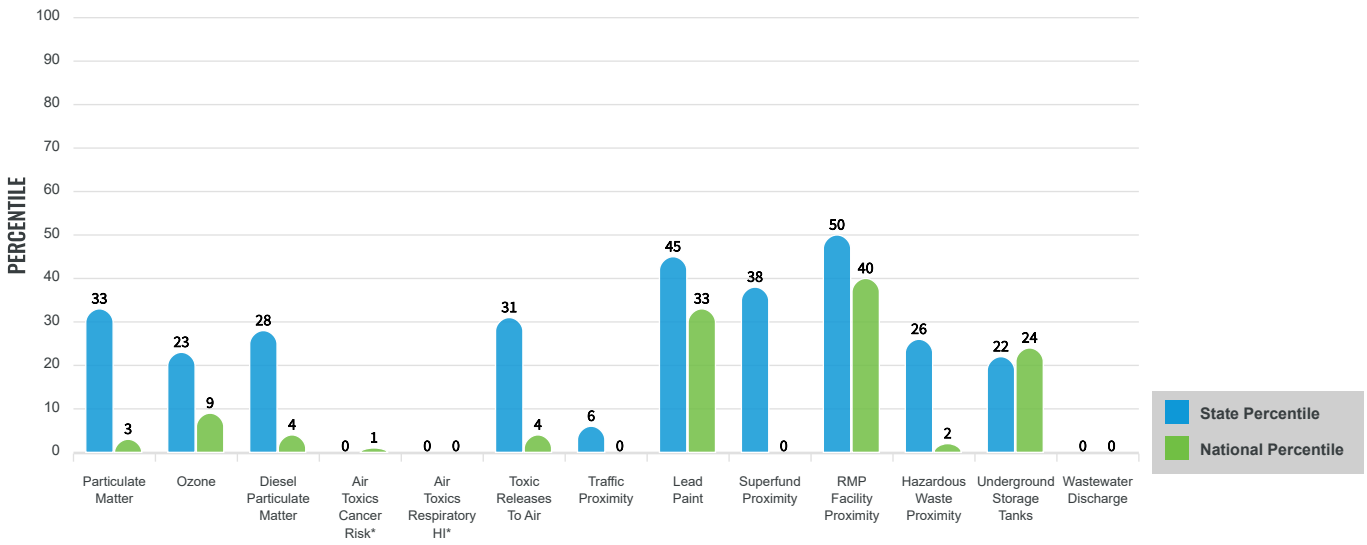
Environmental Justice & Supplemental Indexes

The environmental justice and supplemental indexes are a combination of environmental and socioeconomic information. There are thirteen EJ indexes and supplemental indexes in EJScreen reflecting the 13 environmental indicators. The indexes for a selected area are compared to those for all other locations in the state or nation. For more information and calculation details on the EJ and supplemental indexes, please visit the EJScreen website.

EJ INDEXES

The EJ indexes help users screen for potential EJ concerns. To do this, the EJ index combines data on low income and people of color populations with a single environmental indicator.

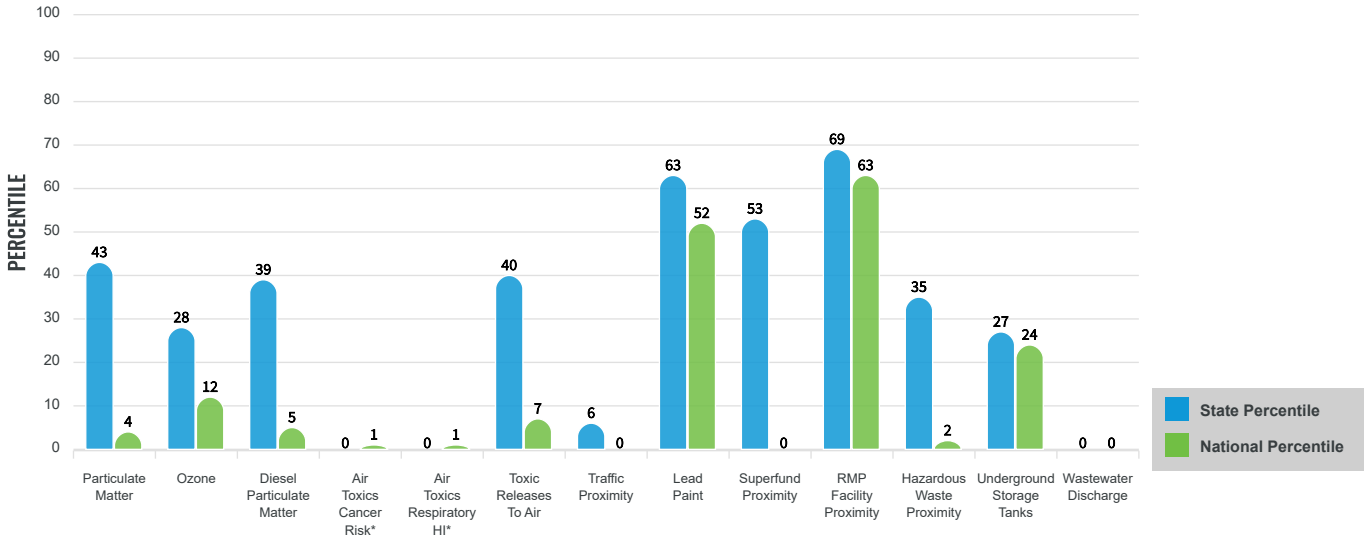
EJ INDEXES FOR THE SELECTED LOCATION



SUPPLEMENTAL INDEXES

The supplemental indexes offer a different perspective on community-level vulnerability. They combine data on percent low-income, percent linguistically isolated, percent less than high school education, percent unemployed, and low life expectancy with a single environmental indicator.

SUPPLEMENTAL INDEXES FOR THE SELECTED LOCATION



These percentiles provide perspective on how the selected block group or buffer area compares to the entire state or nation.

Report for Blockgroup: 380039680001

EJScreen Environmental and Socioeconomic Indicators Data

SELECTED VARIABLES	VALUE	STATE AVERAGE	PERCENTILE IN STATE	USA AVERAGE	PERCENTILE IN USA
POLLUTION AND SOURCES					
Particulate Matter (µg/m^3)	5.22	5.41	46	8.08	4
Ozone (ppb)	56.4	57.3	31	61.6	15
Diesel Particulate Matter (µg/m^3)	0.0641	0.157	36	0.261	6
Air Toxics Cancer Risk* (lifetime risk per million)	10	16	0	25	1
Air Toxics Respiratory HI*	0.1	0.16	0	0.31	1
Toxic Releases to Air	8.2	460	42	4,600	8
Traffic Proximity (daily traffic count/distance to road)	0.26	85	6	210	1
Lead Paint (% Pre-1960 Housing)	0.49	0.29	79	0.3	73
Superfund Proximity (site count/km distance)	0.0046	0.0049	60	0.13	0
RMP Facility Proximity (facility count/km distance)	1.3	0.64	83	0.43	91
Hazardous Waste Proximity (facility count/km distance)	0.025	0.37	32	1.9	3
Underground Storage Tanks (count/km^2)	0.0088	2.1	25	3.9	22
Wastewater Discharge (toxicity-weighted concentration/m distance)	1.4E-08	8.9	0	22	1
SOCIOECONOMIC INDICATORS					
Demographic Index	9%	21%	18	35%	8
Supplemental Demographic Index	9%	11%	31	14%	25
People of Color	4%	16%	22	39%	10
Low Income	15%	26%	24	31%	27
Unemployment Rate	5%	3%	80	6%	60
Limited English Speaking Households	0%	1%	0	5%	0
Less Than High School Education	8%	7%	63	12%	48
Under Age 5	5%	7%	39	6%	50
Over Age 64	18%	17%	58	17%	60
Low Life Expectancy	15%	18%	22	20%	12

*Diesel particulate matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

Sites reporting to EPA within defined area:

Superfund 0
Hazardous Waste, Treatment, Storage, and Disposal Facilities 0
Water Dischargers 11
Air Pollution 1
Brownfields 0
Toxic Release Inventory 0

Other community features within defined area:

Schools 2
Hospitals 0
Places of Worship 2

Other environmental data:

Air Non-attainment ..... No
Impaired Waters ..... Yes

Selected location contains American Indian Reservation Lands* ..... No
Selected location contains a "Justice40 (CEJST)" disadvantaged community ..... No
Selected location contains an EPA IRA disadvantaged community ..... No

Report for Blockgroup: 380039680001

EJScreen Environmental and Socioeconomic Indicators Data

HEALTH INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Low Life Expectancy	15%	18%	22	20%	12
Heart Disease	6.9	6.4	58	6.1	67
Asthma	8.8	9.3	19	10	20
Cancer	7.5	6.8	62	6.1	81
Persons with Disabilities	10%	11.8%	34	13.4%	32

CLIMATE INDICATORS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Flood Risk	13%	9%	83	12%	75
Wildfire Risk	0%	19%	51	14%	0

CRITICAL SERVICE GAPS

INDICATOR	VALUE	STATE AVERAGE	STATE PERCENTILE	US AVERAGE	US PERCENTILE
Broadband Internet	9%	17%	27	14%	43
Lack of Health Insurance	6%	8%	44	9%	42
Housing Burden	No	N/A	N/A	N/A	N/A
Transportation Access	Yes	N/A	N/A	N/A	N/A
Food Desert	No	N/A	N/A	N/A	N/A

Report for Blockgroup: 380039680001

Appendix 2: Sponsor Forms

Sponsor Letter of Request

Sponsor Declaration Form

Barnes County Water Resource District
PO Box 306
Valley City ND 58072
701-845-8508

March 14, 2023

Nathan Jones
Acting State Conservationist
Natural Resources Conservation Service
220 E. Rosser Ave, PO Box 1458
Bismarck, ND 58502-1458

Dear Mr. Jones:

We request NRCS Watershed Program planning assistance for a potential Public Law (PL) 566 project with the Barnes County Water Resource District for a project involving 10 Mile Lake in the Sheyenne River watershed [HUC 10 #0902020401 City of Valley City-Sheyenne River]. The project would address agricultural water management on cropland as well as providing benefit to homes, public roads, structures, and septic systems. The project would entail construction of a control structure and drainage features to lower the elevation of 10 Mile Lake by 4 feet.

We are a political subdivision of a State with a legal interest in or responsibility for the watershed project proposed. We understand, as sponsors of a PL-566 planning effort, that our responsibilities will include:

- Assisting in the locally led planning effort, and making timely decisions to guide the work of NRCS technical staff as planning proceeds,
- Contributing a share of the project costs, as determined by NRCS, by providing funds or eligible services necessary to undertake the activity,
- Before being credited with the value of any in-kind contributions for in-kind services and/or acquisition of land rights, Sponsor will sign a Memorandum of Understanding (MOU) with NRCS,
- Obtaining any necessary real property rights, by eminent domain, if necessary,
- Obtaining any needed water rights, and regulatory permits at the Sponsor's cost,
- Agreeing to provide for any required operation and maintenance of the completed measures.

We look forward to working with NRCS staff to complete a Preliminary Investigation Feasibility Report (PIFR) to provide reasonable assurance that a potential watershed project can be developed that addresses a PL-566 purpose and that there are no apparent insurmountable obstacles to the completion of that project. Economic feasibility, wetland impacts, and availability of suitable wetland mitigation sites are the concerns identified as needing special attention during development of the PIFR. NRCS and our engineering consultant have worked together to develop a plan to conduct feasibility level preliminary economics and evaluation of wetland impacts/potential mitigation sites. Due to the cost of even doing this very preliminary level work, Barnes WRD will fund approximately $40,000 of work by our consultant to partner with NRCS staff in completing remote sensing based wetland delineations, random field sampling, and mitigation site feasibility reviews during the summer/fall of 2023.

Barnes County Water Resource District
PO Box 306
Valley City ND 58072
701-845-8508

It is our understanding that ND NRCS staff will complete the remainder of the analysis work and complete development of the PIFR by the end of December of 2023. At that point, if the PIFR indicates the pursuing a full watershed plan is feasible, we will work with NRCS to develop a Plan of Work for an in-depth planning effort.

The names, addresses, and telephone numbers of the administrative and technical contact persons in our organization are as follows:

Heather Manson
Secretary-Treasurer
Barnes County Water Resource District
PO Box 306
Valley City, ND 58072
(701) 845-8508
hmanson@barnescounty.us

Mike Opat, PE
Barnes County Water Resource District Engineer
Houston Engineering
1401 21st Avenue North
Fargo, ND 58102
(701) 499-9473
mopat@houstoneng.com

Please contact them for any additional information that you might need in assessing our request.

Sincerely,
BARNES COUNTY WATER RESOURCE DISTRICT

Heather Manson
Secretary-Treasurer

Cc: Christi Fisher, ND State Conservation Engineer

State: ND County: Barnes Watershed: Sheyenne River

Project Name: 10 Mile Lake Agricultural Water Management Project

Sponsor's Name:	Barnes County Water Resource District		
Sponsor's Mailing Address:	PO Box 306, Valley City, ND 58072		
Contact Name:	Heather Manson	**Phone:**	701-845-8508
Title:	Secretary-Treasurer	**Email:**	hmanson@barnescounty.us
Sponsor Website:			

Description of the existing condition in the watershed that would be addressed through a Watershed Flood Prevention Operations program project.

10 Mile Lake, located in the Sheyenne River watershed in northern Barnes County, North Dakota, is a closed-basin that has caused significant flooding issues related to excess water in the lake. High water levels in the lake have caused adverse impacts to thousands of acres of cropland, with hundreds of acres often underwater for extended periods of time and hundreds of acres too saturated to seed in the spring or harvest in the fall. High water levels also cause significant impacts to public roadways, and many private homes, out buildings and sewage treatment systems are also negatively impacted.

Potential benefits of a Watershed Flood Prevention Operations program project.

Constructing an outlet to allow for water levels in 10 Mile Lake to be lowered approximately four feet and managed at that level will the District and local stakeholders to mitigate the effects of the recurring high water conditions. The project will also provide opportunities for improved agricultural drainage, particularly improved subsurface drainage opportunities for gravity outlet systems that will be possible with lower water levels in the lake. While lower water levels in the lake will return many regularly inundated acres back to agriculture production, the project will provide significant benefits to agricultural acres that regularly seasonally saturated to the point that they cannot be seeded in the spring or harvested in the fall. The project will also provide much needed relief to local road authorities that have been dealing with expensive impacts to their roadways, as well as to local landowners that have been dealing with flooding around their homes, outbuildings, and sewage treatment systems. Additionally, there may be benefits to existing wildlife management areas in the area that have seen degraded habitat conditions due to the high water levels.

State: ND County: Barnes Watershed: Sheyenne River

Project Name: 10 Mile Lake Agricultural Water Management Project

SPONSOR WILL:

- Assist in the locally led planning effort: YES __X__ NO _____
- Obtain needed land rights including the use of power of eminent domain, if necessary: YES __X__ NO _____
- Provide local cost-share funds and/or in-kind services to provide the required portion of total project costs: YES __X__ NO _____
- Provide Funds for continuing Operation and Maintenance actions: YES __X__ NO _____
- Obtain required permits and approvals at Sponsor cost: YES __X__ NO _____
- Provide leadership to help ensure adequate conservation land treatment measures are maintained on at least 50% of the watershed area above retention reservoirs: N/A _____ YES __X__ NO _____
- Before being credited with the value of any in-kind contribution for any in-kind services and/or acquisition of land rights, Sponsor will sign a Memorandum of Understanding (MOU) with NRCS: YES __X__ NO _____

State: ND County: Barnes Watershed: Sheyenne River

Project Name: 10 Mile Lake Agricultural Water Management Project

Authorized Representative of Sponsor

Name (printed): Jerry Hieb **Title:** Chairman

Signature: Jerry Hieb **Date:** 3/13/23

Appendix 3: Preliminary Environmental Evaluation (CPA-52)

U.S. Department of Agriculture | NRCS-CPA-52
Natural Resources Conservation Service | 04/2023

ENVIRONMENTAL EVALUATION WORKSHEET

A. Client Name: Barnes County Water Resources District

B. Conservation Plan ID # (as applicable):
Program Authority (optional): PL-566

D. Client's Objective(s) (purpose):
Lower the elevation of 10 Mile Lake by 4 feet to alleviate damages caused by excess surface and ground water. Increase crop production in the watershed by bringing land back into crop production and installation of subsurface drainage in existing crop fields.

C. Identification # (farm, tract, field #, etc. as required):
Portions of the following 12-digit HUCs are included in the project area: Orren Slough 090202040103, Tomahawk Lake 090202040104, Silver Creek 090202030703, and Baldhill Creek 090202030808. Barnes County, ND

E. Need for Action:
Excessive wet conditions have lead to damage to roads, residences and crop fields. Response times for emergency services have slowed significantly due to the effects high water levels have had on area infrastructure. The project would bring some former agricultural land back into production, and would implrove water management for other existing ag. land.

H. Alternatives

No Action √ if RMS ☐	*Alternative 1* √ if RMS ☐	*Alternative 2* √ if RMS ☐
Conditions would remain the same. Ag production would continue as it has been, farming more acreage during dry periods and less during wet periods. Prolonged wet periods would result in salinity and compaction issues creeping higher on the landscape, and productivity would go down. During dry periods, ag. production would follow the water line down the landscape as possible. During dryer periods, road O&M would be typical of other roads in the area. During excessively wet periods, damage to roads would increase, potentially becoming a chronic issue.	Practices to be installed: Open Channel (582), Structure for Water Control (587), Subsurface Drain (606), Drainage Water Management (554), Critical Area Planting (342), Wetland Restoration (657). Water control structure would be placed at the lake outlet. An 8.35 mile outlet channel would be constructed to lower the level of 10 Mile Lake 4 feet. Tile drainage, with drainage water management systems would be installed on 13,329 acres of cropland (including lake perimeter) for increased production and salinity management. Mitigation requirements for the project would be 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wetlands, and 1,612 acres of depressional wetlands.	Practices to be installed: Open Channel (582), Structure for Water Control (587), Subsurface Drain (606), Drainage Water Management (554), Critical Area Planting (342), Wetland Restoration (657).Water control structure would be placed at the lake outlet. An 8.35 mile outlet channel would be constructed to lower the level of 10 Mile Lake 4 feet. Tile drainage, with drainage water management systems, would be more limited compared with Alt 1, however still applied around the lake for salinity management. Mitigation requirements for the project would be 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wteland, and 156 acres of depressional wetlands.

Resource Concerns

In Section "F" below, analyze, record, and address concerns identified through the Resources Inventory process (see FOTG Section 3 - Resource Concerns List and Planning Criteria for guidance).

F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	**I. Effects of Alternatives**					
	No Action		***Alternative 1***		***Alternative 2***	
	Amount, Status, Description *(Document both short and long term impacts)*	**√ if does NOT meet PC**	**Amount, Status, Description** *(Document both short and long term impacts)*	**√ if does NOT meet PC**	**Amount, Status, Description** *(Document both short and long term impacts)*	**√ if does NOT meet PC**
SOIL						
Wind erosion Topsoil is vulnerable to wind erosion due to tillage practices used to dry and warm the soil for earlier spring planting. Planner average estimated erosion is 8 T/ac/yr	No Change	☑ NOT meet PC	The resultant lowered lake level and water table will likely result in more no till/reduced till practice adoption as the soils will have improved drainage, however these practices are not required or included in the Plan/EA. Estimated erosion rates may be reduced if tillage practices are voluntarily adopted. It's also possible erosion would increase if some operators continued with conventional tillage.	☑ NOT meet PC	The resultant lowered lake level and water table will likely result in more no till/reduced till practice adoption as the soils will have improved drainage, however these practices are not required or included in the Plan/EA. Estimated erosion rates may be reduced if tillage practices are voluntarily adopted. It's also possible erosion would increase if some operators continued with conventional tillage. Compared with alt 1, the total erosion is expected to be greater.	☑ NOT meet PC
Compaction Planner observed compaction issues occur due to perceived need for tillage to dry soils out. Also through the use of land rollers on wet soils, especially adjacent to wetlands	No Change	☑ NOT meet PC	The resultant lowered lake level and water table will lead to dryer soil conditions which will be be less vulnerable to compaction from land rolling. Also, less, or no tillage will be needed to complete field work in the affected fields.	☑ NOT meet PC	The resultant lowered lake level and water table will lead to dryer soil conditions which will be be less vulnerable to compaction from land rolling. Also, less, or no tillage will be needed to complete field work in the affected fields. This effect is less acres when compared with Alt 1.	☑ NOT meet PC
Concentration of salts or other chemicals Salinity is observed around wetlands or drained wetlands.	No change	☑ NOT meet PC	Soils ringing the lowered lake and other wet cropland are expected to be affected by saline discharge. Subsurfce Drains and DWM will improve the soil condition.	☐ NOT meet PC	Soils ringing the lowered lake are expected to be affected by saline discharge. Subsurfce Drains and DWM will improve the soil condition. This effect is less acres when compared with Alt 1.	☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC

WATER							
Ponding and flooding A long term wet cycle has increased lake and wetland volumes and increased their surface areas, reducing cropable acres and impacting roads.	Surface water levels of Ten Mile Lake will continue fluctuate widely. Issues with road damage, residential basement flooding, and emergency services access to rural residents will continue during wet periods.	☑ NOT meet PC	Surface water level of Ten Mile Lake would no longer expand to the point of causing damages currently being experienced. 580 acres of former lake bottom and non-cropland wouuld be brought into production and tiled to prevent future salinity issues. 13,329 acres of cropland adjacent to the constructed outlet channel would be tile drained, with drainage water management structures installed. Management plan for the outlet structure would ensure releases of water from the lake would not cause downstream flooding.	☐ NOT meet PC	Surface water level of Ten Mile Lake would no longer expand to the point of causing damages currently being experienced. 340.4 acres of former lake bottom and non-cropland wouuld be brought into production. 2,132.7 acres of cropland adjacent to the outlet channel would be tiled, with drainage water management structures installed. Management plan for the outlet structure would ensure releases of water from the lake would not cause downstream flooding.	☐ NOT meet PC
Seasonal high water table A long term wet cycle has increased the frequency of negative impacts from high water tables, including reducing the cropable acres and reduced yields.	Seasonal high water table would continue to negatively affect residences and farmsteads. Farming would remain difficult in wet years. Poor production would continue.	☑ NOT meet PC	Water table would be lower on a much more consistant basis. Alleviating negative impacts caused by the high water table under the no action alternative. 13,329 acres of cropland adjacent to the lake and the outlet channel would be tiled, enabling the controll of the seasonally high water table. Production would improve in yield and consistency. 580 additional acres would be brought into production.	☐ NOT meet PC	Water table would be lower on a much more consistant basis. Alleviating negative impacts caused by the high water table under the no action alternative. 2,132.7 acres of cropland adjacent to the project could have drainage water management practices installed, enabling the controll of the seasonally high water table. Production would improve in yield and consistency. 340.4 additional acres would be brought into production.	☐ NOT meet PC
Salts transported to surface water	No change.	☑ NOT meet PC	Installation of subsurface tile drainage systems on 13,329 acres of adjacent cropland could impact downstream water quality by leaching excess nutrients, herbicides, and salts into surface water.	☑ NOT meet PC	Installation of subsurface tile drainge systems on 2,132.7 acres of cropland adjacent to the lake could impact downstream water quality by leaching excess nutrients, herbicides, and salts into surace water.	☑ NOT meet PC
F. Resource Concerns and Existing/ Benchmark Conditions (Analyze and record the existing/benchmark conditions for each identified concern)	**I. Effects of Alternatives (continued)**						
	No Action		***Alternative 1***		***Alternative 2***		
	Amount, Status, Description *(Document both short and long term impacts)*	**√ if does NOT meet PC**	**Amount, Status, Description** *(Document both short and long term impacts)*	**√ if does NOT meet PC**	**Amount, Status, Description** *(Document both short and long term impacts)*	**√ if does NOT meet PC**
AIR							
Emissions of Particulate Matter (PM) and PM Precursors Air quality is periodically degraded by tillage practices and traffic on gravel roads.	No Change. The AOI is consistent with other rural areas in the eastern part of North Dakota.	☑ NOT meet PC	Increased crop production will slighly increase annual truck/tractor emissions and fugitive dust. Construction will temporarily increase emissions and fugitive dust potentially impacting residents in Dazey and rural residents adjacent to construction.	☑ NOT meet PC	Increased crop production will slighly increase annual truck/tractor emissions and fugitive dust, this impact will be slighly less compared with alt 1. Construction will temporarily increase emissions and fugitive dust potentially impacting residents in Dazey and rural residents adjacent to construction.	☑ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
PLANTS							
Plant productivity and health High water table and flooding have reduced crop yeilds.	No change. High water table and flooding will continue to hinder crop production in the AOI.	☑ NOT meet PC	Consistent water levels and lowered water table would result in improved crop production. Crop production would be made possible in some of the former lake bottom and non-cropland.	☐ NOT meet PC	Consistent water levels and lowered water table would result in improved crop production. Crop production would be made possible in some of the former lake bottom non-cropland.	☐ NOT meet PC
Plant structure and composition High water table and flooding have resulted in an increase of wetland vegetation compared with before the wet cycle where more acres were in cropland land use.	No change.	☑ NOT meet PC	Plant diversity would be reduced to monocultrue crops once drainage and drainage water management systems are installed. Although mitigation efforts will create conditions similar to what is currently present, it will be in a different location.	☐ NOT meet PC	Plant diversity would be reduced to monocultrue crops once drainage and drainage water management systems are installed. Although mitigation efforts will create conditions similar to what is currently present, it will be in a different location.	☐ NOT meet PC

		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
ANIMALS						
Terrestrial habitat for wildlife and invertebrates Wetland buffers and some odd areas of non-cropland provide habitat for a variety of terrestrial wildlife and invertabrates	No Change	☑ NOT meet PC	Conversion of wetlands will destroy most if not all the habitat for terrestrial animals and invertabrates in the affected fields. Mitigation efforts will replace the lost habitat, though in a different location.	☐ NOT meet PC	Conversion of wetlands will destroy most if not all the habitat for terrestrial animals and invertabrates in the affected fields. Mitigation efforts will replace the lost habitat, though in a different location.	☐ NOT meet PC
Aquatic habitat for fish and other organisms Ten Mile Lake and other wetlands in the AOI provide habitat for numerous species of amphibians, fish, and invertabrates.	No Change	☑ NOT meet PC	Conversion of wetlands will destroy most if not all the habitat for aquatic animals and invertabrates in the affected fields. Reduced depth of Ten Mile Lake may adversely affect fish species that may currently be present in the lake. Mitigation efforts will replace the lost habitat, though in a different location.	☐ NOT meet PC	Conversion of wetlands will destroy most if not all the habitat for aquatic animals and invertabrates in the affected fields. Reduced depth of Ten Mile Lake may adversely affect fish species that may currently be present in the lake. Mitigation efforts will replace the lost habitat, though in a different location.	☐ NOT meet PC
		☐ NOT meet PC		☐ NOT meet PC		☐ NOT meet PC
ENERGY						
Energy efficiency of farming/ranching practices and field operations	No Change. Fuel efficiency is poor when having to operate in wet, heavy soils. Additional passes are often required to prepare fields for planting.	☑ NOT meet PC	Land with properly installed drainage should be easier to get equipment across fields. Field operations should take fewer passes to accomplish goals.	☑ NOT meet PC	Land with properly installed drainage should be easier to get equipment across fields. Field operations should take fewer passes to accomplish goals. Improvements would be limited to those areas immedeately adjacent to Ten Mile Lake where DWM practices will be installed.	☑ NOT meet PC
Energy efficiency of equipment and facilities	No Change	☑ NOT meet PC	Increased energy used to pump water out of subsurface tile lines, where gravity outlets are not feasible, on 13,329 acres of new tile drainage.	☑ NOT meet PC	Increased energy used to pump water out of subsurface tile lines, where gravity outlets are not feasible, on 2,133 acres of new tile drainage.	☑ NOT meet PC
Human Economic and Social Considerations						
Public Health and Safety Roads have periods of closure during spring runoff and homes experience basement flooding issues.	Increased response times by emergency services to reach residences within the AOI. Basements will continue to experience flooding issues.		Roads will consistently be in good repair, therefore, reducing response times by emergency services. Residential and Commercial basements should have much fewer issues with flooding.		Roads will consistently be in good repair, therefore, reducing response times by emergency services. Residential and Commercial basements should have much fewer issues with flooding.	
Capital A long term we cycle has increase road operation and maintencance costs and reduced agricultural income.	O&M on township roads will continue to be high. Leading to higher property taxes. Plant productivity will continue to be depressed. Leading to lower revenue for producers		Federal funding through PL-566 would be approximately 54% of total costs, if the proejct had been feasible, leaving an large cost to be funded by state and local sources.		Federal funding through PL-566 would be approximately 54% of total costs, if the proejct had been feasible, leaving an large cost to be funded by state and local sources.	
Land Use Land use is primarily intensive cropping with some haying mixed in. Acres previously in cropped land use have increased hayland and wildlife landuse acres.	No change in land use will occur.		This alternative will make 580.4 acres previously under water or wildlife landuse available for cropping. Although the converted acres will be mitigated, it will be in a different location		This alternative will make 340.4 acres previously under water or wldlife landuse available for cropping. Although the converted acres will be mitigated, it will be in a different location	

Special Environmental Concerns: Environmental Laws, Executive Orders, Policies, etc.

In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "●" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.

G. Special Environmental Concerns (Document existing/ benchmark conditions)	J. Impacts to Special Environmental Concerns					
	No Action		*Alternative 1*		*Alternative 2*	
	Document all impacts (Attach Guide Sheets as applicable)	√ if does NOT meet	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action	Document all impacts (Attach Guide Sheets as applicable)	√ if needs further action
●Clean Air Act *Guide Sheet* North Dkota has no identified non-attainment areas.	No Effect	☐	May Affect Temporary impacts expected during construction will be minimized with BMP's and construction specifications.	☐	May Affect Temporary impacts expected during construction will be minimized with BMP's and construction specifications	☐
●Clean Water Act / Waters of the U.S. *Guide Sheet* Silver Creek along with a tributary that begins within the AOI is listed as an impaired water. Silver Creek is a tributary to the Baldhill Creek. The eastern boundary of the AOI is adjacent to the Baldhill Creek which is labeled as an "Impaired Water" according to CWA 303d. Baldhill Creek discharges into Lake Ashtabula/Sheyenne River which is also labeled as an impaired water under 303d of the CWA. The AOI contains many lacustrine, palustrine and riverine wetlands.	No Effect	☐	May Affect USACE would need to make a CWA determination for wetlands, if the project were to proceed to a full PL-566 plan. Up to 1,254 acres of deepwater habitat and 539 acres of lacustrine fringe wetlands (or more/less based on field wetland delineation) would potentially need to be mitigated under CWA due to lowering of the lake level by 4 feet. Up to 1,611.9 acres of palustrine wetlands (or more/less based on field wetland delineation) would potentially need to be mtiigated under CWA due to tile drainage installed in crop fields. Note that E.O. 11990 would require mitigation for these drained wetlands, even if USACE determined the wetlands were not regulated under CWA.	☑	May Affect USACE would need to make a CWA determination for wetlands, if the project were to proceed to a full PL-566 plan. Up to 1,254 acres of deepwater habitat and 539 acres of lacustrine fringe wetlands (or more/less based on field wetland delineation) would potentially need to be mitigated under CWA due to lowering of the lake level by 4 feet. Up to 155.6 acres of palustrine wetlands (or more/less based on field wetland delineation) would potentially need to be mtiigated under CWA due to tile drainage installed in crop fields. Note that E.O. 11990 would require this mitigation for these drained wetlands, even if USACE determined the wetlands were not regulated under CWA.	☑
●Coastal Zone Management *Guide Sheet* n/a		☐		☐		☐
Coral Reefs *Guide Sheet* n/a		☐		☐		☐
●Cultural Resources / Historic Properties *Guide Sheet* A review of the state Cultural Resource Information System has identified 3 previous cultural resource surveys and 15 recorded archeological sites and structures within the proposed project area. The State Historic Preservation Office and surrounding tribes would be consulted during the planning process.	No Effect	☐	May Affect This alternative would require initiating Section 106 consultation with tribes and NDSHPO and the completion of a Class III Cultural Resource Survey.	☑	May Affect This alternative would require initiating Section 106 consultation with tribes and NDSHPO and the completion of a Class III Cultural Resource Survey.	☑
●Endangered and Threatened Species *Guide Sheet* A USFWS Ipac evaluation was completed for the Ten Mile Lake project area and no ciritical habitats exist for any endangered, threatened, or candidate species. Three species were listed as potentially present Northern Long-Eared Bat (endangered), Dakota Skipper (threatened) and Monarch Butterfly (candidate)	No Effect	☐	May Affect Habitat for the NLEB - large trees - are very limited within the project area, and are not likely to removed. Although wetlands and associated habitat will be mitigated to another location, removal of vegative buffers around wetlands may have negative impacts to monarch butterflies and/or dakota skipppers that may be present in the project area.	☑	May Affect Habitat for the NLEB - large trees - are very limited within the project area, and are not likely to be removed. Although wetlands and associated habitat will be mitigated to another location, removal of vegative buffers around wetlands may have negative impacts to monarch butterflies and/or dakota skipppers that may be present in the project area.	☑

Environmental Justice *Guide Sheet* One Census block group is present in the AOI. No populations were disproportionately represented within this group, compared with the state, county or other nearby block groups.	No Effect	☐	No Effect	☐	No Effect	☐
●Essential Fish Habitat *Guide Sheet* n/a		☐		☐		☐
Floodplain Management *Guide Sheet* Not present, ndram.sc.gov	No Effect	☐	No Effect	☐	No Effect	☐
Invasive Species *Guide Sheet* Zebra Mussels and Curly Leaf Pondweed have been documented in Lake Ashtabula, making their presence in the Baldhill Creek likely. Several noxious weeds are commonly present in the region including Canada Thistle, Musk Thistle, Leafy Spurge, and Absinthe Wormwood.	No Effect	☐	May Affect Aquatic invasive species present in Lake Ashtabula and the Baldhill Creek will have direct access to Ten Mile Lake via the drainage channel proposed by this project. Terrestrial invasive species presence may be increased in disturbed areas after construction of the structure and channel are complete. Mitigation measures to prevent the spread of zebra mussels may be costly.	☑	May Affect Aquatic invasive species present in Lake Ashtabula and the Baldhill Creek will have direct access to Ten Mile Lake via the drainage channel proposed by this project. Terrestrial invasive species presence may be increased in disturbed areas after construction of the structure and channel are complete.Mitigation measures to prevent the spread of zebra mussels may be costly.	☑

●Migratory Birds/Bald and Golden Eagle Protection Act *Guide Sheet* The lack of tall trees makes the presence of eagle nests unlikely. Other migratory birds listed as species of concern that may be found in the AOI throughout the year are Black Tern, Franklin's Gull, Leasser Yellow Legs, Northern Harrier, Pectoral Sandpiper, and Willet	No Effect	☐	May Affect Construction would take place outside of the primary nesting season, therefore no actions from this project should result in the "take" of any migratory bird species. Migratory birds may be displaced with the removal of existing shoreland habitat; the timing and placement of mitigation sites may impact migratory birds.	☐	May Affect Construction would take place outside of the primary nesting season, therefore no actions from this project should result in the "take" of any migratory bird species. Migratory birds may be displaced with the removal of existing shoreland habitat; the timing and placement of mitigation sites may impact migratory birds.	☐
Natural Areas *Guide Sheet* There are 7 US FFWS Waterfowl Production areas, 1 Easement Refuge, 1 ND Game & Fish Wildlife Management Areas within 5 miles of Ten Mile Lake.	No Effect	☐	May Affect The project may affect the natural aesthetics of 10 mile lake.	☐	No Effect The project may affect the natural aesthetics of 10 mile lake.	☐
Prime and Unique Farmlands *Guide Sheet* 72% of the farmland in the proposed project area is designated as prime farmland, or prime if drained.	No Effect	☐	No Effect No farmland will be converted to non-ag. use through this project.	☐	No Effect No farmland will be converted to non-ag. use through this project.	☐
Riparian Area *Guide Sheet* The Baldhill Creek is located at the far eastern edge of the AOI; Baldhill Creek empties into the Sheyenne River downstream of the AOI. Both are bordered by a mix of native herbaceous vegetation, crop and hay/pastureland. There are numerous fresh water emergent wetlands within the AOI intersected by large and small drains. The larger wetlands in the AOI are lined with native and introducred herbaceous vegetation. Smaller wetlands within the cropland are typically unbuffered.	No Effect	☐	May Affect Both large and small wetlands within the AOI may be affected by surface and/or subsurface drainage due to this project.	☑	May Affect Both large and small wetlands located in fields adjacent to Ten Mile Lake may be affected by surface and/or subsurface drainage due to this project.	☑
Scenic Beauty *Guide Sheet* Except for Lake Ashtabula, the landscape is under intensive agricultural management.	No Effect	☐	May Affect The scenic beauty of the 10-mile lake may be adversely impacted by the lake drawdown.	☐	May Affect The scenic beauty of the 10-mile lake may be adversely impacted by the lake drawdown.	☐
●Wetlands *Guide Sheet* According to USFWS NWI data, there are 7,488.6 acres of wetlands within the project AOI. 3,237.5 ac. are lacustrine, 4,025.9 ac. are palustrine, and 225.6 ac. are riverine. Of that, 1,611 acres (not includeing Ten Mile Lake) are not protected by a conservation easement or fee-title ownership.	No Effect	☐	May Affect The project would result in loss of an estimated of 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wetlands, and 1,611.9 acres of palustrine wetlands. These would be mitigated for elsewhere within the Red River Basin under NDIRT requirements.	☑	May Affect The project would result in loss of an estimated of 1,254 acres of deepwater habitat, 539 acres of lacustrine fringe wetlands, and 1,611.9 acres of palustrine wetlands. These would be mitigated for elsewhere within the Red River Basin under NDIRT requirements.	☑
●Wild and Scenic Rivers *Guide Sheet* n/a		☐		☐		☐

K. Other Agencies and Broad Public Concerns	No Action	Alternative 1	Alternative 2
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.	No permits or easements necessary	A US ACOE 404 permit will be required. Mitigation easements will be necessary. Land purchase will be needed. ND DWR permit will be needed. Public vote may be needed. Formal measures may be required for preventing the spread of ANS.	404 permit will be necessary. Mitigation easements will be necessary. Land purchase will be needed. ND DWR permit will be needed. Public vote may be needed.Formal measures may be required for preventing the spread of ANS.
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)	No effect. Damage to public and private infrastructure will continue during wet periods.	Cropland productivity will improve due to controlled water table. O&M of public and private infrastructure will stabilize and be more consistent. Wildlife habitat quality and quantity will continue to decrease as the drainage effects make more land farmable.	Cropland productivity will improve across the AOI due to controlled water table. O&M of public and private infrastructure will stabilize and be more consistent. Wildlife habitat quality and quantity will continue to decrease as the drainage effects make more land farmable.
L. Mitigation (Record actions to avoid, minimize, and compensate)	No mitigation required	2,881.9 wetland acres requred. Deep Water Habitat: 1,254 ac. Lacustrine Fringe: 539 ac. Palustrine (pothole) wetlands: 1083.6 ac. Riverine: 5.3 ac.	1,948.6 wetland acres required. Deep Water Habitat: 1,254 ac. Lacustrine Fringe: 539 ac. Palustrine (pothole) wetlands: 1083.6 ac. Riverine: 0.0 ac.
M. Preferred Alternative — √ preferred alternative	☑	☐	☐
M. Preferred Alternative — Supporting reason	Alternatives 1 and 2 were found to be infeasible for PL-566 due to a benefit to cost ratio < 1, therefore the No Action alternaive is the preferred alternative		

N. Context (Record context of alternatives analysis) The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.	-Town or city
	-Sub-watershed (ex. 12-digit HUC, or smaller)
	-County

O. To the best of my knowledge, the data shown on this form is accurate and complete:

In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.

Signature (TSP if applicable)	Title	Date
RITA SVEEN Digitally signed by RITA SVEEN Date: 2024.09.09 15:04:48 -05'00'	Watershed Planner	9/9/2024
Signature (NRCS)	**Title**	**Date**

If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client, then indicate to whom this is being provided.

The following sections are to be completed by the Responsible Federal Official (RFO)

NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.

P. Determination of Significance or Extraordinary Circumstances

To answer the questions below, consider the severity (intensity) of impacts in the contexts identified above. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.

Yes	No	
☐	☑	• Is the preferred alternative expected to cause significant effects on public health or safety?
☐	☑	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?
☐	☑	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?
☐	☑	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?
☐	☑	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?
☐	☑	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?
☐	☑	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in this determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.
☐	☑	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?

Q. NEPA Compliance Finding (check one) The preferred alternative:		Action required
☑	1) is **not a federal action** where the agency has control or responsibility.	Document in "R.1" below. No additional analysis is required
☐	2) is a federal action **ALL** of which is **categorically excluded** from further environmental analysis **AND** there are **no extraordinary circumstances as identified in Section "P".**	Document in "R.2" below. No additional analysis is required
☐	3) is a federal action that has been **sufficiently analyzed** in an existing Agency state, regional, or national NEPA document **and** there are no predicted significant adverse environmental effects or extraordinary circumstances.	Document in "R.1" below. No additional analysis is required.
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects **and has been formally adopted by NRCS**. NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (**Note: This box is not applicable to FSA)**	Contact the State Environmental Compliance Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required
☐	5) is a federal action that has **NOT** been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.	Contact the State Environmental Compliance Liaison. Further NEPA analysis required. Explain in Notes Section.

R. Rationale Supporting the Finding

R.1 Findings Documentation	If a PL-566 Watershed Plan were to proceed on this project, an EIS would be necessary given the extent of impacts to wetlands and wildlife habitat, as well as concerns regarding water quality and invasive species. Given the economic analysis results, however, the project was found infeasible for PL-566. Therefore, No Action is the preferred federal alternative.
R.2 Applicable Categorical Exclusion(s) **(more than one may apply)** 7 CFR Part 650 *Compliance With NEPA* , subpart 650.6 *Categorical Exclusions* states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	

I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.

S. Signature of Responsible Federal Official:

RICHARD WEBB Digitally signed by RICHARD WEBB Date: 2024.09.09 15:16:54 -05'00'	State Resource Con.	9/9/2024
Signature	**Title**	**Date**

Additional Notes

10 Mile Lake Water Management Project

Appendix D-4: PIFR Technical Analysis

Prepared for:

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Prepared by:

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United States Department of Agriculture

August 22, 2024

Contents

This technical appendix report is provided to document the field work, wetland mitigation analysis, preliminary design, and preliminary economic analysis work completed to assess feasibility of improvements a water management project on 10 Mile Lake as required for the Preliminary Investigation of Feasibility.

1- Estimation of Wetland Extents and Types

The project area for the 10 Mile Preliminary Investigation Findings Report (PIFR) was chosen based on proximity of land to 10 Mile Lake and the proposed outlet channel. The fields immediately surrounding the lake were chosen because the newly exposed cropland (former lake bottom) would likely need to have subsurface drainage installed to help control inevitable salinity issues. The potential profitible installation of subsurface drainage in the rest of those fields surrounding the lake was positive. A buffer of approximately two miles was used along the proposed outlet channel was used as the remainder of the project area. The topography in this area is conducive to tile drainage into the proposed channel. Not all wetlands within the project area are eligible for drainage. Many of the wetlands in the area are protected from drainage either through easements or fee title ownership by government agencies. The wetlands that could potentially eligible for drainage under each alternative are listed in the tables below and were assumed to all be drained under Alternative 1 for increased crop production in the watershed.

Wetlands play an important role in in the water cycle, reducing flooding, providing filtration and recharge for aquafers, in addition to many other benefits. Because of the important role wetlands play in the nation's ecosystems, the U.S. government has put restrictions on the use of federal funds for activities that would negatively impact wetlands. Executive Order 11990 states: Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities (E.O. 11990, Sec.1(a)). Which basically says the federal government can not fund projects that will adversely affect wetlands. The work around for this situation is through mitigation. Table 1 and Table 2 below show the wetland acreages and types of wetlands eligible for drainage, and therefore mitigation. Wetlands are defined as those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds. The question then arises regarding the need to mitigate the portion of 10 Mile Lake classified as deepwater habitat, because it does not meet the vegetative requirements of the wetland definition. The deepwater habitat needs to be mitigated for because a large portion of 10 Mile Lake is classified as lacustrine fringe habitat, which does meet the definition of a wetland. Without deepwater habitat, lacustrine fringe habitat cannot exist. Typically, a hydrogeomorphic model (HGM) would be used to determine the mitigation extent necessary to offset the conversion activity, however, no HGM for deepwater habitat or lacustrine fringe habitat exists for the northern great plains. Instead, during an interagency meeting, it was decided that using a 2:1 ratio

approved by NDIRT, and used often during the construction of mitigation banks, would be used to calculate mitigation needs for this PIFR.

Table 1 - Alternative 1 Wetlands Potentially Eligible to Drain

Wetland Code	Wetland Type	Acres	Count
L2AB, G, d, x	Lake	1523.5	14
PABF, x	Freshwater Pond	24.5	34
PEM1A, x	Freshwater Emergent	255.6	278
PEM1C, d, x	Freshwater Emergent	608.3	140
PEM1F	Freshwater Emergent	0.9	2
Pf	Other (farmed)	337.4	897
PFO1A	Freshwater Forested	1.8	2
PSS1A	Freshwater Shrub	0.1	1
R4SBA, x	Riverine	1.5	3
R4SBC, x	Riverine	3.8	6
	Total	2607.1	1,377

Table 2 - Alternative 2 Wetlands Potentially Eligible to Drain

Wetland Code	Wetland Type	Acres	Count
L2AB, G, d, x	Lake	1523.5	14
PABF	Freshwater Pond	1.4	3
PEM1A, d	Freshwater Emergent	20.1	36
PEM1C, d	Freshwater Emergent	85.9	35
Pf	Other (farmed)	48.2	194
	Total	1679.1	282

2- Mitigation Cost Estimates

In order to complete a cursory economic analysis for project alternatives, it was necessary to develop cost estimates for the wetland and deepwater habitat mitigation requirements outlined above. Compensatory wetland mitigation in North Dakota is coordinated through the North Dakota Interagency Review Team (NDIRT) made up of NRCS, USACE, EPA, and USFWS which has published technical guidelines outlining requirements for mitigation bank sponsors. The 10 Mile Lake watershed lies within the Red River wetland mitigation service area. Mitigation credits may be purchased by project developers through existing approved banks, however currently in the Red River there 175 acres of mitigation credits available for purchase, for Clean Water Act wetland mitigation, at an average price of $63,000/acre currently. Clearly this is only a small fraction of what would be necessary for the 10 Mile Lake project and there is no availability of credits for lacustrine fringe or deepwater habitat mitigation. The practical and cost-effective approach would be for the Barnes WRD to develop their own mitigation sites in partnership with an experienced mitigation bank entity operating in ND. As a part of the PL-566 project, Barnes WRD would purchase land rights, complete construction of restoration/creation projects under the NDIRT guidelines and turn over long term management of the mitigation bank properties to the partner. A multitude of sites spread across the Red River watershed would likely be necessary, although sites in Barnes County near the project would be preferred.

Recognizing that wetland mitigation would be a major cost to the project, NRCS invited Barnes WRD to identify any cost-effective mitigation sites in the county. Barnes WRD hired Houston Engineering to assist with this. HEI and NRCS looked at 4 potential sites. The sites (labeled 16, 17, 18, and 22) are all wetlands with pre-existing drainage, however, none are fully converted. NRCS and HEI completed wetland delineations according to USACOE wetland delineation procedures. Of the 4 sites, 2 have the

potential to generate wetland credits. Wetland 16 is located within the SE¼ of Sec. 35 T142N R61W and the N½ of Sec. 2 T141N R61W, Barnes County ND. It has the potential to generate 23.2 credits. Wetland 18 is located within the NE ¼ Sec. 35 T142N R61W. It has the potential to generate 13.7 credits. Total potential number of credits between the two wetlands is 36.9. These credits would be suitable for depressional wetlands, not lacustrine fringe or deepwater habitat. (See Figures 4 and 5) Unfortunately, 36.9 is only a fraction of the credits required for depressional wetlands, let alone the credits required for lacustrine fringe and deepwater habitat.

Given that the goal of the PIFR was to simply complete a feasibility level economic analysis, NRCS intentionally utilized a very optimistic cost estimate of $20,000/acre for mitigation of depressional wetlands and assumed these could be developed in areas currently not being farmed. Note that if mitigation were to occur on cropland, the economic loss of taking that land out of production would further reduce the overall economic benefits of this project. Development of a site to mitigation the 1,254 acres of deepwater habitat and 539 acres of lacustrine fringe wetlands would logically involve construction of a dam. A dam on the Upper Maple River was constructed in Steele County in 2015 at a total cost of $9.2 million, including land rights; adjusted to 2024 that would be $11.8 million. The dam has a maximum height of 30 feet and impounds 5,205 acre-feet of water to the auxiliary spillway crest. It was constructed as a dry dam; however, construction costs would be similar if a principal spillway design to create a permanent pool would have been included. The stage-storage curve for the dam indicates that this project could have generated 387 acres of deepwater habitat, and 338 acres of lacustrine fringe wetlands and mitigation costs were estimated accordingly. Note that this is again a generous estimate; in reality, construction of a dam with a permanent pool would likely require extensive mitigation of riverine and depressional wetlands that would be flooded by the permanent pool level. In addition to those potentially high wetland mitigation costs, any cropland taken out of production by the new dam would also have to be accounted for in the PL-566 economic analysis. Table 3 provides a summary of the mitigation cost assumptions utilized for this analysis, with the recognition that this is an unlikely "best case" scenario from an economic standpoint.

Table 3- Mitigation Requirements

Mitigation Type	Mitigation Development Assumption	Alt 1	Alt 1 Mitigation Cost	Alt 2	Alt 2 Mitigation Cost
Deepwater Habitat	$30,332/ac	1,254 ac	$38,036,193	1,254 ac	$38,036,193
Lacustrine Fringe Wetlands	$34,726/ac	539 ac	$18,717,089	539 ac	$18,717,089
Depressional Wetlands	$20,000/ac	1,612 ac	$32,240,000	156 ac	$3,120,000
Total		3,405 ac	$88,993,282	1,949 ac	$59,873,282

3- Preliminary Engineering Alternatives

As noted in the PIFR, a preliminary design had already been developed for a control structure and outlet channel designed to lower 10 Mile Lake by 4 feet by Houston Engineering (see attachment). NRCS laid out the alternative channel location shown in Appendix 2, Exhibits 10 and 11 to minimize wetland impacts, as required by E.O. 11990. The control structure would likely be a corrugated metal riser with incorporated slide gate. Houston Engineering provided an approximate construction cost estimate for the control structure and channel, in 2024 dollars, as listed below based on proportioning the length of the previous design to the new alignment.

To evaluate both a minimum and maximum approach to installing subsurface drainage in cropland, to look at benefit-to-cost ratios, two alternatives were developed. Alternative 1 maximizes cropland drainage along the outlet channel, to the extent possible given topography and existing conservation easements, for the purpose of maximizing benefits. Alternative 2 includes only cropland drainage immediately adjacent to 10-Mile Lake, for the purpose of minimizing costs. In reality, there would be a full range of potential scenarios between the two. Costs for cropland drainage were derived from the Ellingson Tile report (see attachment) average for 3/8" drainage coefficient for tiling.

Table 4- Construction Costs

Item	Quantity	Unit	Rate	Construction Cost
Furnish and install 36" pipe (incl. road crossings and field accesses)	6,040	LF	$125	$755,000
Drainage channel excavation (incl, topsoil, seeding, etc.)	36,300	LF	$66	$2,395,000
Furnish and install water control structure	1	LS	$50,000	$50,000
Erosion control	1	LS	$50,000	$50,000
Mobilization, overhead, traffic control, contractor QC	1	LS	$150,000	$150,000
Subtotal – control structure and channel				$3,400,800
Alternative 1				
Subsurface tile installation	13,329	AC	$1,140	$15,195,060
Total				**$18,595,860**
Alternative 2				
Subsurface tile installation	539	AC	$1,140	$2,431,620
Total				**$5,832,420**

Total implementation costs, including engineering, administration, land rights, and utilities were estimated as follows and percentages applied up to the maximum federal share allowed by the NRCS policy. Note that it is assumed that the WRD would develop contracts with private owners of fields to be tiled (with the private owner funding the non-federal share of tiling) and that construction easements for that work would be at no charge to the project.

Table 5- Total implementation Costs, Alternative 1

Item	Total Cost	NRCS	Local/State
Engineering Design	$816,192	$816,192	$0
Construction Engineering	$544,128	$544,128	$0
Construction	$18,595,860	$13,946,895	$4,648,965
Sponsor Legal/Contract Admin Costs	$85,000	$0	$85,000
Land Rights (not including mitigation)	$1,125,000	$0	$1,125,000
Wetland / Deepwater Habitat Mitigation (construction + land rights)	$88,993,282	$44,496,641	$44,496,641
Utility Relocations	$215,000	$0	$215,000
Total	$110,374,462	$59,803,856	$50,570,606

Table 6- Total Implementation Costs, Alternative 2

Item	Total Cost	NRCS	Local/State

Engineering Design	$408,096	$408,096	$0
Construction Engineering	$272,064	$272,064	$0
Construction	$5,832,420	$4,374,315	$1,458,105
Sponsor Legal/Contract Admin Costs	$85,000	$0	$85,000
Land Rights (not including mitigation)	$1,125,000	$0	$1,125,00
Wetland / Deepwater Habitat Mitigation (construction + land rights)	$59,873,282	$29,936,641	$29,936,641
Utility Relocations	$215,000	$0	$215,000
Total	$67,810.862	$34,991,116	$32,819,746

An estimate of $5,000 was assumed for annual operation and maintenance costs for the control structure and channel and $3/acre was assumed for tile drainage systems in crop fields, which would including energy costs for pumping. The O&M for wetland mitigation sites was assumed to be included in the per acre rates.

Table 7- Operation and Maintenance Costs

Item	**Alt 1**	**Alt 2**
Annual O & M Costs Channel/Outlet Structure	$5,000	$5,000
Annual O&M Costs Tile Drainage	$39,987	$6,399
Total	$44,987	$11,399

4- Historic Crop Types, Yield Projections

The USDA National Agricultural Statistics Services (NASS) Cropland Data Layer (CDL) provides remote sensing derived raster data for the U.S. on an annual basis. In North Dakota, this source is generally considered to be the most reliable data source for crop type estimates at a watershed scale. Data was summarized for the watershed for 2021, 2022, and 2023 as shown in Figures 1, 2, and 3 which are summarized in Table 8.

Table 8- Historic Crop Data

Crop	**2021 (acres)**	**2022 (acres)**	**2023 (acres)**	**Avg. (acres)**	**% of Total**
Corn	9,289	2,210	4,537	5,345	24%
Soybeans	10,841	10,043	6,854	9,246	41%
Small Grains (Wheat, Barley, Rye)	4,021	4,000	8,940	5,654	25%
Dry Beans	80	640	0	240	1%
Alfalfa	80	80	80	80	0%
Grass/Pasture	2,055	2,055	2,055	2,055	9%
Total	26,366	19,028	22,466	22,920	

The proposed project alternatives would be targeted to improving production on row crops, therefore only the percentage of row crops in the watershed was relevant to the analysis. Predictive equations for yield improvements due to drainage are not available for dry beans, barley, and rye and spring wheat is the predominant small grain crop grown in Barnes County. Therefore, the percentages were adjusted for economic analysis as listed in Table 9. Crop yields, with and without subsurface tile, were

taken from the Ellingson Tile Drainage Assessment (see attachment) prepared for the project area. Note that the yields without tile reported in the Ellingson report match to the NDSU

Table 9- Yield Estimates

Crop	% of Total	Average Undrained Cropland Yield (bu/ac)	Average Drained Cropland Yield (bu/ac)
Corn	26%	143.4	178.1
Soybeans	46%	37.5	42.9
Spring Wheat	28%	59.9	69.8

5- Economic Benefits Analysis

The analysis relies on the procedures and guidance provided in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G), the Principles and Requirements for Federal Investments in Water Resources (PR&G), and the National Resources Economics Handbook (NREH) part 611. The analysis uses the Fiscal Year (FY) 2024 federal discount rate for water resources projects of 2.75%.

Crop Production Benefits

The National Resource Economics Handbook 611.0102(b)(1) directs use of current normalized prices for economic evaluation of watershed projects. The state-level normalized prices as provided by the Economic Research Service (ERS) for 2023 were utilized for revenues. For land newly brought into production due to the project, the full annual direct production costs from the NDSU 2024 Crop Budgets for South East North Dakota was utilized. For the additional yield on tiled land, it was assumed that the only production costs that would increase would be drying and hauling costs.

Table 10- Crop Revenues and Costs

Crop	Price	Full Production Costs	Drying and Hauling Costs
Corn	$4.00/bu	$422.30/ac	$0.17/bu
Soybeans	$9.50/bu	$320.33/ac	$0.20/bu
Spring Wheat	$5.99/bu	$229.88/ac	$0.17/bu

The resulting annual crop production benefits due to newly created cropland under each alternative are outlined below.

Table 11- Production Benefits Due to Newly Created Cropland

Crop	Alt 1 New Cropland (ac)	Alt 1 Net Revenue Increase	Alt 2 New Cropland (ac)	Alt 2 Net Revenue Increase
Corn	153	$44,425	90	$26,043
Soybeans	265	$23,104	155	$13,543
Spring Wheat	162	$30,487	95	$17,872
Total	580	$98,016	340	$57,458

The resulting annual crop production benefits due to installation of drain tile on existing cropland under each alternative are outlined below.

Table 12- Production Benefits Due to Tile Drainage Installation

Crop	Alt 1 Drained Cropland (ac)	Alt 1 Net Revenue Increase	Alt 2 Drained Cropland (ac)	Alt 2 Net Revenue Increase
Corn	3,519	$471,625	563	$75,473
Soybeans	6,087	$302,880	974	$48,469
Spring Wheat	3,722	$213,821	596	$34,217
Total	13,329	$988,326	2,133	$158,159

Road Maintenance Benefits

NRCS contacted the township boards responsible for road maintenance and repairs around the lake and received the following information on road maintenance costs due to high water that would be avoided with construction of this project, over the last 5 years.

Table 13- Benefits Due to Reduced Road Maintenance

Year	Township	High Water Road Repair Costs
2019	Laketown	$33,184
2020	Laketown	$133,831
2021	Edna	$102,265
2022	------	that------
2023	Laketown	$
Total		$988,326
Average Annual Costs		$61,243

City of Dazey Municipal Benefits – Buildings, Streets, Sewage Lagoons

NRCS contacted both the former and current mayors of Dazey to request information on expenditures related to high water tables. The city has spent substantial funds on lift stations, ditch clean out, street repairs, and work on the sewage lagoons due to high groundwater but could not easily put together historical data other than a recent expenditure of $ 6,817. An estimate of $20,000 a year was utilized, as an intentionally liberal value in computing the potential benefits of the project in terms of avoided costs to Dazey.

Residential Benefits – Sump Pump O&M, Basement Refinishing, Mold Remediation

NRCS requested information from the Barnes WRD, Moore Engineering, and directly asked a resident but was unable to glean any specific information on costs related to high ground water control in basements, although it is generally known to be a persistent issue for many of the 81 homes in the area (55 homes within Dazey and 26 rural homes). An estimate of $20,000 a year was utilized, as an intentionally liberal value in computing the potential benefits of the project in terms of avoided costs to private homeowners.

6 – Benefit Cost Summary

The net present values and benefit to cost ratio of each alternative are listed in Table 14.

Discount rate = 2.75%

Construction Years = 2024-37
Project Life = 50 Years
Construction Period + Project Life = 50 Years

Table 14- Alternative Net Present Value, Benefit-to-Cost Ratio Summary

Item	Alternative 1 Net Present Value	Alternative 2 Net Present Value
Costs		
Implementation Costs	$ 104,571,051	$64,245,415
Operation and Maintenance Costs	$ 1,119,592	$283,687
Financing Costs	$ 5,911,746	$3,632,005
Total Costs	**$ 111,602,389**	**$68,161,107**
Benefits		
Revenue from New Cropland Under Production	$ 2,439,323	$1,429,948
Revenue from Tiling Existing Cropland	$ 15,496,875	$3,090,681
Reduced Road Maintenance	$ 1,524,160	$ 1,524,160
Reduced Residential Groundwater Costs	$ 497,740	$ 497,740
Reduced Municipal Groundwater Costs	$ 497,740	$ 497,740
Total Benefits	**$ 20,455,839**	**$7,040,270**
Benefit/Cost	**0.18**	**0.10**
Net Benefits	**($91,146,550)**	**(61,120,837)**

7 - References

Economic Research Service (ERS), U.S. Department of Agriculture (USDA). "Normalized Prices". September 30, 2023. https://www.ers.usda.gov/data-products/normalized-prices/

Ellingson Water Management, 2024. 10 Mile Lake Drainage Assessment.

Haugen, 2024. North Dakota State University (NDSU) Extension. Farm Management Planning Guide EC 1659 Projected 2024 Crop Budgets: South East North Dakota. https://www.ndsu.edu/agriculture/ag-hub/ag-topics/farm-managemetn/crop-economics/projected-crop-budgets.

North Dakota State University. 2020 North Dakota Custom Rates Part II – Late Season Operations, December 2020. https://www.ndsu.edu/agriculture/ag-hub/ag-topics/farm-management/2020-north-dakota-custom-rates.

NRCS National Bulletin NB 200-24-1 ECN – Discount Rate for Fiscal Year 2023 Water Resources Planning and Evaluation. November 1, 2023.

8 – List of Preparers (PIFR and/or PIFR Technical Appendix)

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M. Linsay – NDDWR

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Attachments:

Ellingson Water Management, 2024. Drainage Assessment 10 Mile Lake

Moore Engineering, 2021. Preliminary Plans 10 Mile Outlet

Figure 1 - 2021 Crop Data

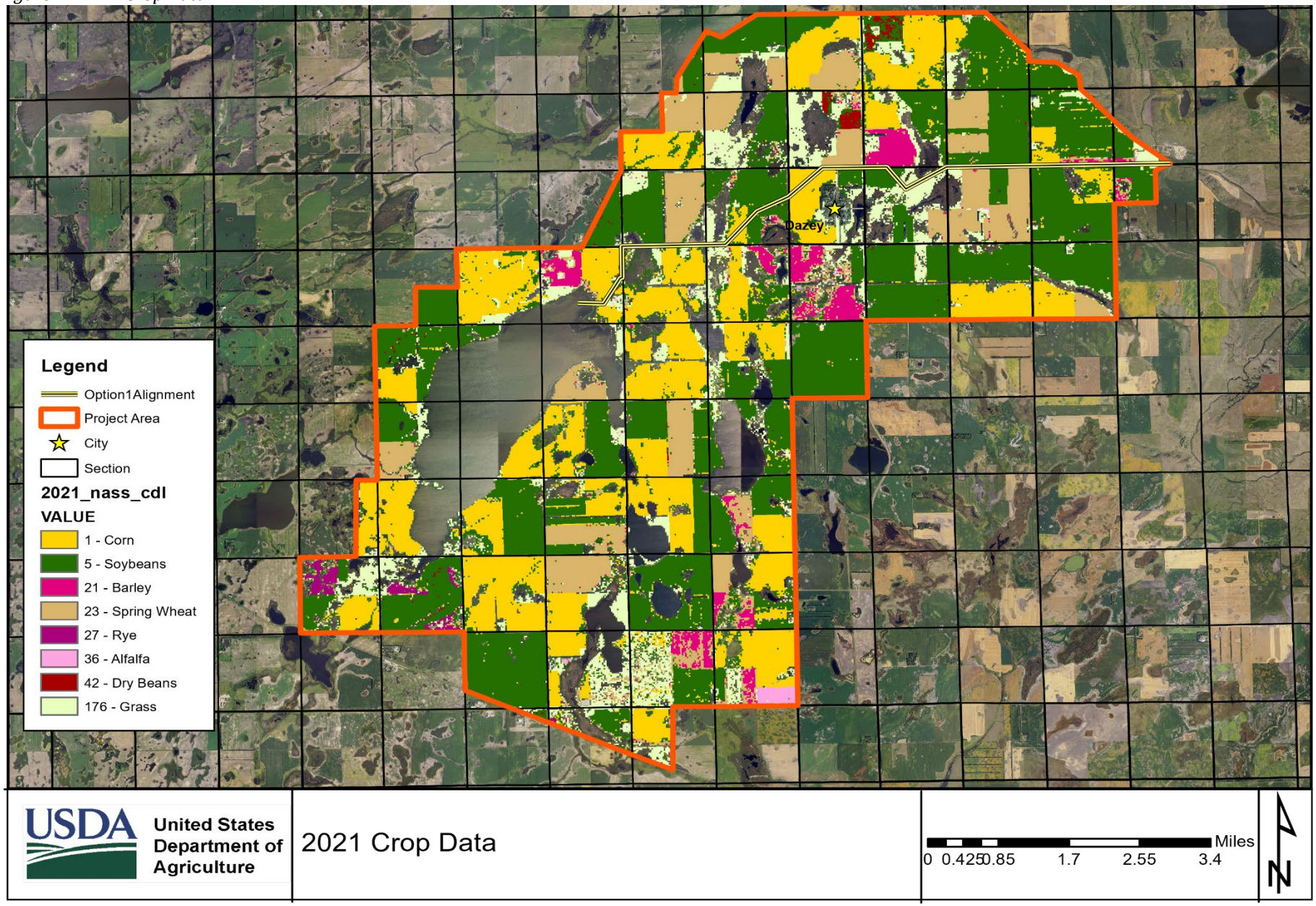


Figure 2 - 2022 Crop Data

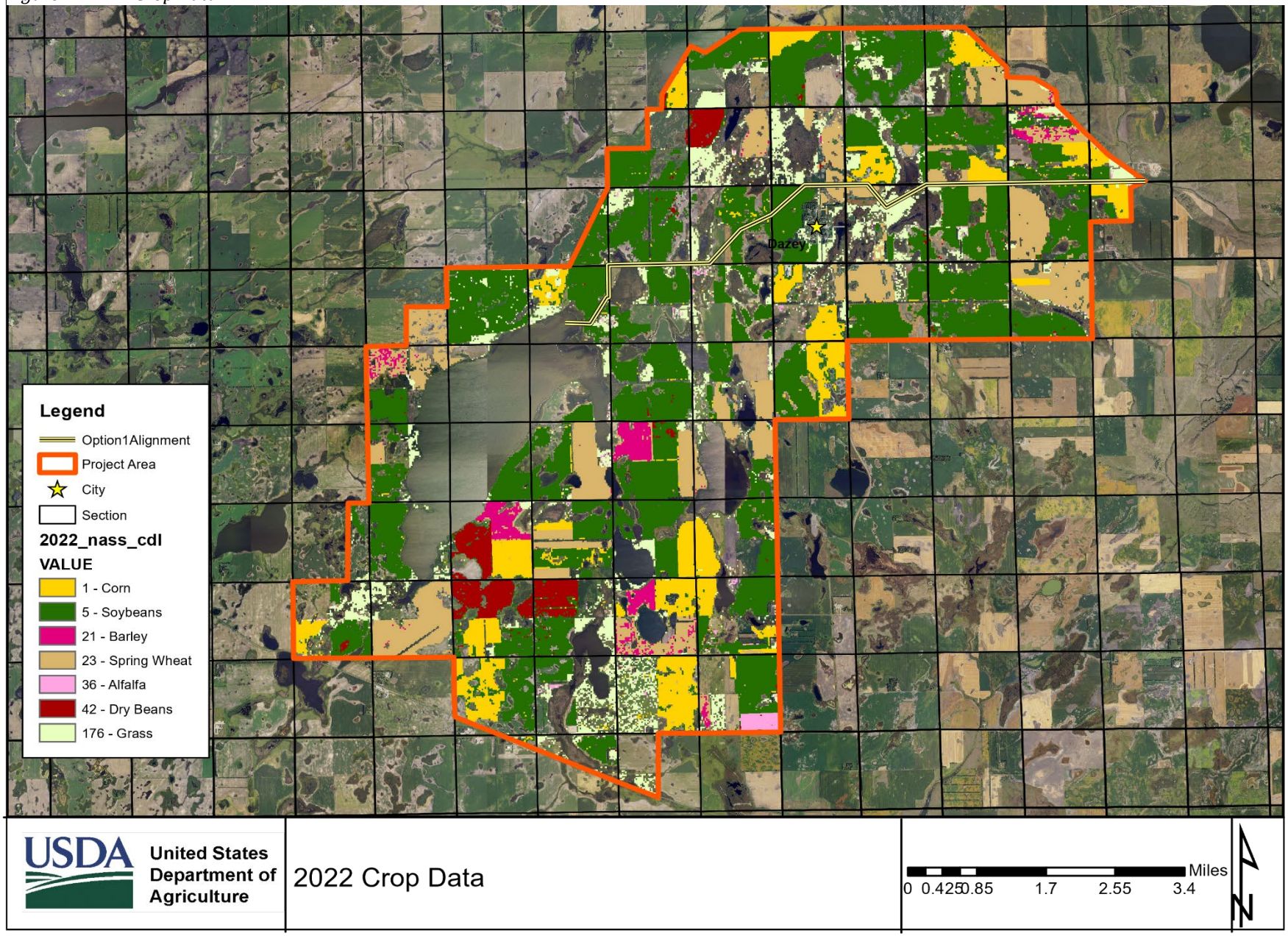


Figure 3 - 2023 Crop Data

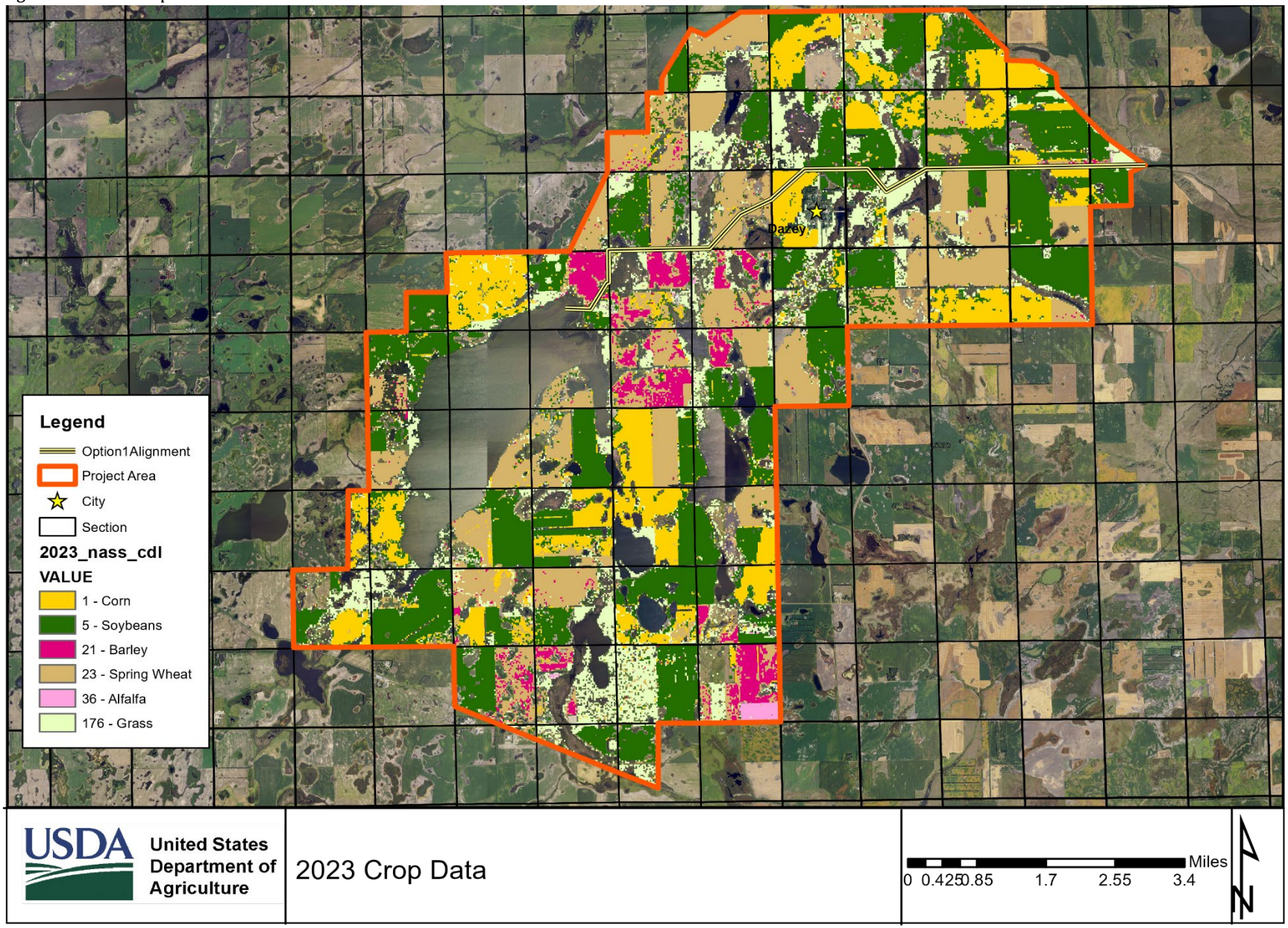


Figure 4 - Wetland 16, Potential Mitigation Site

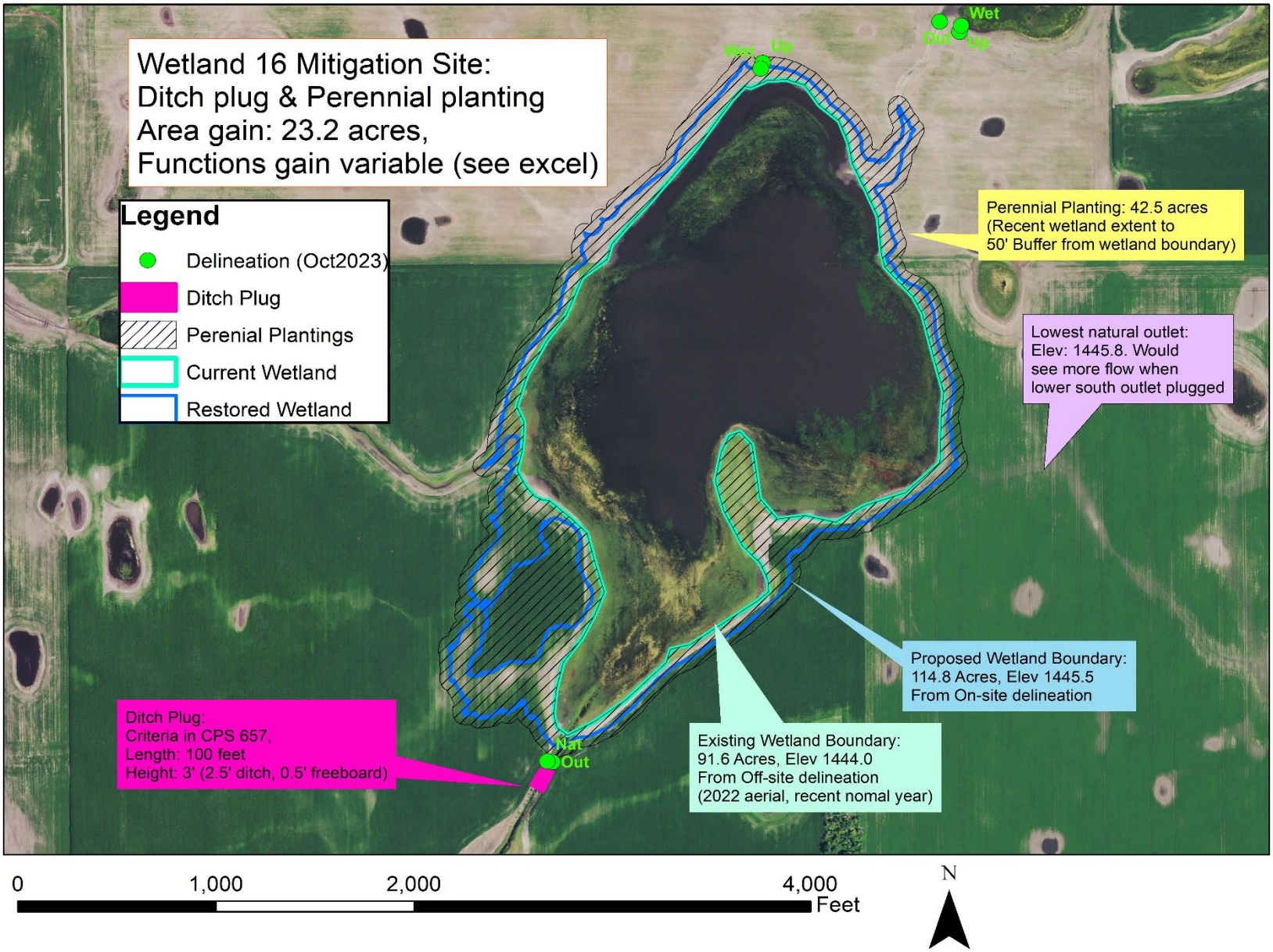
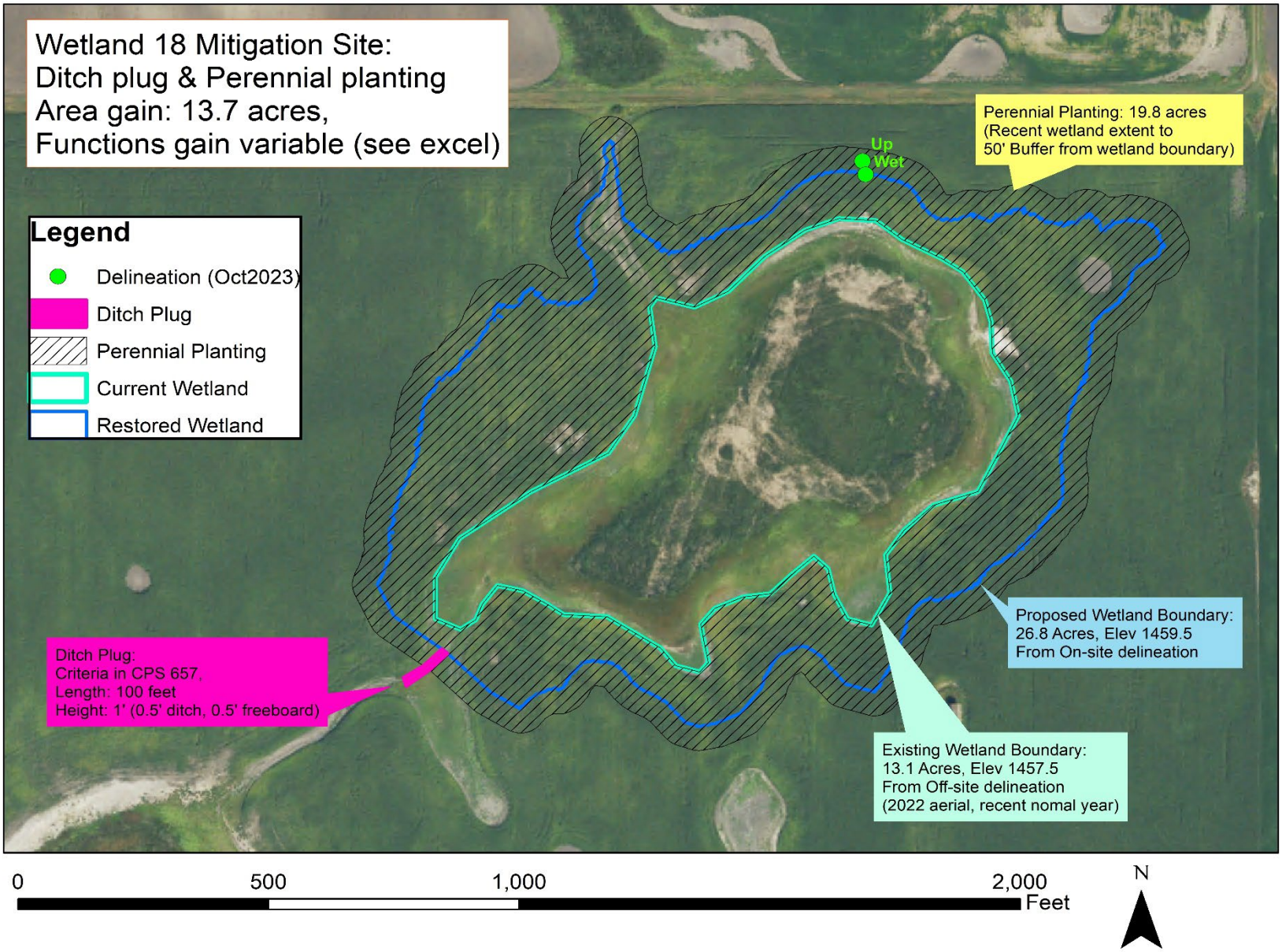


Figure 5 - Wetland 18 Potential Mitigation Site



ELLINGSON

WATER MANAGEMENT

DRAINAGE ASSESSMENT

Prepared For: NRCS

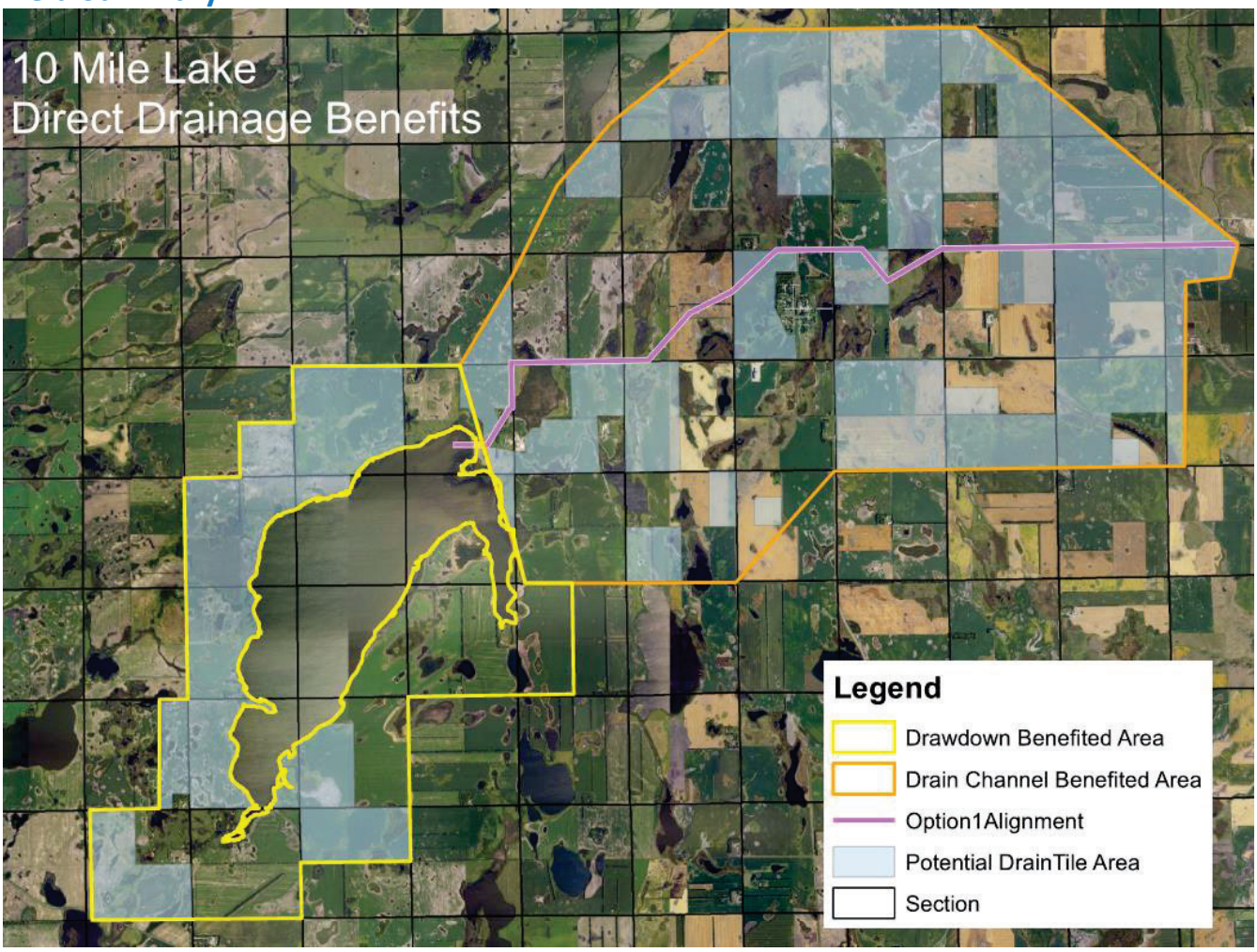
June 24, 2024

DRAINAGE ASSESSMENT: ASSUMPTIONS AND SUMMARY TABLE

The table below outlines key information on all fields/farms selected for this assessment. ROI values are derived from proprietary calculations using factors such as: preliminary project costs, soil properties, weather history, crop value and rotation, and each crop's projected yield response to tile drainage.

For this analysis the Potential Drain Tile Area from the map on the next page is considered as a single field, the ROI values in this analysis represent an average of that area. Individual fields could have a higher/lower ROI depending on each field's unique soil characteristics and crop rotation. The crop yields used in this analysis are from the county estimates of the National Agricultural Statistics Service for the 2023 growing season.

Field Summary



Field Rank	Field Name	Location	Total Area (Acres)	Investment Range per acre	Annual ROI (%)	Image	Recommended Drainage Coefficient
1	10 Mile Lake Project	Barns County, North Dakota	11432	$970 – $1310	**7.1**		3/8

Financial Summary

Crop	Drainage Coefficient						
	1/4	3/8	1/2	3/4	1	1-1/2	2
Corn	9.9%	11.8%	11.1%	9.0%	8.0%	6.6%	6.0%
Soybeans	3.5%	4.8%	4.6%	3.8%	3.4%	2.8%	2.4%
Wheat	3.7%	4.8%	4.6%	3.7%	3.3%	2.7%	2.4%
ROI	5.7%	7.1%	6.7%	5.5%	4.9%	4.0%	3.6%

The table above shows a return on investment for each drainage coefficient. Numbers are weighted based on the crop rotation specified. Your best returns are highlighted in Dark Green

Projected Yield Response 3/8" Drainage Coefficient

Yield Response & Revenue									
Crop	Rotation	Market Price	Unit	Historical Ave Yield	Projected Yield Increase	Projected Yield	Current Revenue	Projected Revenue	Profit
		$/Unit		*Unit/AC*	*Unit/AC*	*Unit/AC*	*$/AC*	*$/AC*	*$/AC*
Corn - Field	33.3%	3.83	*BU*	143.10	34.99	178.09	548.07	682.10	134.02
Soybeans	33.3%	10.32	*BU*	37.50	5.35	42.85	387.00	442.24	55.24
Wheat	33.3%	5.55	*BU*	59.90	9.87	69.77	332.45	387.20	54.76
	100%							**503.85**	**81.34**

10 year Payback analysis												
			Years									
D/C	Initial Investment	Annual Profit	1	2	3	4	5	6	7	8	9	10
1/4	$ 10,928,343.76	$ 623,824.81	$ (10,304,518.96)	$ (9,680,694.15)	$ (9,056,869.34)	$ (8,433,044.53)	$ (7,809,219.72)	$ (7,185,394.91)	$ (6,561,570.10)	$ (5,937,745.29)	$ (5,313,920.49)	$ (4,690,095.68)
3/8	$ 13,028,205.00	$ 929,565.67	$ (12,098,639.33)	$ (11,169,073.66)	$ (10,239,507.99)	$ (9,309,942.32)	$ (8,380,376.65)	$ (7,450,810.98)	$ (6,521,245.31)	$ (5,591,679.64)	$ (4,662,113.97)	$ (3,732,548.30)
1/2	$ 14,879,628.98	$1,002,807.78	$ (13,876,821.20)	$ (12,874,013.43)	$ (11,871,205.65)	$ (10,868,397.87)	$ (9,865,590.10)	$ (8,862,782.32)	$ (7,859,974.54)	$ (6,857,166.77)	$ (5,854,358.99)	$ (4,851,551.21)

Estimated Investment Per Acre: **$1140**

Estimated Return on Investment: **7.1%**

Estimated Profit Per Acre: **$81**

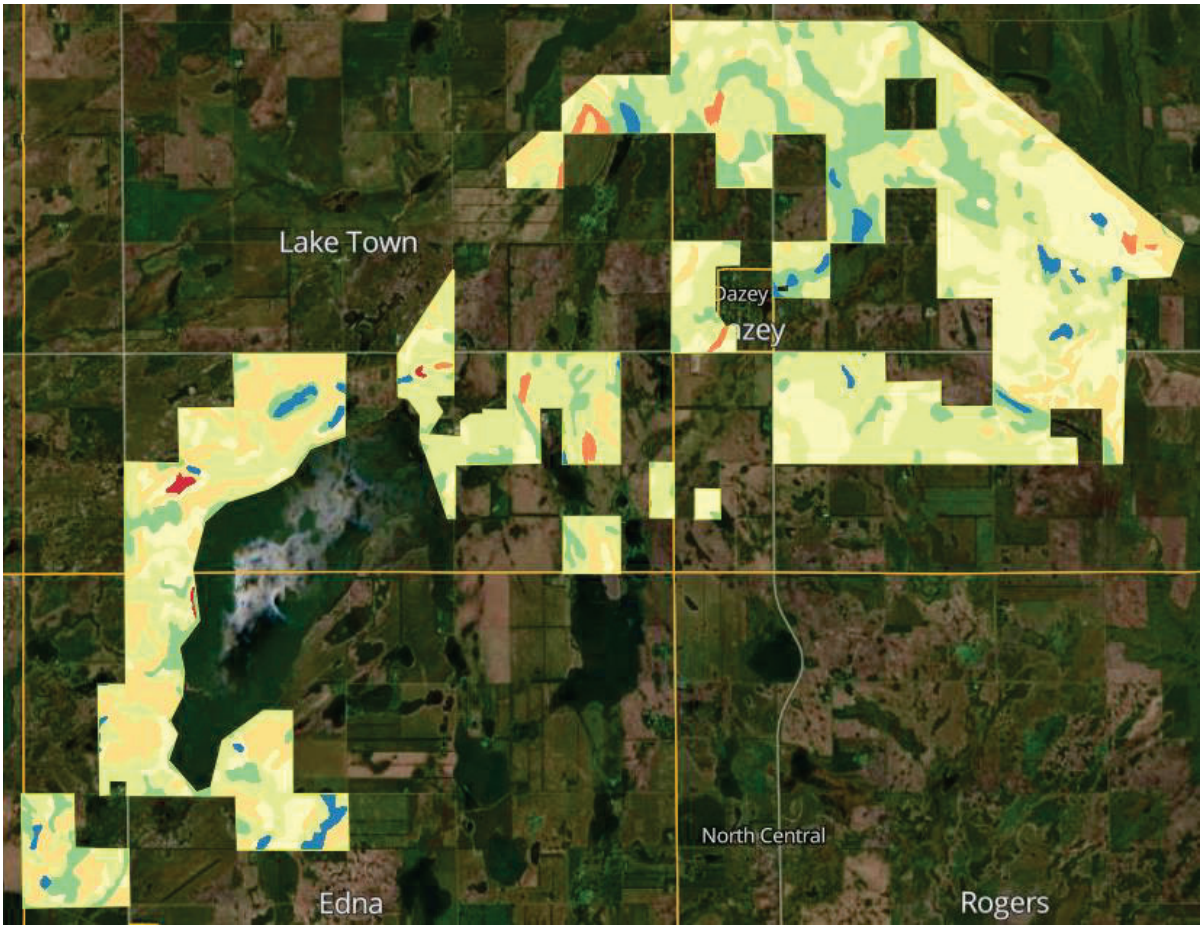
50ft

Recommended spacing

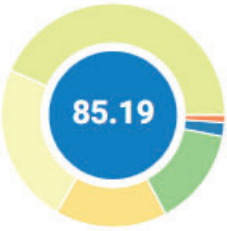
3/8

Recommended drainage coefficient

Field Overview - Drainage



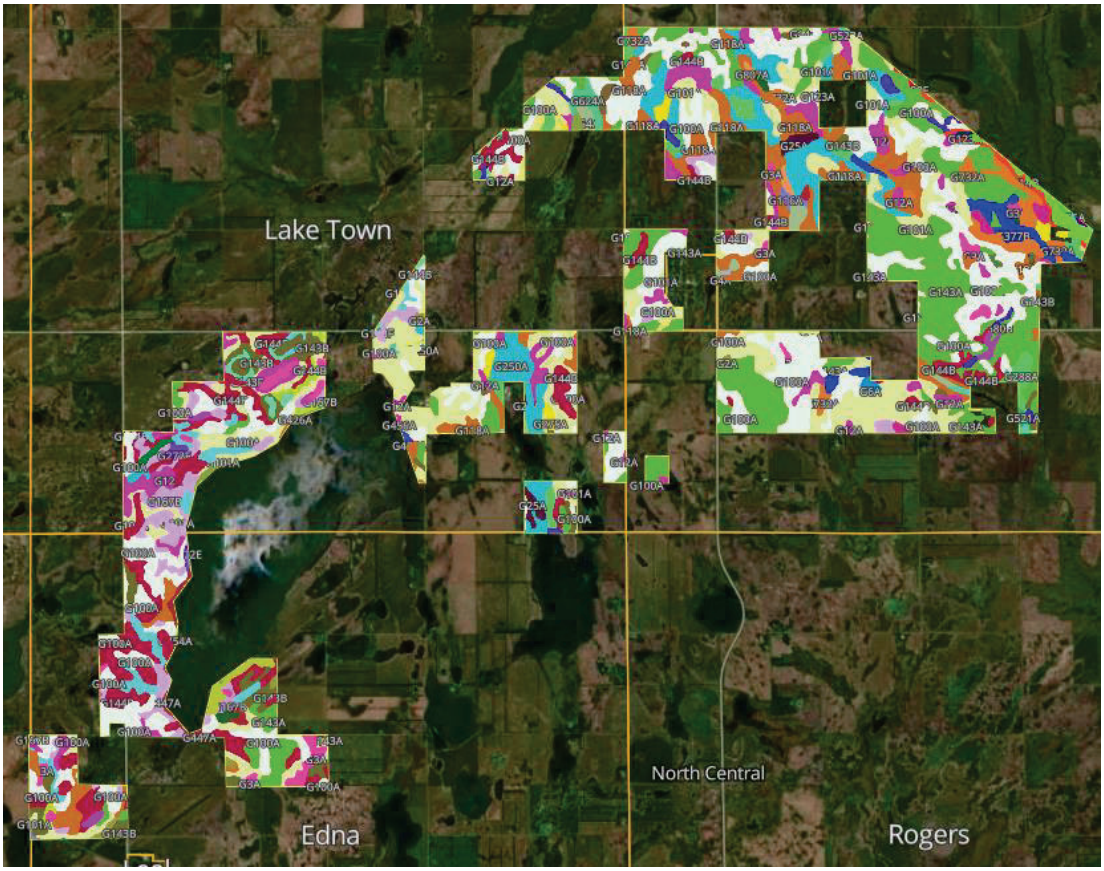
Key	Drainage Class	Acres(%)
	Somewhat poorly drained	43.00%
	Moderately well drained	23.00%
	Well drained	16.00%
	Poorly drained	14.00%
	Very poorly drained	2.00%
	Somewhat excessively drained	1.00%
	Excessively drained	0.00%
	Total	99.00%



Drainage Index

A formulation based off soil properties and crop productivity index (CPI) to determine the response of subsurface drainage in a given area to increase yield potential and improve soil health.

Field Overview – Soil



Key	Soil Code	Description	Acres (%)	Drainage Class	Crop Prod Index	Water Table Depth (Annual Minimum)
	G100A	Hamerly-Tonka complex, 0 to 3 percent slopes	2383.60 20.85	Somewhat poorly drained	85	0.0
	G101A	Hamerly-Wyard loams, 0 to 3 percent slopes	1810.18 15.83	Somewhat poorly drained	85	29.9
	G143A	Barnes-Svea loams, 0 to 3 percent slopes	1797.31 15.72	Moderately well drained	85	48.0
	G144B	Barnes-Buse loams, 3 to 6 percent slopes	831.88 7.28	Well drained	80	59.8
	G118A	Vallers loam, saline, 0 to 1 percent slopes	742.18 6.49	Poorly drained	35	9.1
	G250A	Divide loam, 0 to 2 percent slopes	656.25 5.74	Somewhat poorly drained	65	29.9
	G12A	Vallers, saline-Parnell	576.58	Poorly drained	35	0.0

Key	Soil Code	Description	Acres (%)	Drainage Class	Crop Prod Index	Water Table Depth (Annual Minimum)
		complex, 0 to 1 percent slopes	5.04			
	G167B	Balaton-Wyard loams, 0 to 6 percent slopes	425.02 3.72	Moderately well drained	71	29.9
	G143B	Barnes-Svea loams, 3 to 6 percent slopes	281.82 2.47	Well drained	80	48.0
	G143C	Barnes-Buse-Langhei loams, 6 to 9 percent slopes	211.18 1.85	Well drained	64	0.0
	G288A	Fordville loam, 0 to 2 percent slopes	190.45 1.67	Well drained	60	59.8
	G732A	Swenoda-Barnes fine sandy loams, 0 to 3 percent slopes	177.72 1.55	Moderately well drained	80	48.0
	G3A	Parnell silty clay loam, 0 to 1 percent slopes	176.33 1.54	Very poorly drained	20	0.0
	G377B	Embden-Egeland fine sandy loams, 2 to 6 percent slopes	152.17 1.33	Moderately well drained	71	48.0
	G4A	Southam silty clay loam, 0 to 1 percent slopes	79.72 0.70	Very poorly drained	6.1	0.0
	G680B	Barnes-Sioux complex, 1 to 6 percent slopes	72.64 0.64	Well drained	85	59.8
	G143F	Buse-Barnes loams, 15 to 35 percent slopes	63.80 0.56	Well drained	24	0.0
	G275A	Renshaw loam, 0 to 2 percent slopes	62.79 0.55	Somewhat excessively drained	45	0.0
	G25A	Marysland loam, 0 to 1 percent slopes	59.92 0.52	Poorly drained	30	9.1
	G614B	Barnes-Svea loams, 0 to 6 percent slopes, extremely stony	58.36 0.51	Well drained	6	48.0
	G276B	Renshaw-Sioux complex, 2 to 6 percent slopes	57.09 0.50	Somewhat excessively drained	43	0.0
	G143D	Barnes-Buse-Langhei loams, 9 to 15 percent slopes	55.27 0.48	Well drained	48	0.0
	G147F	Buse-Barnes-Darnen loams, 9 to 35 percent slopes	45.65 0.40	Well drained	24	0.0
	G251A	Divide loam, loamy substratum, 0 to 2	44.20 0.39	Somewhat poorly drained	70	29.9

Key	Soil Code	Description	Acres (%)	Drainage Class	Crop Prod Index	Water Table Depth (Annual Minimum)
		percent slopes				
	G732B	Swenoda-Barnes complex, 3 to 6 percent slopes	43.60 0.38	Moderately well drained	76	48.0
	G624A	Vallers, saline-Manfred loams, 0 to 1 percent slopes, extremely stony	42.98 0.38	Poorly drained	5	0.0
	G454A	Glyndon loam, 0 to 2 percent slopes	39.28 0.34	Somewhat poorly drained	80	29.9
	G447A	Colvin-Borup complex, saline, 0 to 1 percent slopes	37.00 0.32	Poorly drained	35	9.1
	G680C	Barnes-Sioux complex, 3 to 9 percent slopes	33.38 0.29	Well drained	80	59.8
	G45A	Colvin silty clay loam, 0 to 1 percent slopes	30.24 0.26	Poorly drained	40	9.1
	G2A	Tonka silt loam, 0 to 1 percent slopes	26.04 0.23	Poorly drained	40	0.0
	G272E	Sioux-Arvilla-Renshaw complex, 9 to 25 percent slopes	22.14 0.19	Excessively drained	11	0.0
	G523A	Lowe-Fluvaquents, channeled complex, 0 to 2 percent slopes, frequently flooded	20.57 0.18	Poorly drained	12.2	0.0
	G486C	Eckman-Zell loams, 6 to 9 percent slopes	17.15 0.15	Well drained	68	59.8
	G426A	Minnewaukan loamy fine sand, 0 to 2 percent slopes	16.98 0.15	Poorly drained	20	5.9
	G807A	Arveson loam, loamy substratum, 0 to 1 percent slopes	16.53 0.14	Poorly drained	30	9.1
	G6A	Vallers loam, 0 to 1 percent slopes	14.48 0.13	Poorly drained	40	9.1
	G116A	Easby clay loam, 0 to 1 percent slopes	14.45 0.13	Poorly drained	15	9.1
	G61A	Dovray silty clay, 0 to 1 percent slopes	7.31 0.06	Very poorly drained	20	0.0
	G123A	Svea-Cavour loams, 0 to 3 percent slopes	6.70 0.06	Moderately well drained	100	48.0
	G272C	Sioux-Arvilla-Renshaw complex, 6 to 9 percent slopes	6.06 0.05	Excessively drained	15	0.0

Key	Soil Code	Description	Acres (%)	Drainage Class	Crop Prod Index	Water Table Depth (Annual Minimum)
	G606A	Nutley silty clay, 0 to 2 percent slopes, colluvial	5.84 0.05	Well drained	85	59.8
	G521A	Lowe loam, 0 to 1 percent slopes, occasionally flooded	5.30 0.05	Poorly drained	40	9.1
	G456A	Glyndon loam, saline, 0 to 2 percent slopes	4.63 0.04	Somewhat poorly drained	48	29.9
	G998	Water, miscellaneous	4.27 0.04	N/A	N/A	0.0
	G680F	Buse-Sioux complex, 9 to 35 percent slopes	3.87 0.03	Well drained	24	0.0
	G606B	Nutley silty clay, 2 to 6 percent slopes, colluvial	1.61 0.01	Well drained	80	59.8

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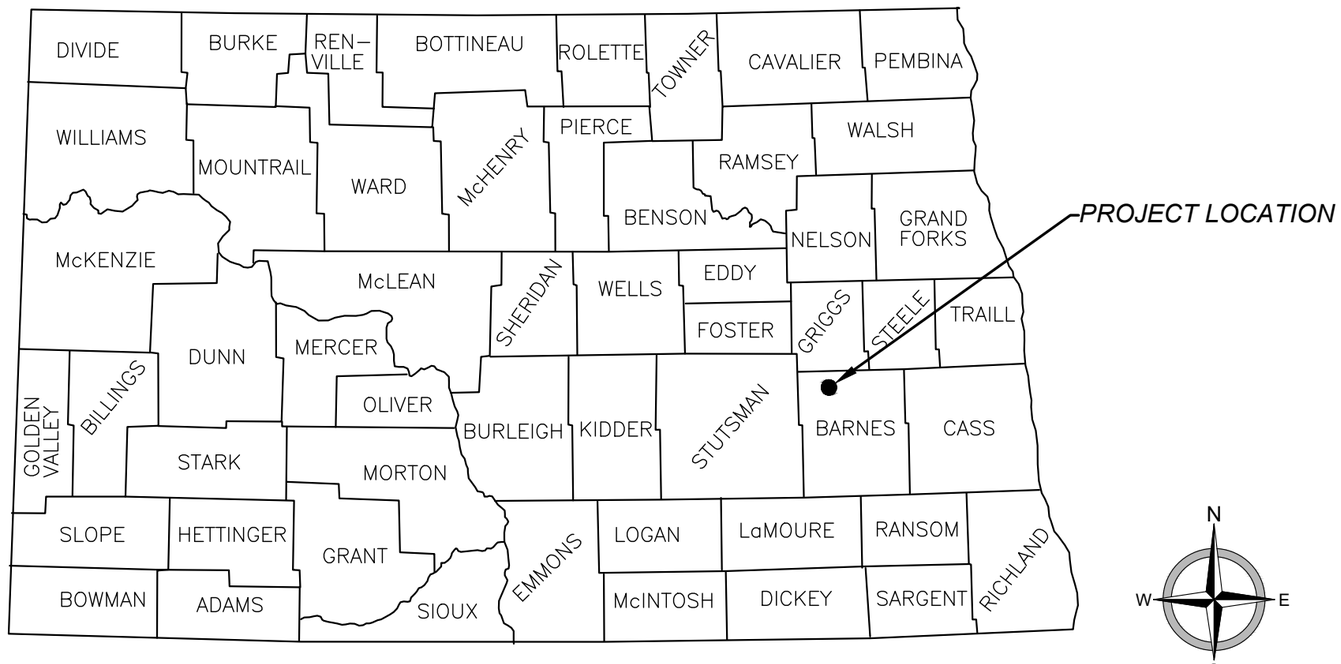
TEN MILE LAKE HIGH WATER OULET

BARNES COUNTY WATER RESOURCE DISTRICT

moore engineering, inc.
Consulting Engineering • Land Surveying
925 10th Avenue East, Suite 1 • West Fargo, North Dakota
www.mooreengineeringinc.com

BARNES COUNTY, NORTH DAKOTA

VICINITY MAP



PROJECT No. 19404

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BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
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MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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LATERAL

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Scale in Feet

PRELIMINARY

moore
engineering, inc.

GENERAL LAYOUT
TEN MILE LAKE HIGH WATER OULET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
GENERAL LAYOUT

DATE:	03.05.21
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PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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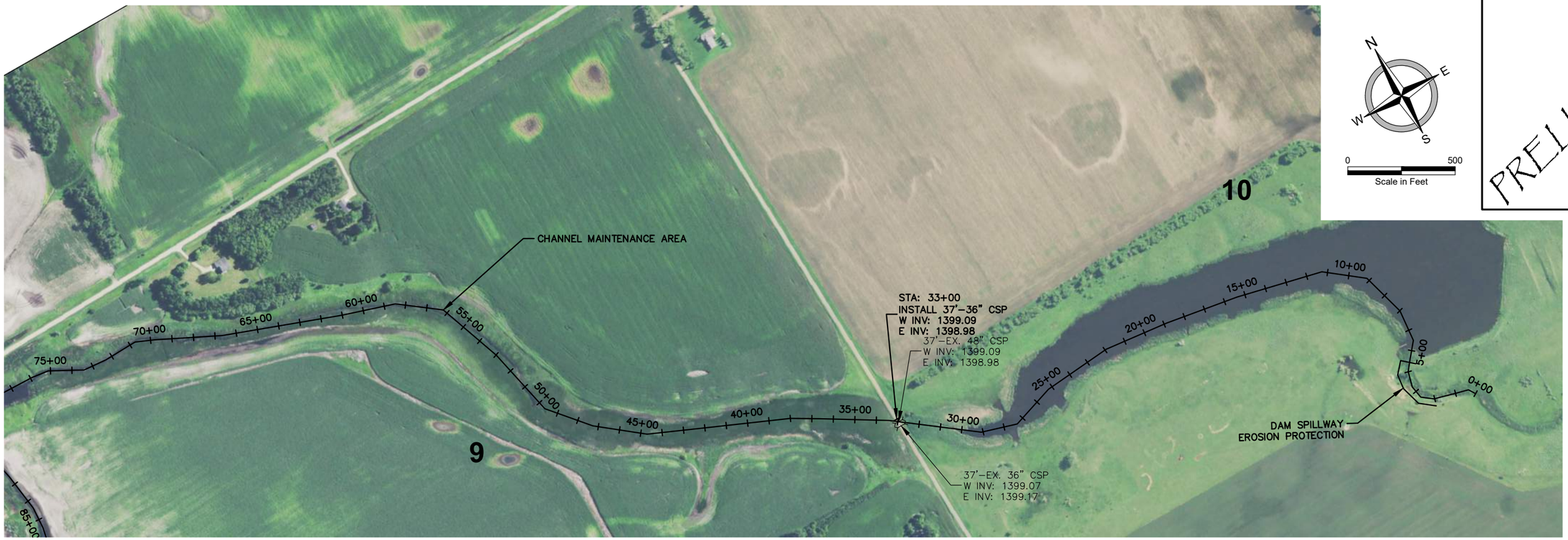

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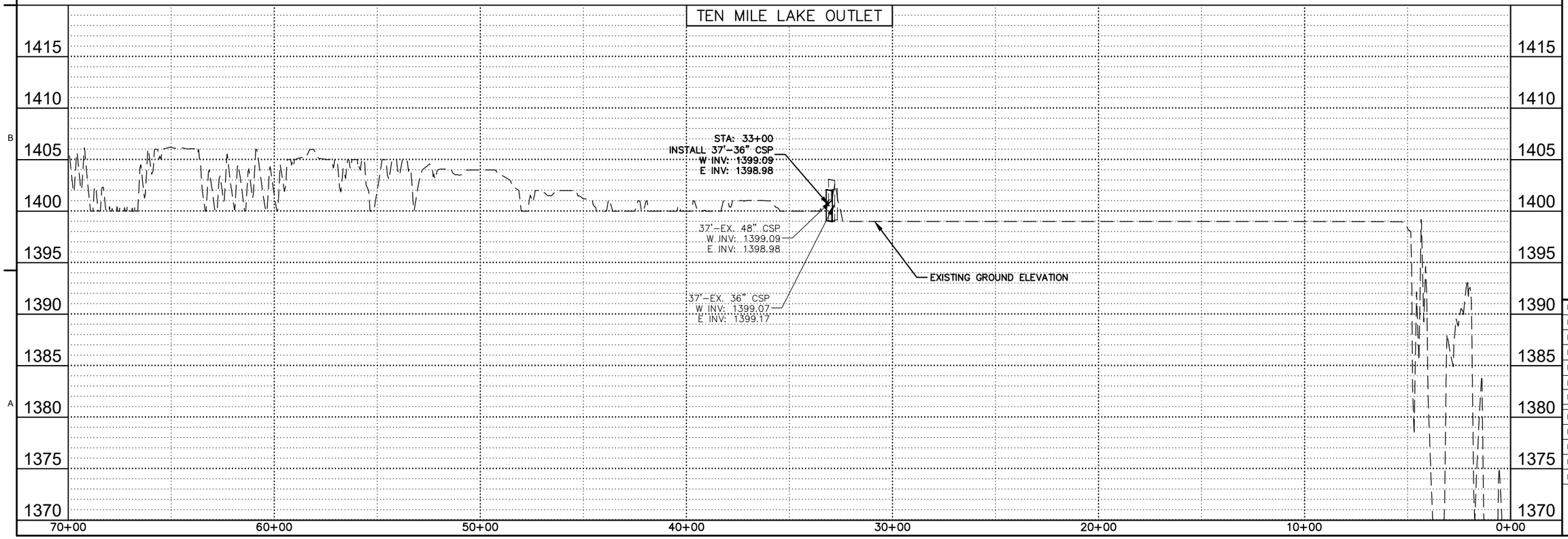

PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

DATE:	03.05.21
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PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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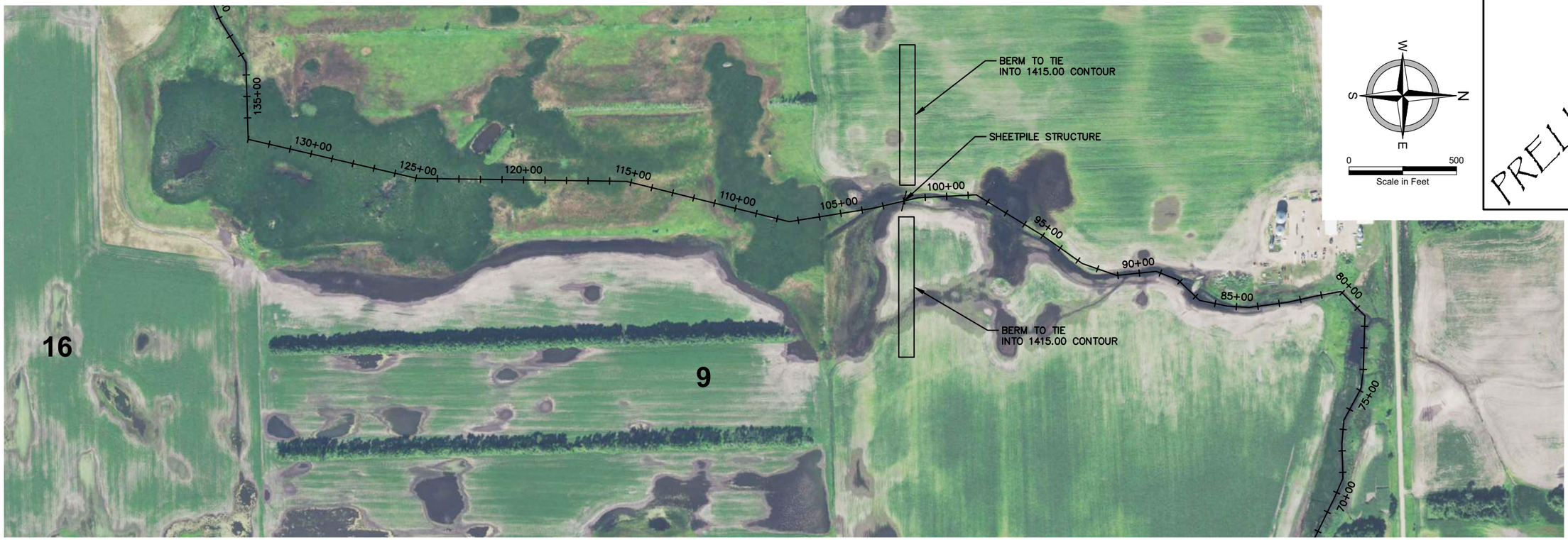

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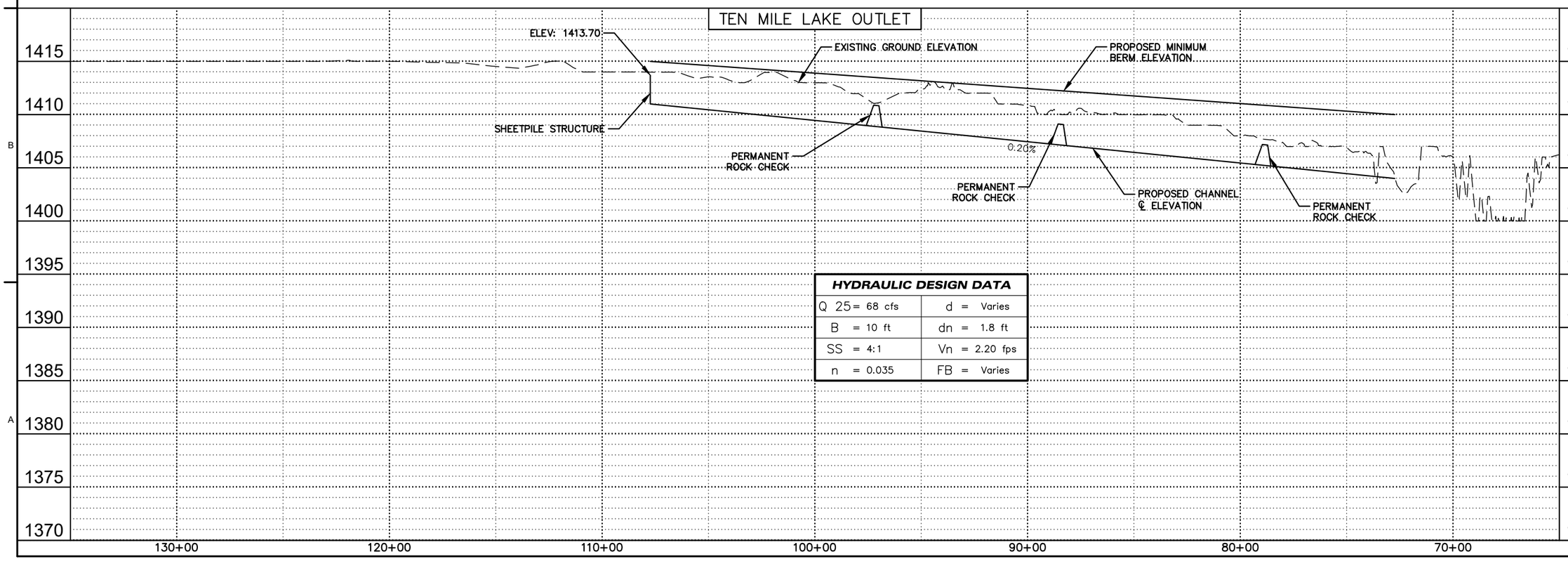

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PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

DATE:	03.05.21
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DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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SHEET 3 OF 2

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TEN MILE LAKE OUTLET

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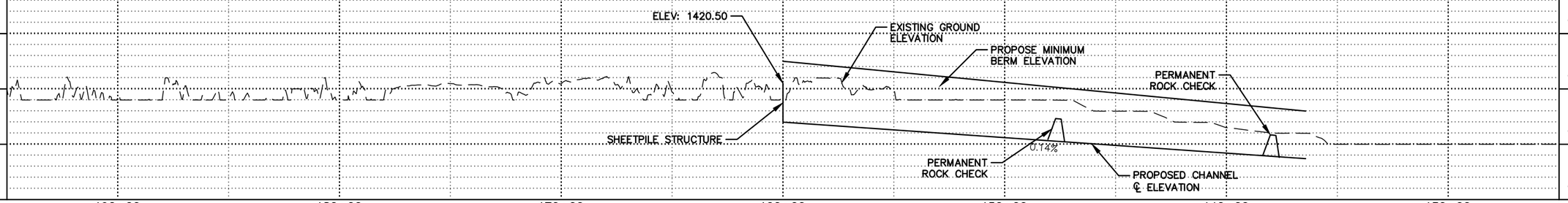

PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

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REVIEWER:	JMH

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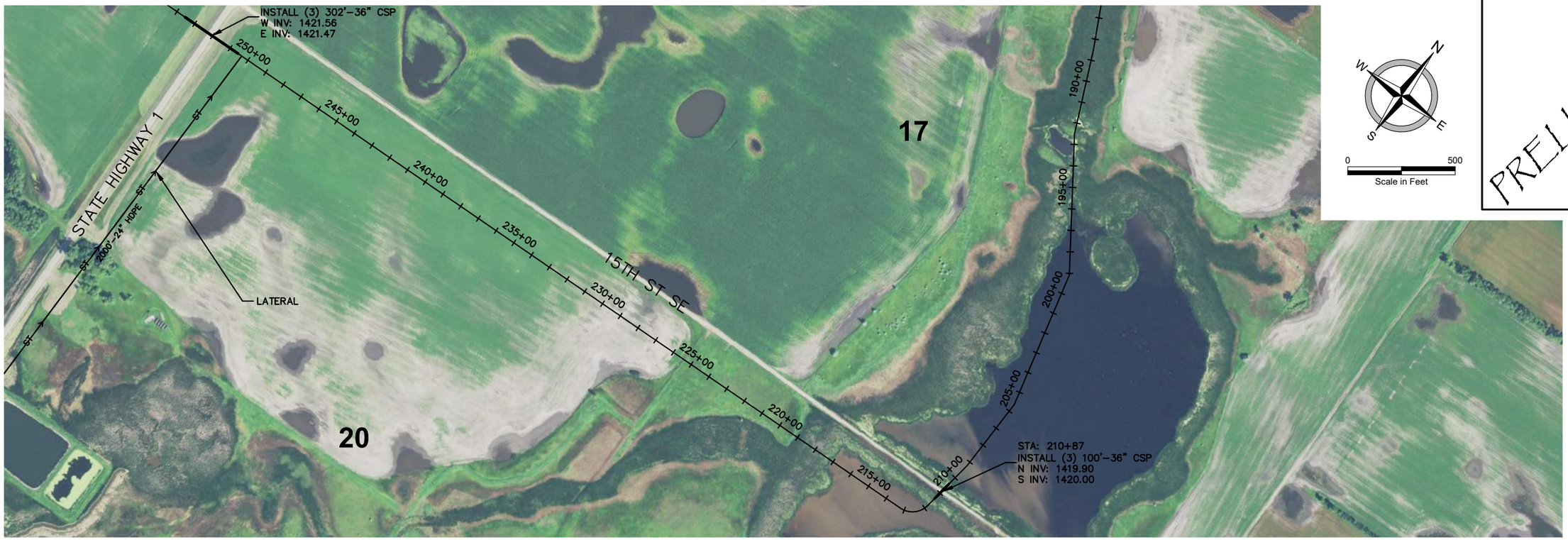

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TEN MILE LAKE HIGH WATER OUTLET
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BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

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REVIEWER:	JMH

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SHEET 5 OF 2

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TEN MILE LAKE OUTLET

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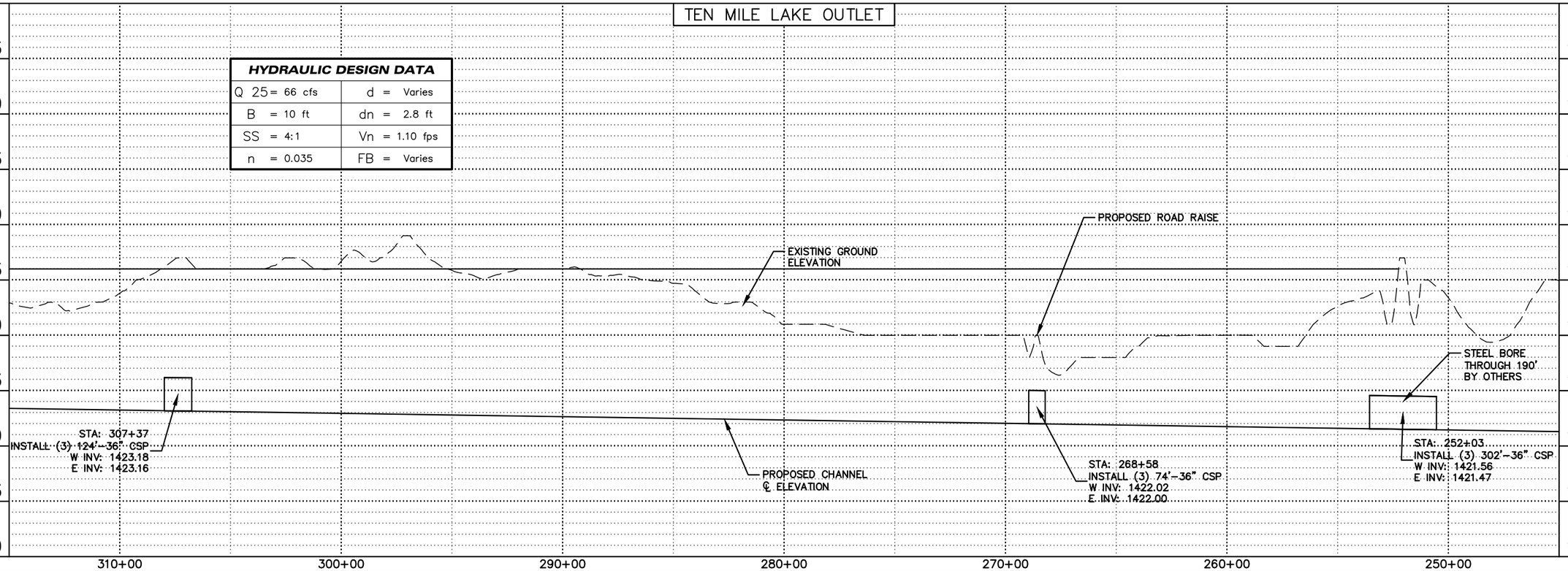

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TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

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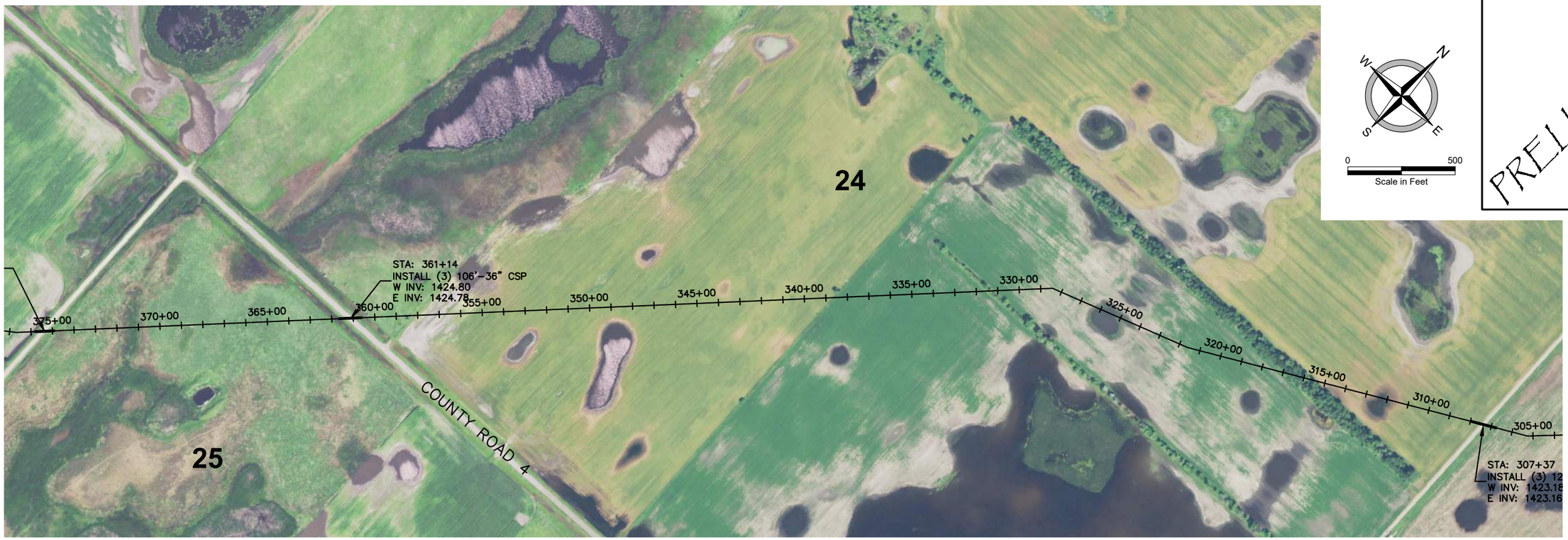

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TEN MILE LAKE OUTLET

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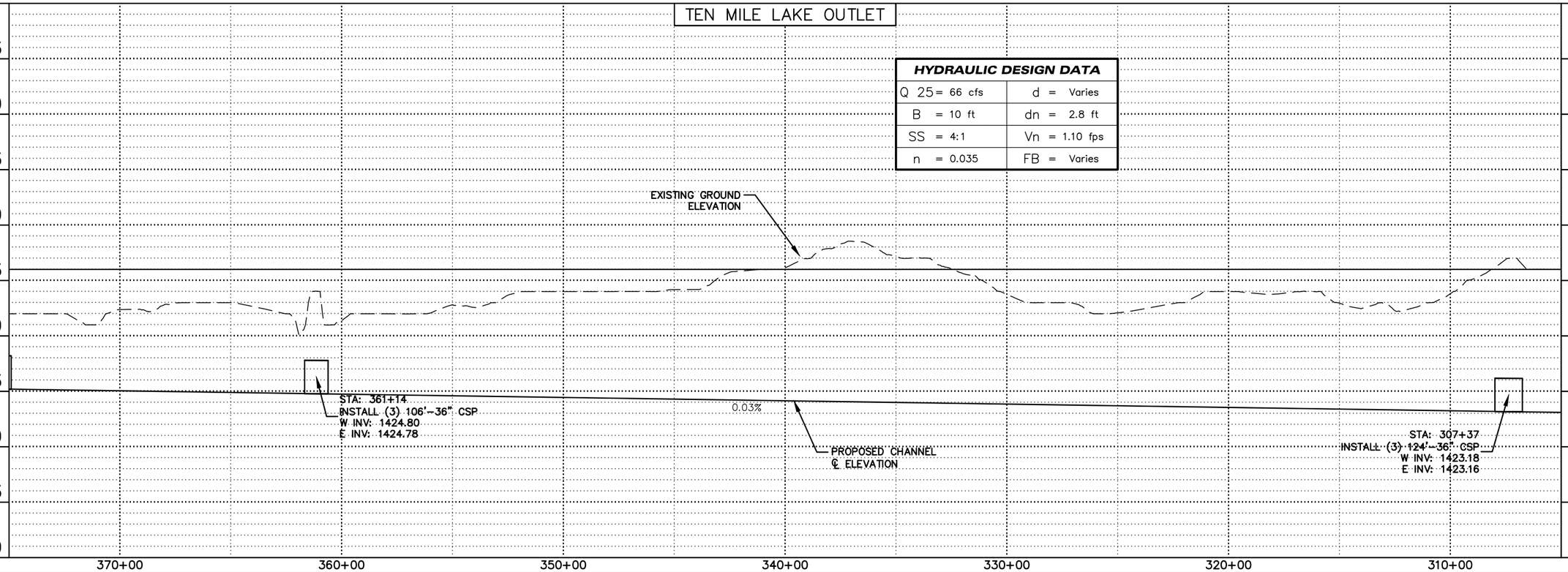

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PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

DATE:	03.05.21
REVISED:	----
REVISED:	----
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REVISED:	----
RECORD:	----
PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

C-206

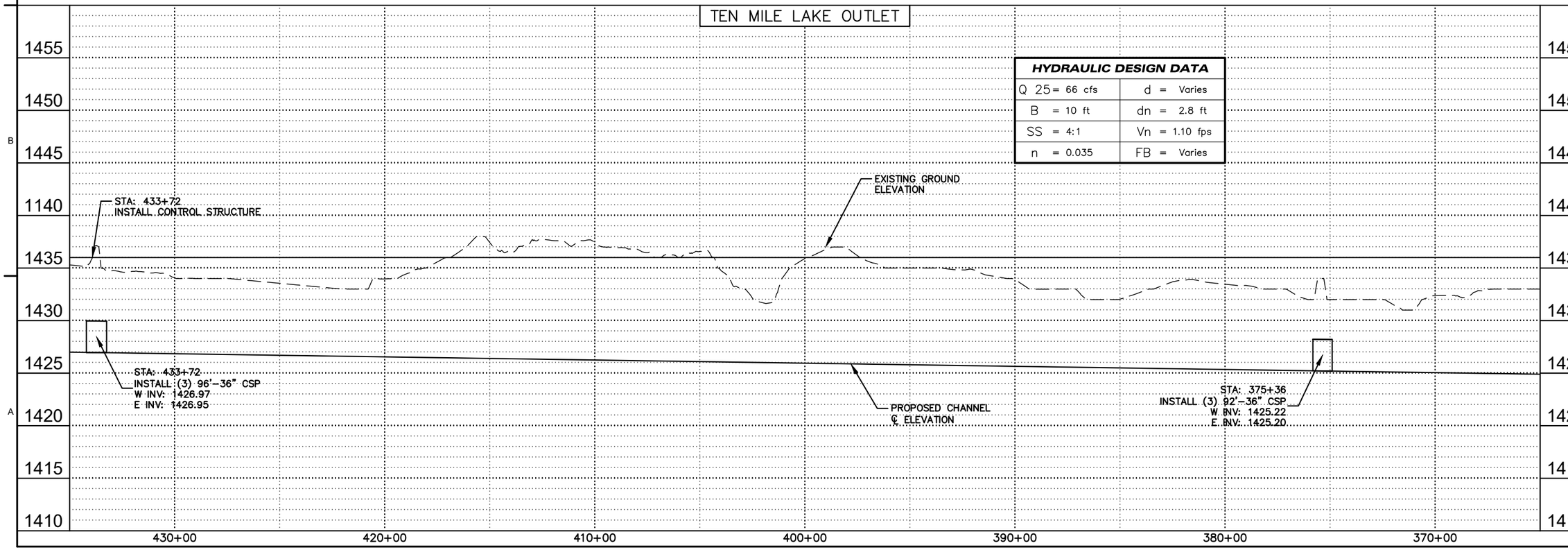
SHEET 7 OF 2

FILE LOCATION: R:\Civil 3D Projects\19404\DRAWINGS\DESIGN\19404-ALTERNATIVES-PP.dwg

PRELIMINARY

moore engineering, inc.

TEN MILE LAKE OUTLET



HYDRAULIC DESIGN DATA	
Q 25 = 66 cfs	d = Varies
B = 10 ft	dn = 2.8 ft
SS = 4:1	Vn = 1.10 fps
n = 0.035	FB = Varies

PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

DATE:	03.05.21
REVISED:	----
REVISED:	----
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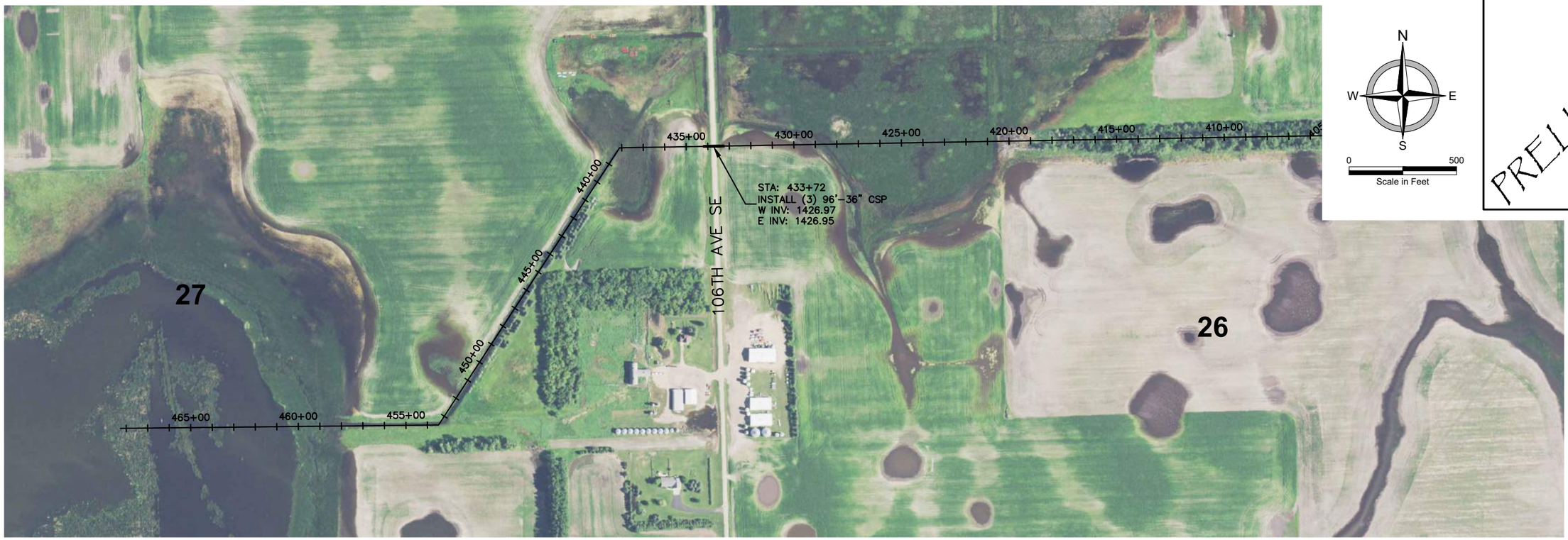
REVISED:	----
RECORD:	----
PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

C-207

SHEET 8 OF 2

FILE LOCATION: R:\Civil 3D Projects\19404\DRAWINGS\DESIGN\19404-ALTERNATIVES-PP.dwg



PRELIMINARY

moore engineering, inc.

TEN MILE LAKE OUTLET

HYDRAULIC DESIGN DATA	
Q 25 = 66 cfs	d = Varies
B = 10 ft	dn = 2.8 ft
SS = 4:1	Vn = 1.10 fps
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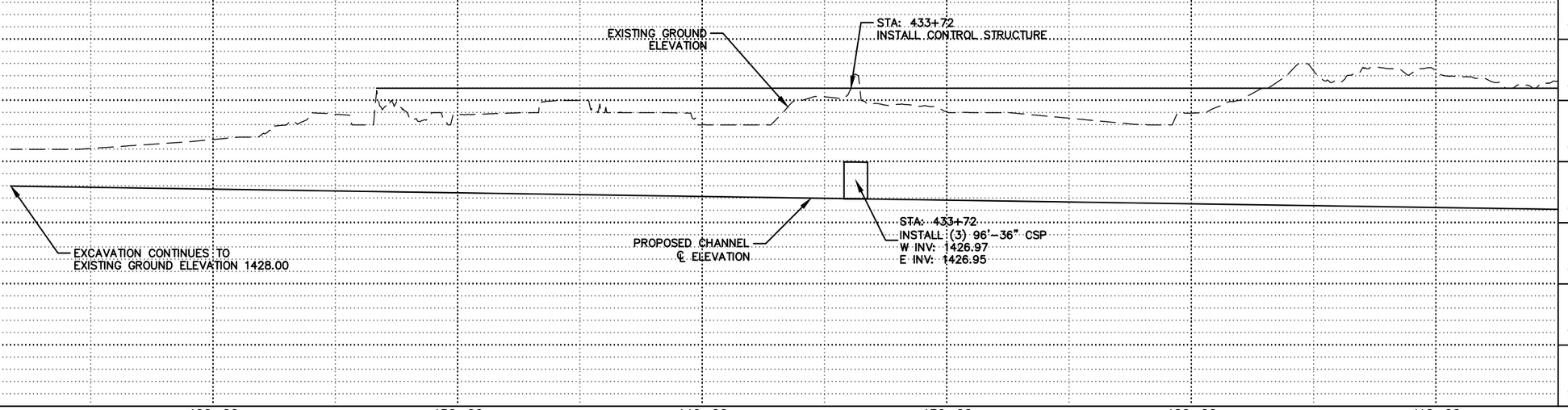

PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
TEN MILE LAKE OUTLET

DATE:	03.05.21
REVISED:	----
REVISED:	----
REVISED:	----
REVISED:	----
REVISED:	----
RECORD:	----
PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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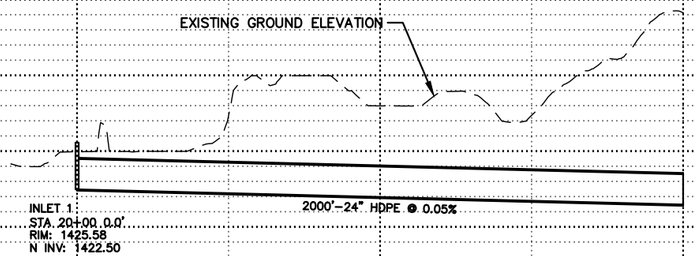
SHEET 9 OF 2

PRELIMINARY

moore engineering, inc.

LATERAL



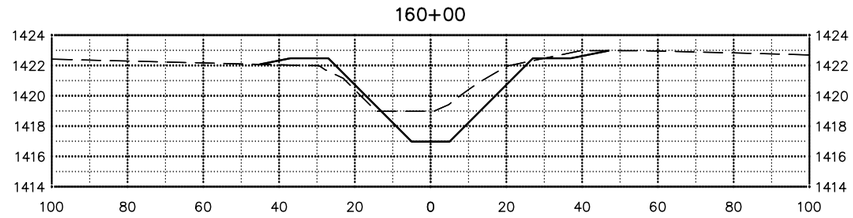
PLAN AND PROFILE
TEN MILE LAKE HIGH WATER OUTLET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
LATERAL

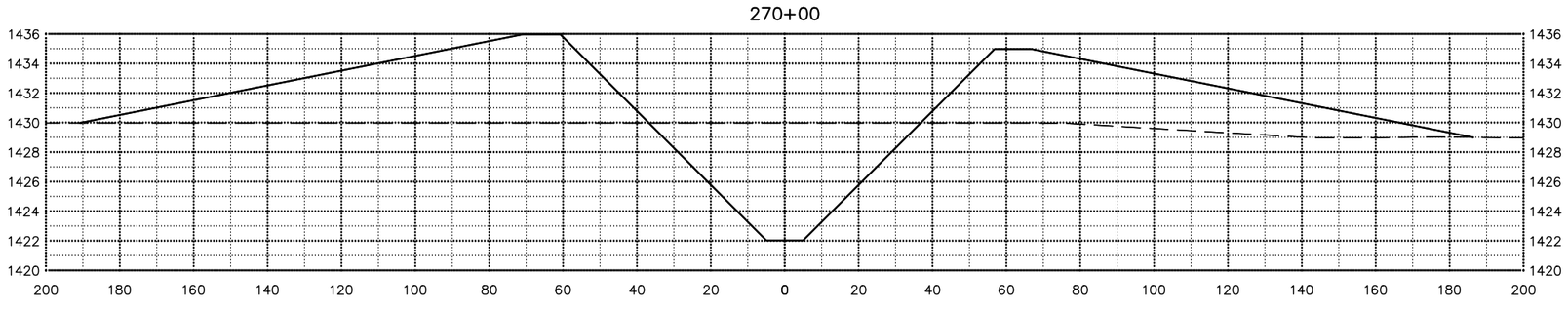
DATE:	03.05.21
REVISED:	----
REVISED:	----
REVISED:	----
REVISED:	----
REVISED:	----
RECORD:	----
PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

C-209

SHEET 10 OF 2

FILE LOCATION: R:\Civil 3D Projects\19404\DRAWINGS\DESIGN\19404-ALTERNATIVES-PP.dwg





PRELIMINARY

moore engineering, inc.

CROSS SECTIONS
TEN MILE LAKE HIGH WATER OULET
BARNES COUNTY WATER RESOURCE DISTRICT
BARNES COUNTY, NORTH DAKOTA
CROSS SECTIONS

DATE:	03.05.21
REVISED:	----
REVISED:	----
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REVISED:	----
RECORD:	----
PROJECT No.	19404
MANAGER:	CMG
DESIGNER:	AKS
DRAFTER:	RJK
REVIEWER:	JMH

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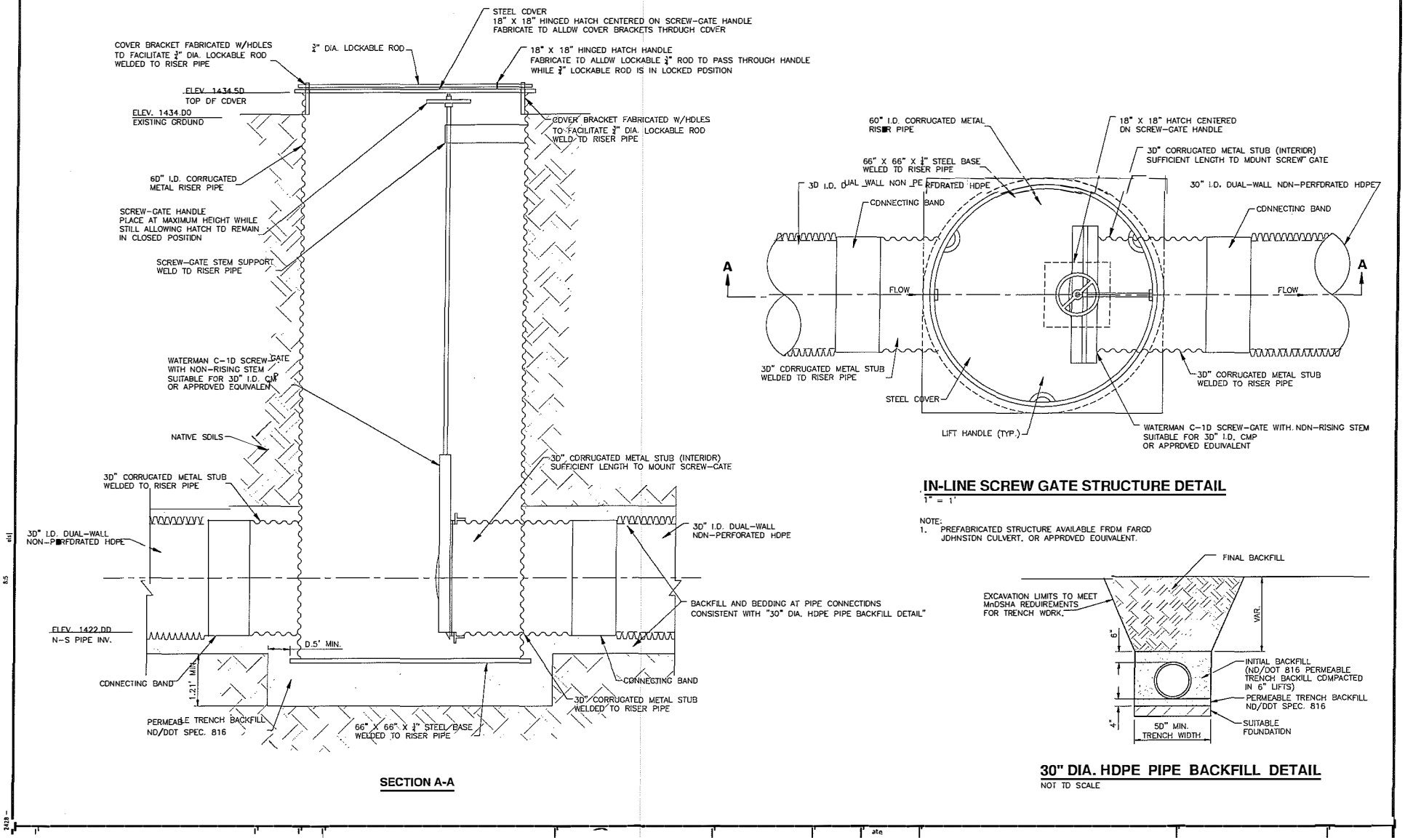
SHEET 11 OF 2

Concept Drawing, Control Structure



SECTION A-A

IN-LINE SCREW GATE STRUCTURE DETAIL

1" = 1'

NOTE:
1. PREFABRICATED STRUCTURE AVAILABLE FROM FARGO JOHNSTON CULVERT, OR APPROVED EQUIVALENT.

30" DIA. HDPE PIPE BACKFILL DETAIL

NOT TO SCALE