SWAMP LAKE PHOSPHORUS AND PEAK FLOW REDUCTION FEASIBILITY STUDY

STANTEC CONSULTING LTD.

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Adopted by the Prior Lake-Spring Lake Watershed District Board of Managers December 12, 2023

Reference: Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study

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1 EXECUTIVE SUMMARY

The Prior Lake-Spring Lake Watershed District (PLSLWD) authorized the following study to assess the feasibility of a water quality best management practice (BMP) and/or outlet modifications of Swamp Lake to decrease the Total Phosphorus (TP) loads and peak discharge rates from the Swamp Lake Subwatershed into the downstream impaired water bodies of Spring Lake and Prior Lake.

The District PCSWMMM model was used and updated, based on current existing survey data of the outlet of Swamp Lake, to model the existing conditions of the lake more accurately. The updated model was then utilized to model multiple design alternatives to quantify discharge rate and TP load reductions in the downstream flows to Spring Lake and Prior Lake. The designs used in the different alternatives included outlet modifications for Swamp Lake, the addition of an iron-enhanced sand filter (IESF) downstream of Swamp Lake, and additional outlet and filter modifications to provide further rate control for downstream water bodies.

Project costs for each alternative were analyzed and the total costs including construction, land acquisition, annual operation and maintenance, monitoring, and permitting fees are estimated to range from $589,200 to $654,800, net present value. The cost effectiveness of the alternatives ranges from $204 to $221 per pound of TP removed over the 30-year life span of the IESF. Along with project costs, other factors were taken into consideration with each design alternative including amount of land needed, additional permitting costs, and additional benefit to downstream water bodies.

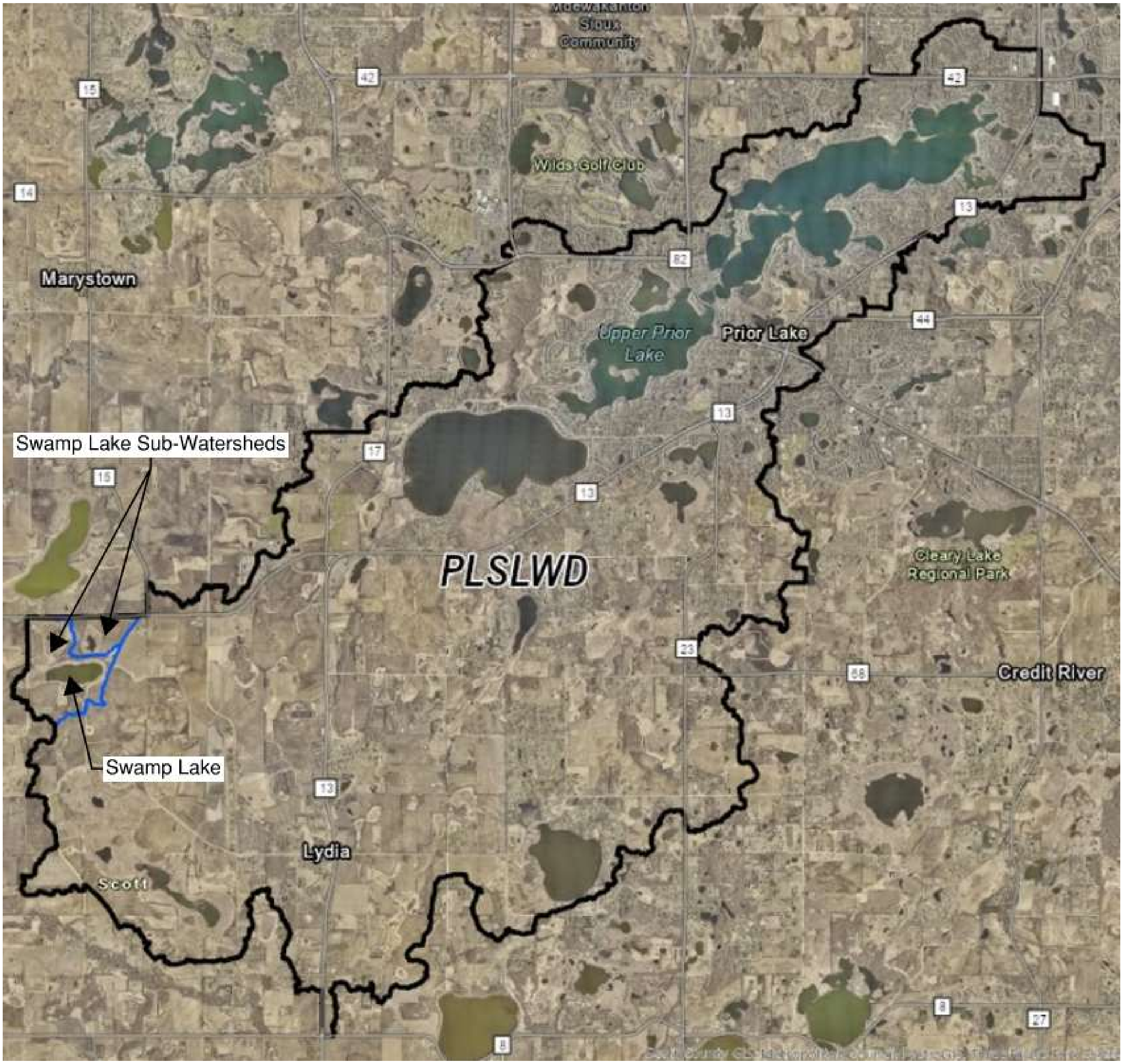
The recommended design alternative was a 64,000-cubic-foot IESF with a diversion berm, diverting the discharge flows from Swamp Lake into the proposed filter. This option is expected to remove 96.3 pounds/year of the 129.5 pounds/year TP load discharging from Swamp Lake.

Sponsoring Agency: MN-BWSR

The funding for this study was provided by the Minnesota Board of Water & Soil Resources. On a bi-annual basis, BWSR distributes State of Minnesota clean water funds through the Watershed-Based Implementation Funding (WBIF) program to implementing agencies. This is a non-competitive process that funds water quality improvement projects. One selected project was the Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study. The Swamp Lake feasibility study was identified as a project in the Upper Watershed Blueprint report (developed in 2021) and was selected through the WBIF local convening process for it's potential to decrease TP loading and stream flows to Spring Lake and Prior Lake.

Reference: **Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study**

Figure 1. Swamp Lake Location Within PLSLWD.



2 INTRODUCTION

Spring Lake is included on the state's Impaired Waters List. A lake is placed on this list when an assessment determines that it is not meeting one of its designated uses. Spring Lake and Prior Lake are both considered to be impaired due to excess nutrients, which can lead to algal blooms and low water clarity. Water quality monitoring conducted by the District has identified that phosphorus is the nutrient contributing most to the water quality impairments for these lakes.

Over the years, the District has undertaken significant efforts to improve water quality in Spring Lake and Prior Lake by attempting to control phosphorus loading by managing internal and external sources. The efforts have ranged from small scale raingardens and lakeshore restorations to large public improvement projects. Internal phosphorus sources have been managed through an aggressive carp removal and management program and by performing alum treatments. Alum is used to strip phosphorus from the water column and to create a short-term 'cap' on the lake's bottom sediment to prevent phosphorus release. The District constructed and has been operating a Ferric Chloride treatment system to treat external sources from the largest ditch (County Ditch 13) flowing to Spring Lake since 1998. This system captures an estimated 60% of the total phosphorus from the ditch flows. The District has also worked with watershed farmers to adopt agricultural conservation practices that help control external sources by reducing erosion and nutrient export from their fields.

The purpose of this feasibility study is to assess the viability of water quality BMPs and/or outlet modifications to decrease Total Phosphorus (TP) loads and peak flow rates from the Swamp Lake subwatershed into the downstream impaired water bodies of Spring Lake and Prior Lake. The main efforts of this feasibility study included field reconnaissance (topographic survey and wetland delineation), existing condition PCSWMM model updates per the site survey, revised annual pollutant loading (TP) estimates per District monitoring data, assessment of site and design alternatives, discussions with District staff, Board, agency and landowners, and preparation of this feasibility study report.

3 METHODS & FINDINGS

Swamp Lake is in Sand Creek Township, bordered by Redwing Avenue on the east and southeast, Zumbro Avenue (HWY 71) on the west and County Trail W (HWY 282) on the north. The Lake is approximately 45-acres with a maximum depth of 4-feet (large littoral zone) and encompasses a 393-acre watershed. Swamp Lake primarily discharges into County Ditch 13 (CD-13) and eventually into Spring Lake. A wetland delineation was performed and determined wetlands to be located only on the east side of Redwing Avenue, directly adjacency to Swamp Lake. Wetlands were not identified along CD-13. See Appendix C for the full wetland delineation report. Stantec also completed an updated survey in the Summer of 2023 that confirms the possible outlet elevations and the CD-13 elevations. Swamp Lake's existing primary outlet is a 36" Corrugated Metal Pipe (CMP) that is located on the east side of the lake, flowing under Redwing Avenue.

There is also an equalization culvert located under Zumbro Avenue on the west side of the lake that allows for ponding storage west of Zumbro Avenue. This culvert is not considered an outlet of Swamp Lake, but rather a connection to an adjacent storage area. The additional ponding storage is retained onsite and is accounted for in the modeling. A second culvert (18" CMP) was identified under Zumbro Avenue on the west side of Swamp Lake; however, this culvert is mostly clogged/blocked by debris and is considered to be an additional outlet for Swamp Lake out of the Prior Lake-Spring Lake Watershed. The modeling accounts for this second culvert and was added to the EOR model to create a modified model. The primary outlet begins discharging water when Swamp Lake's water surface elevation reaches 948.87-feet. The western secondary outlet begins discharging water when Swamp Lake's water surface elevation reaches 949.20-feet (assuming it has been maintained/cleared of debris).

The Prior Lake-Spring Lake Watershed District (PLSLWD) monitored TP concentrations in Swamp Lake from 2014 to 2016. During this time, 54 TP concentration measurements were collected across a variety of storm events and flows. TP concentration ranged from less than 0.1-mg/L up to a maximum of 1.2-mg/L with a mean of 0.36-mg/L and a median of 0.30-mg/L.

3.1 AGENCY AND STAKEHOLDER ENGAGEMENT

Stantec and PLSLWD met with the Minnesota Department of Natural Resources (MNDNR), Scott County, Scott County Soil and Water Conservation District (SWCD), Sand Creek Township and the landowner over the course of the study to gain feedback on the potential for a water quality BMP and/or outlet modification to decrease TP loads and peak flow rates carried from the Swamp Lake subwatershed downstream. Additionally, permitting considerations, available modeling, and other potential restrictions were discussed.

The MNDNR had a number of concerns given they have authority over public waters and floodplains of Swamp Lake. The Area Hydrologist was consulted and was not opposed to a water quality BMP but expressed concerns regarding outlet control modification. Their concerns were related to both possible floodplain and fish and wildlife impacts. If the outlet were to be modified both the ordinary high water level and 100-year flood stage would likely be altered. Flowage easements would need to be obtained from all landowners abutting the ordinary high water level of Swamp Lake. Also, ordinary high water level changes have potential to impact fish and wildlife of Swamp Lake and could necessitate environmental review. Floodplain impacts would require review and permitting at the local (county), state and national level before altering the 100-year floodplain. No existing floodplain models were available from the DNR.

Scott County echoed DNR concerns regarding the floodplain as they have local review authority over any changes in the 100-year base flood elevation. No existing floodplain models were available from Scott County. No other concerns were indicated from Scott County.

Scott County SWCD is both the Local Government Unit (LGU) for wetland considerations and has authority over the downstream channel of Swamp Lake as it is a county ditch (Count Ditch 13 or CD-13). A wetland delineation was required and did not identify any wetlands in the county ditch immediately downstream of Swamp Lake. However, wetlands around Swamp Lake would be impacted from changes in the outlet elevation, if proposed. These changes would require wetland impact permitting. Any modifications, such as diverting drainage, to CD-13 would require a petition to be submitted to the Drainage Authority according to MN 103E.227 during final design. SWCD noted that the project proposed is unlikely to be controversial because it is at the very upstream end, it will be a benefit to water quality, and changes to the ditch will be limited to divert flow into a potential BMP. As a watershed district no petitioners bond would be required although fees of $1500 could be expected.

Sand Creek Township had minimal concerns regarding the project. Sand Creek is the entity responsible for the roadway (Red Wing Trail) dividing Swamp Lake from CD-13. The roadway (gravel) and culvert underneath (corrugated metal pipe) are in relatively good shape and do not require replacement in the near-term. Any changes to the culvert underneath Red Wing Trail would require coordination with the township if altered. However, no changes to the culvert itself are suggested through this feasibility study.

Landowner's concerns were also minimal and pertain to maintaining the ability to farm remaining land not purchased for the water quality BMP. The landowner noted that any buy out or easement should follow a general east-west trend to prevent the creation of oddly shaped "triangles" that would be difficult to farm.

3.2 EXISTING MODEL UPDATES

Stantec used the PLSLWD PCSWMM model provided by Emmons & Oliver Inc. (EOR) for the hydrologic and hydraulic modeling. It is assumed that the district's existing PCSWMM model is the best available data to determine a Base Flood Elevation (BFE) for the approximate A-Zone FEMA Floodplain. Discussion with Scott County indicated that no other modeling exists for the Swamp Lake Floodplain.

EOR provided Stantec with two District models. One model simulates collected 2014 rainfall data and the other simulates design storms. Both models are from the PLSLWD 2016 Flood Study. Stantec used the 100-year, 30-day design storm at EOR's recommendation to retain conformity with the 2016 flood study that used this event to evaluate flood reductions in Prior Lake and Spring Lake. Any flood reductions noted in this report will be comparable to the results from the original 2016 flood study.

Stantec modified the EOR model with updated survey data of current conditions with the primary culvert invert and the culvert under Zumbro Avenue, that acts as a secondary outlet out of the watershed, corrected to the 2023 survey. The modified model establishes a BFE of 950.99' in the NAVD88 coordinate system.

3.3 WATER QUALITY LOADING UPDATES

This feasibility study was first identified in the Upper Watershed Blueprint (UWB) (developed in 2021) as a priority stormwater management location to decrease TP loading to Spring Lake and Prior Lake. The UWB estimated an annual TP loading of 322-pounds from Swamp Lake. The UWB also estimated that an IESF at the proposed location would provide an annual TP loading reduction of 223-pounds. Water quality measurements taken by PLSLWD were provided to Stantec to refine these previous estimates of annual TP loading from Swamp Lake.

The provided data spanned various storm events from 2014 to 2016. Results for TP concentrations were collected by grab samples during storm events. From this data an event mean concentration (EMC) was estimated by averaging the results. Results varied from less than 0.1-mg/L to 1.2-mg/L with a mean value of 0.36-mg/L and a median value of 0.30-mg/L with a standard deviation of 0.26-mg/L.

For the purposes of this study, Stantec used Minimal Impact Design Standards (MIDS) version 4, a Minnesota-based water quality modeling software, to estimate annual TP loading with an EMC of 0.36-mg/L based on existing measurements of TP concentration in runoff. The watershed consists of a combination of C and D hydrologic soil groups (HSG) or dual classifications that default to D soils for undrained soils. Swamp Lake is 45-acres and the remainder of the 393-acre watershed is largely undeveloped. Therefore, to estimate the TP loading from the Swamp Lake watershed the EMC was adjusted to 0.36-mg/L. Forest/Open Space (HSG C) occupies 148-acres of the watershed, Forest/Open Space (HSG D) occupies

200-acres of the watershed, and impervious area to simulate the Swamp Lake water surface runoff occupies 45-acres.

Stantec used MIDS to estimate the annual TP loading to be 129.5-pounds/year from Swamp Lake. This baseline value was used to evaluate alternatives based on their ability to remove TP downstream. The MIDS showed lower TP loading than specified in the UWB because it is based on actual data rather than approximations based on land uses. Stantec assumed the significant decrease in a refined load estimate (from 322-pounds to 129.5-pounds) may be a result of natural treatment of stormwater runoff within Swamp Lake prior to discharge downstream. While MPCA's Minnesota Stormwater Manual conservatively limits credit given to IESFs to 41% particulate phosphorus (PP) and 40% dissolved phosphorus (DP) or 41% TP, the manual also cites removal efficiencies values that are more reflective of the expected pollutant removal efficiency values of the proposed concepts. For the purposes of this study, 85% PP and 60% DP, or 74% TP removal was assumed for all runoff entering the IESF. As a result of the lower TP loads discharging from Swamp Lake, the removals in pounds are significantly lower than projected in the UWB (from 223-pounds to 83.4-95.8-pounds).

3.4 ALTERNATIVES ASSESSMENT/CONCEPT DESIGN

Stantec began the best management practice (BMP) and outlet alternative identification design by first investigating the existing regulatory framework to better understand feasible modifications to the outlet and downstream channel. This investigation identified constraints that limited available options to adjust the outlet. The primary constraint is the presence of a floodplain for both Swamp Lake and CD-13.

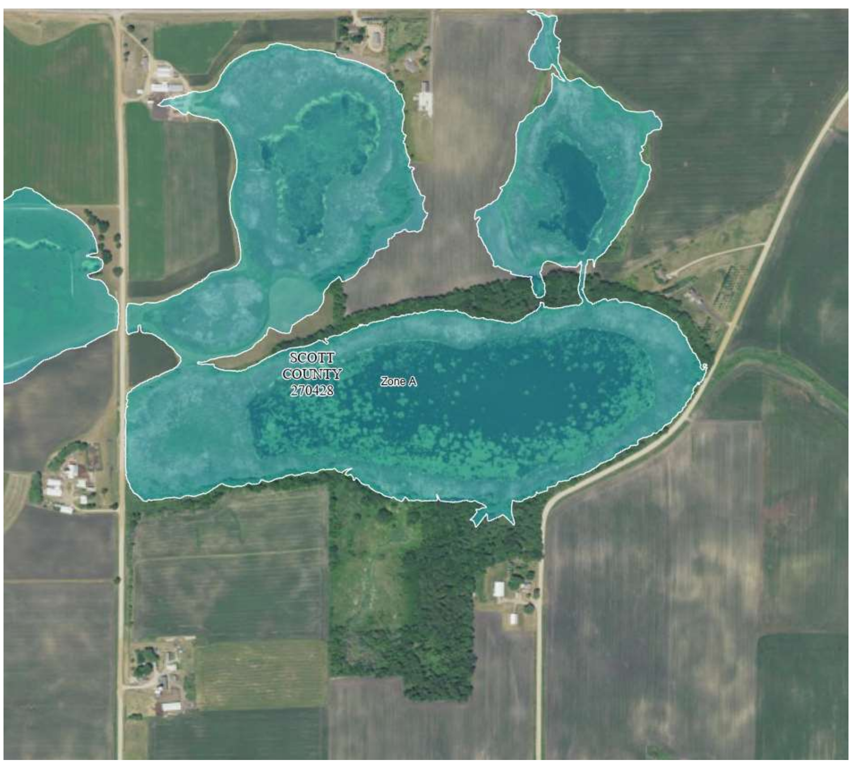


Figure 2. FEMA floodplain of Swamp Lake area.

The floodplain for both is mapped as an A-zone with no established BFEs. FEMA A-zones are areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. Because detailed analyses are not performed for such areas; no depths or base flood elevations are shown within these zones. For the purposes of this feasibility study Stantec established a BFE at 950.99’ to compare the proposed options. This BFE was established with the modified EOR model as described above. Stantec then created “Proposed” models for each option analyzed. Any option that changes the BFE by more than +/- 0.004’ triggers the CLOMR/LOMR (Conditional Letter of Map Revision/Letter of Map Revision) permitting process through FEMA. Any project that triggers the CLOMR/LOMR process is considered undesirable with low feasibility in this situation because of the time commitment and cost associated with it. However, in the interest of providing an option which could reduce flooding in Spring Lake and Prior Lake, one proposed option looked at raising the outlet conditions to increase ponding in Swamp Lake (Option 2).

The county ditch classification for CD-13 adds another regulatory complication as any ditch modification is considered on a case-by-case basis and requires a permit/petition from the County. Since this project is located near the upstream end of CD-13 and is unlikely to increase flows to the ditch (likely a decrease in flow due to detention in a BMP), the complications should be lower for permitting a modification. Additionally, because of PLSLWD’s relationship with the County and the purpose/intent of the project, the County is unlikely to disapprove of any of the proposed alternatives unless they significantly impact ditch performance. None of the proposed alternatives documented will significantly impact ditch performance except for the first 100-200-feet to divert flow into the proposed IESF.

BMP types other than the IESF were considered although they were not found viable because TP removal efficiency has been proven to be lower than with the IESF. The proposed IESF basins have been sized to maximize the effective TP removal. Increasing the size of the IESF would not measurably increase TP removal. The TP removal is primarily limited by the modeled loading discharging from Swamp Lake (129.5-pounds) and percent bypass of water entering IESFs. In Option 2, a filter was designed to capture all possible flow into CD-13 with 0% bypass and therefore 74% TP removal was achieved.

Stantec modeled oversized BMPs to assess the flood reduction benefits, but modeling indicated that even when other BMPs were 10 times larger than the proposed IESF, no decrease in flood elevations at Prior and Spring Lakes was expected. Therefore, BMP types other than the IESF were not considered as viable options in the feasibility study because they would not provide as much TP loading removal as an IESF nor provide any additional flood reduction benefit.

The flow bypass percentage is one factor that determines the water quality benefit of the IESF and was estimated based on the rainfall/runoff data in **Figure 3**. The green line represents the fraction of total rainfall volume that would be captured if all rain events below a certain depth are captured. For example, capturing up to the 1.25-inch event results in collecting 73% of all volume with 27% bypassing the IESF. The blue line represents the percentage of storms smaller than a given event. For example, 80% of storms are smaller than a 0.75-inch event. This chart helped inform water quality modeling by determining a flow percentage that would be expected to bypass the IESF for the annual removal estimates.

Reference: Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study

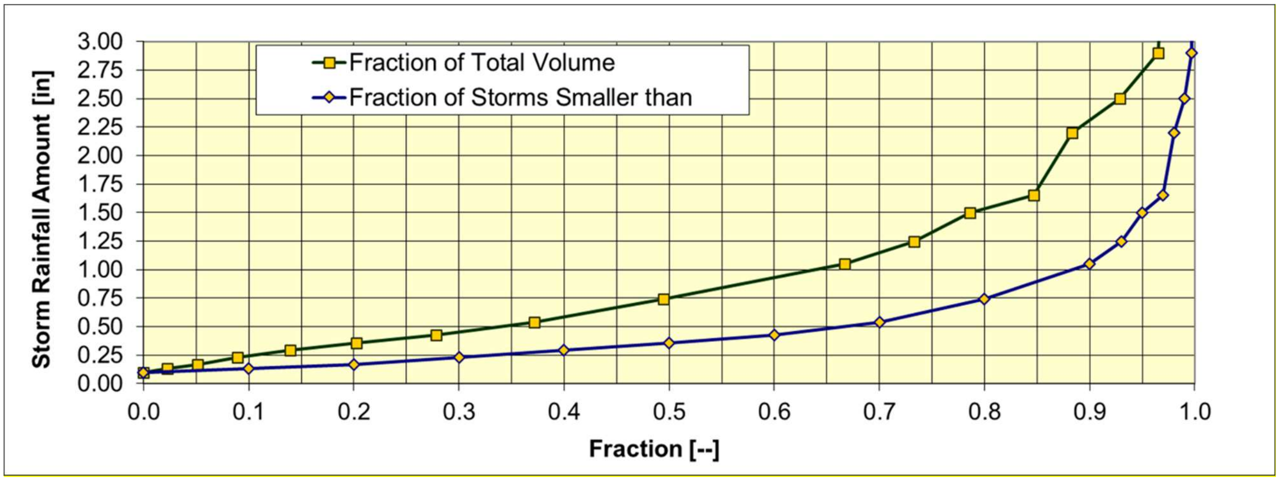


Figure 3. Fraction of Total Rainfall Volume and Storms Smaller than a Given Rainfall Amount. (MSP/Airport Data)

Three main alternatives were developed in this feasibility study with consideration of site constraints and landowner preference. Concept design for each option was used to model expected TP removals, prepare an opinion of probable cost, and to provide a visual understanding of the project footprint and extent. The IESF will cause ponding within the IESF footprint extents shown on the concept figure during storm events ranging in depth from 2 to 5-feet. The three resulting options are as described below:

Option 1: IESF with No Lake Level Rise

The Option 1 concept consists of the construction of a berm within CD-13 to divert ditch flows into a 12” culvert that discharges into a proposed Iron Enhanced Sand Filter that will be located adjacent to the ditch. The IESF is proposed to have a bioretention cell to infiltrate base flow and allow the filter to dry between storm events as this has been proven to provide better IESF performance. The IESF design provides 64,000-cubic-feet (1.5-acre-feet) of storage volume. The proposed configuration of the system would place the diversion berm invert at the same elevation as the Swamp Lake outlet elevation invert (947.52’), which would cause all storms up to a 2-inch rainfall event to flow through the IESF, while larger storm event flows would allow some flow to bypass the filter and flow over the proposed berm. This results in an expected treatment of 87% of flow, while 13% would bypass the system (**Figure 3**). Flow that is diverted into the IESF would be treated by the filter prior to collection in a drain tile and discharge back into CD-13.

This option provides complete water quality treatment for all flows generated by up to the 2-inch rainfall event within the Swamp Lake Watershed, improving the water quality for Spring Lake and Prior Lake downstream. The modeling shows that an estimated 83.4-pounds of TP (~64% of the TP loading of 129.5-pounds) would be removed annually from the Swamp Lake Watershed.

Hydraulic modeling results indicate that the proposed berm and IESF would not impact the high-water levels within Swamp Lake and therefore would not require additional FEMA floodplain permitting through the CLOMR/LOMR process. The modeling results also indicated that the filter did not lower the high-water levels in the downstream water bodies of Spring Lake and Prior Lake. Therefore, the proposed filter would not provide any flood attenuation for these downstream water bodies.

Option 2: IESF with Outlet Modification and Lake Level Rise

Option 2 has a similar concept plan as Option 1, with the added goal of adjusting the elevations of the berm and emergency overflow outlet of the proposed IESF to achieve flood attenuation in Spring Lake and Prior Lake downstream. Stantec performed several model iterations gradually increasing the berm elevation, to determine which elevation provided the optimal flood attenuation. The berm and filter overflow elevations were ultimately adjusted to 951.90’, which is 3.03-feet higher than Swamp Lake’s current primary outlet. These berm elevations would require steeper side slopes for the IESF without reducing the IESF’s footprint.

This concept design would divert all storm flows from Swamp Lake for the 100-year, 30-day rainfall event to pass through the IESF, without any flows bypassing the filter over the berm or filter emergency overflow. The modeling shows that an estimated 95.8-pounds of TP (~74% of the TP loading of 129.5-pounds) would be removed annually from the Swamp Lake Watershed.

Hydraulic modeling results indicated that the 100-year high-water level in Prior Lake would be reduced by approximately 0.06-feet; however, there was no noticeable change in the high-water level in Spring Lake. Additionally, the 100-year high-water level in Swamp Lake is increased by approximately 0.1-feet since the flow discharging from Swamp Lake is constrained by the increased elevation of the berm and filter overflow. This result would trigger the CLOMR/LOMR permitting application process with FEMA. A CLOMR/LOMR application and approval is a long and arduous process that typical takes upwards of one to two years to complete and requires detailed submittals to FEMA and the MNDNR to obtain approval. A CLOMR is the first step that is required pre-construction to ensure that the project is allowable under FEMA and MNDNR regulations. The LOMR is completed post-construction to document as-built conditions and floodplain mapping changes. In addition to the cost of modeling and other documentation for the proposed changes to the floodplain mapping, there are application fees of approximately $8,000 each for the CLOMR and LOMR processing by FEMA. Additionally, all seven of the adjacent property owners that would be impacted by an increase in the BFE of Swamp Lake would need to approve the change, which could stall or completely prevent the project from progressing. This may require additional buyouts besides the land needed for the IESF. Also, because of the secondary outlet, additional flow would be sent out of the watershed which could require additional floodplain permitting in the adjacent watershed.

Option 3: IESF with Outlet Modification and No Lake Level Rise

Option 3 has a similar base concept as Option 1, with the main goal of adjusting the elevation of the CD-13 berm that diverts water to the proposed IESF to achieve maximum water quality treatment without impacting the BFE established for the Swamp Lake floodplain.

Through an iterative process, Stantec determined that the optimal berm overflow elevation is 949.00’, 0.13-feet higher than Swamp Lake’s current primary outlet invert of 948.87’. This concept design would divert all flows generated up to the 1-year, 30-day rainfall event (2.49”) for the Swamp Lake Watershed into the proposed IESF without any flow bypassing over the berm. Only 7% of flow would be expected to bypass the IESF in the modeled storms. The modeling shows that an estimated 89.1-pounds of TP (~69% of the TP loading of 129.5-pounds) would be removed annually from the Swamp Lake Watershed.

Hydraulic modeling results indicated that the proposed berm and IESF would not affect the high-water levels within Swamp Lake and therefore would not require additional floodplain permitting. The modeling results also indicated that the filter did not change the high-water levels in Spring Lake and Prior Lake downstream; therefore, the proposed filter would not provide any flood attenuation for these downstream water bodies. Option 3 maximizes water quality treatment to the extent practicable while also avoiding triggering the CLOMR/LOMR process.

4 CONCLUSIONS

Qualitative and quantitative evaluation criteria were considered to compare the options and inform recommendations. Criteria were discussed and prioritized in collaboration with PLSLWD staff. Three potential project options were evaluated using criteria such as the ability of the project to achieve PLSLWD goals, estimated project capital costs, and permitting needs/complications. The criteria are outlined in additional detail below.

The ability of the project options to remove TP and reduce the effluent load from Swamp Lake was identified as the primary goal of the feasibility study and an overarching goal of PLSLWD. To address this goal, the three concept designs sought to maximize TP removal capacity of each evaluated option. Stantec used MIDS water quality modeling to evaluate the TP removal capacity for the three scenarios. Additionally, to address PLSLWD's flood reduction goals, this study looked at the potential to manage discharge rates and the effective flood elevation impact that could be expected on Spring Lake and Prior Lake (downstream), permitting needs, site constraints, and the engineering complexity of the three proposed options as shown below:

- Option 1 is expected to provide enhanced water quality for County Ditch 13 and Spring Lake and Prior Lake downstream. The TP cost per pound of removal was the highest in comparison with the other two options, and there are minimal site constraints and no federal permitting requirements associated with this option.

- Option 2 is expected to provide flood attenuation for Prior Lake. This option does not require any special access and requires the same land acquisition as the other two options with a similar complexity design. The main complication of Option 2 is that the design elevations capture all flooding events up to the 100-year, 30-day design storm. This causes an increase in Swamp Lake's 100-year floodplain elevation, which would trigger the extensive CLOMR/LOMR permitting process through FEMA. This long and arduous process is not desirable for this project given that the primary goal is the water quality downstream. Additionally, the CLOMR/LOMR process requires all seven affected landowners to agree to the floodplain rise, which adds considerable uncertainty to the likelihood of project completion.

- Option 3 is an optimized form of Option 1 shown above. This option includes an adjustment to both the County Ditch 13 berm and the emergency overflow outlet of the proposed IESF. The adjustment to the proposed berms provides higher TP removal and allows for a greater storage volume in the IESF. Unfortunately, modeling results did not show any measurable flood attenuation at Spring Lake or Prior Lake as Option 2 did, but Stantec has determined that considering the cost, time, project complexity, and avoidance of federal permitting makes Option 3 the most desirable and feasible option as a future project.

Table 1. Option Results Summary

	Option 1	Option 2	Option 3
Description	IESF	IESF + Outlet	IESF + Outlet
Lake Level Rise?	No	Yes	No
Water Bypassing the IESF (%)	13	0	7
TP Removal (Pound/Year)	83.4	95.8	89.1
TP Removal (Cost/Pound)	$238	$228	$220
Engineer's Opinion of Probable Cost	$596,400	$654,800	$589,200
Flood Attenuation on Prior Lake (ft)	0.00	0.06	0.00
Flood Attenuation on Spring Lake (ft)	0.00	0.00	0.00
CLOMR/LOMR Permitting Required?	No	Yes	No

Reference: Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study

5 NEXT STEPS

The following are recommended next steps:

- Board approval of the Swamp Lake Phosphorus and Peak Flow Reduction Feasibility Study.
- Submit Feasibility Study to the Board of Water & Soil Resources (BWSR).
- Pursue landowner agreement and easement acquisition.
- Pursue grant funding.
- Authorize final design of the preferred option.

Sincerely,

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Attachment: Opinion of Probable Costs, Concept Plan, Wetland Delineation

APPENDIX A: ENGINEERS OPINION OF PROBABLE COSTS

Stantec completed a conceptual level opinion of probable cost (OPC) for all three design options. This information is used to evaluate cost efficiency of TP removal associated with each option, as well as to provide insight into the physical configuration and operations & maintenance requirements of each option. Itemized opinion of probable cost and concept design schematics for each option are included in the attachment and total costs in the table below. A 30% contingency was estimated for Options 1 and 3 to account for uncertainty at this planning level and for final design and permitting needs. Because permitting needs are expected to be much more extensive for Option 2, a 40% contingency was estimated. Land acquisition costs were determined based on the estimated market value in 2023 of the parcel acreage needed for Options 1-3. All options would have the same BMP operation and maintenance costs as they all incorporate the same general type of BMP, the proposed IESF. Maintenance for IESF includes raking using manual or mechanical methods to break up surface crusting twice yearly and jetting out the drain tile as necessary. This estimate is primarily a labor cost and doesn't include design and legal fees. For long-term maintenance, the typical life of an IESF is assumed to be 15 years. Every 15 years, either additional iron filings must be tilled in, or all sand/iron media removed and replaced. For the purposes of calculating maintenance costs, a 30-year lifecycle was assumed with one tilling of additional iron filings (5% by weight). These costs are included in the attached opinion of probable cost.

PROJECT 227705785 - SWAMP LAKE IESF
PRIOR LAKE SPRING LAKE WATERSHED DISTRICT
OPINION OF PROBABLE COST
NOVEMBER 2023

PROJECT 227705785 SWAMP LAKE IESF - OPTION 1

NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION AND DEMOBILIZATION	LS	1	$ 35,200.00	$ 35,200.00
2	TRAFFIC CONTROL	LS	1	$ 1,500.00	$ 1,500.00
3	COMMON EXCAVATION - OFFSITE	CY	3,900	$ 25.00	$ 97,500.00
4	BIORETENTION SOIL MIX	CY	150	$ 85.00	$ 12,750.00
5	TEMPORARY DEWATERING	LS	1	$ 20,000.00	$ 20,000.00
6	TEMPORARY ROCK CONSTRUCTION ENTRANCE - MAINTAINED	EA	1	$ 1,500.00	$ 1,500.00
7	SEDIMENT CONTROL LOG TYPE STRAW (OR BIOROLL) - MAINTAINED	LF	550	$ 4.00	$ 2,200.00
8	FLOTATION SILT CURTAIN - MOVING WATER	LF	15	$ 30.00	$ 450.00
9	EROSION CONTROL BLANKET CATEGORY 20	SY	1,000	$ 2.00	$ 2,000.00
10	GEOTEXTILE FABRIC TYPE 4 NON-WOVEN	SY	100	$ 4.00	$ 400.00
11	COARSE FILTER AGGREGATE	CY	665	$ 85.00	$ 56,525.00
12	PREMIXED IRON/FINE FILTER AGGREGATE	CY	520	$ 225.00	$ 117,000.00
13	RIP RAP CLASS II	TON	45	$ 100.00	$ 4,500.00
14	6" SLOTTED PVC SCH 40 PIPE	LF	710	$ 30.00	$ 21,300.00
15	10" SOLID PVC SCH 40 PIPE	LF	95	$ 55.00	$ 5,225.00
16	12" CMP CULVERT	LF	38	$ 100.00	$ 3,800.00
17	6" CLEANOUT W/ VENT SCREEN	EA	4	$ 500.00	$ 2,000.00
18	10" CLEANOUT W/ VENT SCREEN	EA	1	$ 1,200.00	$ 1,200.00
19	SAMPLE PORT	EA	1	$ 1,750.00	$ 1,750.00
20	MnDOT SEED MIX 34-261	LB	8	$ 40.00	$ 320.00
21	LAND ACQUISITION COSTS	LS	1	$ 13,000.00	$ 13,000.00
22	OPERATION AND MAINTENANCE COSTS	LS	1	$ 47,000.00	$ 47,000.00
23	MONITORING	LS	1	$ 10,000.00	$ 10,000.00
24	COUNTY DITCH PETITION	LS	1	$ 1,500.00	$ 1,500.00
				SUBTOTAL:	$ 458,700.00
				30% CONTINGENCY:	$ 137,700.00
				TOTAL COST	$ 596,400.00

PROJECT 227705785 - SWAMP LAKE IESF
PRIOR LAKE SPRING LAKE WATERSHED DISTRICT
OPINION OF PROBABLE COST
NOVEMBER 2023

PROJECT 227705785 SWAMP LAKE IESF OPTION 2

NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION AND DEMOBILIZATION	LS	1	$ 34,200.00	$ 34,200.00
2	TRAFFIC CONTROL	LS	1	$ 1,500.00	$ 1,500.00
3	COMMON EXCAVATION - OFFSITE	CY	3,500	$ 25.00	$ 87,500.00
4	BIORETENTION SOIL MIX	CY	150	$ 85.00	$ 12,750.00
5	TEMPORARY DEWATERING	LS	1	$ 20,000.00	$ 20,000.00
6	TEMPORARY ROCK CONSTRUCTION ENTRANCE - MAINTAINED	EA	1	$ 1,500.00	$ 1,500.00
7	SEDIMENT CONTROL LOG TYPE STRAW (OR BIOROLL) - MAINTAINED	LF	550	$ 4.00	$ 2,200.00
8	FLOTATION SILT CURTAIN - MOVING WATER	LF	15	$ 30.00	$ 450.00
9	EROSION CONTROL BLANKET CATEGORY 20	SY	1,000	$ 2.00	$ 2,000.00
10	GEOTEXTILE FABRIC TYPE 4 NON-WOVEN	SY	100	$ 4.00	$ 400.00
11	COARSE FILTER AGGREGATE	CY	665	$ 85.00	$ 56,525.00
12	PREMIXED IRON/FINE FILTER AGGREGATE	CY	520	$ 225.00	$ 117,000.00
13	RIP RAP CLASS II	TON	45	$ 100.00	$ 4,500.00
14	6" SLOTTED PVC SCH 40 PIPE	LF	710	$ 30.00	$ 21,300.00
15	10" SOLID PVC SCH 40 PIPE	LF	95	$ 55.00	$ 5,225.00
16	12" CMP CULVERT	LF	38	$ 100.00	$ 3,800.00
17	6" CLEANOUT W/ VENT SCREEN	EA	4	$ 500.00	$ 2,000.00
18	10" CLEANOUT W/ VENT SCREEN	EA	1	$ 1,200.00	$ 1,200.00
19	SAMPLE PORT	EA	1	$ 1,750.00	$ 1,750.00
20	MnDOT SEED MIX 34-261	LB	8	$ 40.00	$ 320.00
21	LAND ACQUISITION COSTS	LS	1	$ 13,000.00	$ 13,000.00
22	OPERATION AND MAINTENANCE COSTS	LS	1	$ 47,000.00	$ 47,000.00
23	CLOMR/LOMR APPLICATION FEES AND ADJACENT OWNER COORDINATION	LS	1	$ 20,000.00	$ 20,000.00
24	MONITORING	LS	1	$ 10,000.00	$ 10,000.00
25	COUNTY DITCH PETITION	LS	1	$ 1,500.00	$ 1,500.00

SUBTOTAL:	$ 467,700.00
40% CONTINGENCY:	$ 187,100.00
TOTAL COST	$ 654,800.00

PROJECT 227705785 - SWAMP LAKE IESF
PRIOR LAKE SPRING LAKE WATERSHED DISTRICT
OPINION OF PROBABLE COST
NOVEMBER 2023

PROJECT 227705785 SWAMP LAKE IESF OPTION 3

NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
1	MOBILIZATION AND DEMOBILIZATION	LS	1	$ 34,700.00	$ 34,700.00
2	TRAFFIC CONTROL	LS	1	$ 1,500.00	$ 1,500.00
3	COMMON EXCAVATION - OFFSITE	CY	3,700	$ 25.00	$ 92,500.00
4	BIORETENTION SOIL MIX	CY	150	$ 85.00	$ 12,750.00
5	TEMPORARY DEWATERING	LS	1	$ 20,000.00	$ 20,000.00
6	TEMPORARY ROCK CONSTRUCTION ENTRANCE - MAINTAINED	EA	1	$ 1,500.00	$ 1,500.00
7	SEDIMENT CONTROL LOG TYPE STRAW (OR BIOROLL) - MAINTAINED	LF	550	$ 4.00	$ 2,200.00
8	FLOTATION SILT CURTAIN - MOVING WATER	LF	15	$ 30.00	$ 450.00
9	EROSION CONTROL BLANKET CATEGORY 20	SY	1,000	$ 2.00	$ 2,000.00
10	GEOTEXTILE FABRIC TYPE 4 NON-WOVEN	SY	100	$ 4.00	$ 400.00
11	COARSE FILTER AGGREGATE	CY	665	$ 85.00	$ 56,525.00
12	PREMIXED IRON/FINE FILTER AGGREGATE	CY	520	$ 225.00	$ 117,000.00
13	RIP RAP CLASS II	TON	45	$ 100.00	$ 4,500.00
14	6" SLOTTED PVC SCH 40 PIPE	LF	710	$ 30.00	$ 21,300.00
15	10" SOLID PVC SCH 40 PIPE	LF	95	$ 55.00	$ 5,225.00
16	12" CMP CULVERT	LF	38	$ 100.00	$ 3,800.00
17	6" CLEANOUT W/ VENT SCREEN	EA	4	$ 500.00	$ 2,000.00
18	10" CLEANOUT W/ VENT SCREEN	EA	1	$ 1,200.00	$ 1,200.00
19	SAMPLE PORT	EA	1	$ 1,750.00	$ 1,750.00
20	MNDOT SEED MIX 34-261	LB	8	$ 40.00	$ 320.00
21	LAND ACQUISITION COSTS	LS	1	$ 13,000.00	$ 13,000.00
22	OPERATION AND MAINTENANCE COSTS	LS	1	$ 47,000.00	$ 47,000.00
23	MONITORING	LS	1	$ 10,000.00	$ 10,000.00
24	COUNTY DITCH PETITION	LS	1	$ 1,500.00	$ 1,500.00

SUBTOTAL:	$ 453,200.00
30% CONTINGENCY:	$ 136,000.00
TOTAL COST	$ 589,200.00

APPENDIX B: CONCEPT PLANS

FULL BMP FOOTPRINT + EASEMENT/ACCESS + 25' BUFFER = 1.61 AC

Stantec	CLIENT NAME: PRIOR LAKE-SPRING LAKE WATERSHED DISTRICT	PROJECT TITLE: SWAMP LAKE BMP FEASIBILITY STUDY
		DWN BY: RWN · CHK'D: JJOA · APP'D: JJOA · DWG DATE: SEE CERT. · SCALE: SEE SCALE BAR
		PROJECT NO.: 227705785 · SHEET NO.: 1 OF 1

LEGEND

- TRAFFIC SIGN
- FLARED END SECTION
- DECIDUOUS TREE
- STORM SEWER
- TREE LINE

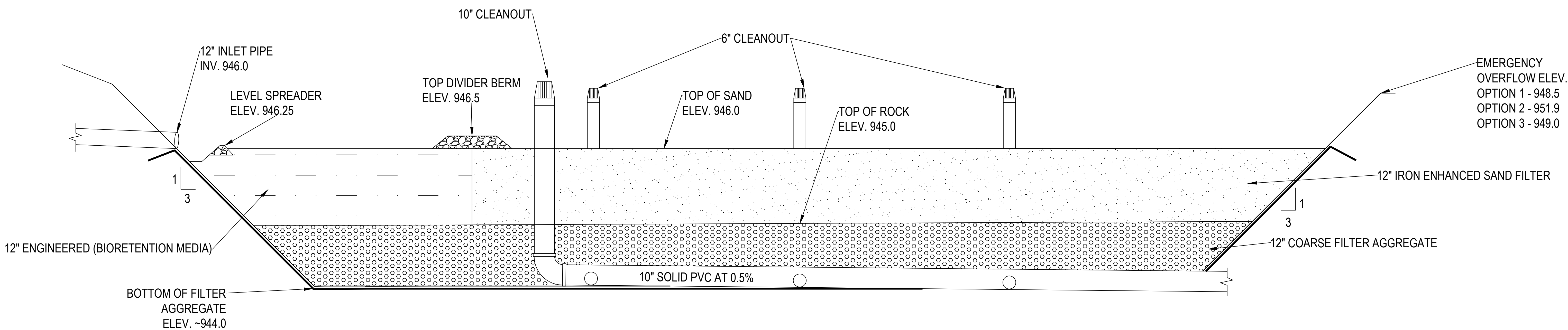
GENERAL NOTES

1. Bearings shown hereon are based on the Scott County Coordinate System relative to the NAD83(11) control adjustment.
2. Elevations and contours shown hereon were established with GPS and are relative to the NAVD88 vertical datum.

N

0 30 60

SCALE IN FEET



1 / A CROSS SECTION VIEW
NOT TO SCALE

Stantec

CLIENT NAME: PRIOR LAKE–SPRING LAKE WATERSHED DISTRICT

PROJECT TITLE: DETAILS

DWN BY	CHK'D	APP'D	DWG DATE	SCALE
JTW	XXX	XXX	SEE CERT.	SEE SCALE BAR

PROJECT NO. 227705785

SHEET NO. 1 OF 1

Xref ..\4 REFERENCES\x-TTLB 227704093.dwg

APPENDIX C: WETLAND DELINEATION & ADDENDUM

Swamp Lake Wetland Delineation Report

PLSLWD Swamp Lake IESF
Sand Creek Township, Scott County, MN
Stantec Project #: 227705785

Stantec

Prepared for:

Prior Lake – Spring Lake Watershed District
4646 Dakota Street Southeast
Prior Lake, MN 55372

Prepared by:

Stantec Consulting Services Inc.
One Carlson Parkway
Suite 100
Plymouth, MN 55447

Sign-off Sheet

This document entitled Swamp Lake Wetland Delineation Report was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of the Prior Lake – Spring Lake Watershed District (PLSLWD) (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by ______________________________
(signature)

Mia Bauer, Environmental Scientist

Reviewed by ______________________________
(signature)

Tony Kaster, Senior Environmental Scientist

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LIST OF TABLES

LIST OF APPENDICES

1.0 INTRODUCTION

Stantec Consulting Services Inc. (Stantec) performed a wetland determination and delineation of the proposed PLSLWD Swamp Lake Iron-Enhanced Sand Filter (IESF) Project site (the "Study Area") on behalf of the PLSLWD. The Study Area is approximately 19.08 acres in size and located in Sections 13 and 24, Township 114 North, Range 23 West, Sand Creek Township, Scott County, Minnesota. The Study Area is located immediately east of Swamp Lake and crosses Redwing Avenue with most of the Study Area located east of the road (**Appendix A, Figure 1**).

The purpose and objective of the wetland determination and delineation was to identify the extent and spatial arrangement of wetlands and waterways within the Study Area. The field investigation was performed on May 9, 2023.

2.0 METHODS

2.1 WETLANDS

Wetland determinations were based on the criteria and methods outlined in the *U.S. Army Corps of Engineers Wetlands Delineation Manual,* Technical Report Y-87-1 (1987) and subsequent guidance documents (USACE 1991, 1992), and applicable Regional Supplements to the *Corps of Engineers Wetland Delineation Manual*.

The wetland determination involved the use of available resources to assist in the assessment such as U.S. Geological Survey (USGS) topographic maps, U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) soil survey, U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) mapping, Minnesota Department of Natural Resources (MNDNR) Protected/Public Waters mapping, and aerial photography.

On-site wetland determinations were made using the three criteria (vegetation, soil, and hydrology) and technical approach defined in the USACE 1987 Manual and applicable Regional Supplement. According to procedures described in the 1987 Manual and applicable Regional Supplement, areas that under normal circumstances reflect a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology (e.g., inundated or saturated soils) are considered wetlands.

Additionally, as climate plays an important role in the formation and identification of wetlands, the antecedent precipitation in the months leading up to the field investigations was reviewed. Antecedent precipitation was determined prior to the field investigation utilizing the U.S. Army Corps of Engineers Antecedent Precipitation Tool. The tool compares precipitation totals from the three months prior to the date of the field investigation with 30-year normal amounts, calculating a weighted multi-month score and determining the climate conditions (dry, normal, wet).

The wetland boundaries and sampling points were identified and surveyed with a Global Positioning System (GPS) capable of sub-meter accuracy and mapped using Geographical Information System (GIS) software.

2.2 WATERWAYS

Waterways (streams, channels, rivers, ditches, etc.) were considered separately from wetlands if they exhibited physical evidence of an Ordinary High-Water Mark (OHWM) per the characteristics outlined in the 2005 USACE Regulatory Guidance Letter Number 05-05 (OHWM Identification) but lack wetland criteria. If observed, waterways, waterbodies, culverts, and/or other connections to off-site wetland or aquatic features that may be under federal or state authority were located using a hand-held GPS and mapped using GIS software.

3.0 RESULTS

3.1 SITE DESCRIPTION

The Study Area is located immediately east of Swamp Lake and crosses Redwing Avenue with most of the Study Area located east of the road. The Study Area has slight changes in topography, with high points located along the southern portion of the Study Area (**Appendix A, Figure 5**). The surrounding area consists of cultivated crops, hay/pasture, low-density residential, deciduous/mixed forest, emergent/woody wetlands, and open water features. NRCS soils present within the Study Area and their hydric status are summarized in **Table 1** and mapped in **Appendix A, Figure 2**.

Table 1. Summary of Soils Identified within the Study Area

Soil Symbol:	Soil Unit Name	Acres in Study Area	% Hydric Rating	Hydric Category
Ga	Glencoe silty clay loam, 0 to 1 percent slopes	6.57	100	All Hydric
Wb	Webster-Glencoe silty clay loam	3.93	100	All Hydric
PaA	Klossner muck, 0 to 1 percent slopes	2.48	100	All Hydric
CaB	Clarion loam, 2 to 6 percent slopes	2.23	5	Pre-dominantly non-Hydric
Wc	Webster-Le Sueur silty clay loam	1.47	70	Pre-dominantly Hydric
CaC2	Clarion loam, 6 to 10 percent slopes, moderately eroded	1.42	0	All non-Hydric
LcB	Lester loam, 2 to 6 percent slopes	0.63	10	Pre-dominantly non-Hydric
CaC	Clarion loam, 6 to 10 percent slopes	0.35	0	All non-Hydric

The MNDNR Protected/Public Waters map identifies Swamp Lake (70011100) as a MNDNR Public Waters Basin within the far western portion of the Study Area (**Appendix A, Figure 3**).

The National Wetland Inventory (NWI) map identifies a portion of one emergent wetland (PEM1C) within the western portion of the Study Area (**Appendix A, Figure 4**). The National Hydrology

Dataset (NHD) identifies one stream that flows east/west within the central portion of the Study Area (**Appendix A, Figure 4**).

Precipitation was analyzed using the Army Corps of Engineers Antecedent Precipitation Tool (APT) which calculates a three-month rolling precipitation total. Precipitation was considered *wetter than normal* prior to the site visit on May 9, 2023, as shown in the precipitation figure in **Appendix D** and **Table 2**, below.

Table 2. Antecedent Precipitation Tool Data

Time Period (30-day period ending on)		30% chance <	30% chance >	Precip	Condition Dry, Wet, Normal	Condition Value[1]	Month Weight Value	Product of Previous Two Columns
1st Prior Month	5-9-2023	2.12	4.49	3.04	Normal	2	3	6
2nd Prior Month	4-9-2023	1.22	2.07	3.35	Wet	3	2	6
3rd Prior Month	3-10-2023	0.55	1.43	3.15	Wet	3	1	3
Conclusions[2]	**Prior period has been *wetter than normal***						**Sum**	**15**

Source: Precipitation data was compiled and analyzed using the Army Corps of Engineer Antecedent Precipitation Tool available at: https://www.epa.gov/wotus/antecedent-precipitation-tool-apt (accessed November 2022).

[1] Condition Values are as follows: Dry=1, Normal=2, Wet=3

[2] Conclusions are as follows: If the sum is 6-9 than the period has been drier than normal; if the sum is 10-14 then that period has been normal; if the sum is 15-18 then the period has been wetter than normal.

3.2 WETLANDS

One wetland was identified and delineated within the Study Area during the May 2023 visit. Wetland determination data forms were completed for two sample points along a transect through the wetland and adjacent upland and are contained in **Appendix B**. Photographs of the wetland and adjacent lands are contained in **Appendix C**. The wetland boundaries and sample point locations are shown on **Appendix A, Figure 6**. The wetland is summarized in **Table 3** and described in detail in the following sections.

Table 3. Summary of Wetlands Identified within the Study Area

Wetland	Field Classified Wetland Type	NWI Wetland Type	Adjacent Surface Waters	Acreage (on-site)
Wetland A (WA)	PEM/Type 3 with Type 2 fringe	PEM1C	Swamp Lake (70011100)	0.13

3.2.1 Wetland A

Wetland A (WA) is an emergent wetland community located at the western end of the Study Area on the west side of Redwing Avenue. An upland and wetland sample point were taken as a representative transect. Wetland A is closely associated with Swamp Lake (70011100), and the corresponding upland is located in the vicinity of a forested area northeast of the wetland.

Vegetation

Dominant plant species identified at the wetland sample point, WA-w, consisted of reed canary grass (*Phalaris arundinacea)* and narrow-leaved cattail (*Typha angustifolia*). The dominant species within the wetland are comprised of hydrophytic vegetation (OBL, FACW, and/or FAC) and meets the hydrophytic vegetation criterion. Dominant plant species identified at WA-u, the upland sample point, consisted of boxelder (*Acer negundo*), American plum (*Prunus americana*), Canada goldenrod (*Solidago canadensis*), and Missouri gooseberry (*Ribes missouriense*). The dominant species at the upland sample point did not meet the hydrophytic vegetation criterion.

Hydrology

The wetland sample point had primary indicators of wetland hydrology, including Surface Water (A1) (approximately three inches), as well as High Water Table (A2) and Saturation (A3) to the surface. The wetland sample point also had secondary indicators of wetland hydrology, including Geomorphic Position (D2) and the FAC-Neutral Test (D5). Therefore, the wetland hydrology criterion was met. No hydrology indicators were observed for the upland sample point, so the hydrology wetland criterion was not met at the upland sample point.

Soils

Soils within the wetland, as well as the upland sample point, were mapped by the NRCS as Glencoe silty clay loam, zero to one percent slopes, which is 100 percent hydric (**Appendix A, Figure 2**). However, no soil samples were taken as sample points were located along a roadside where there is a potential for buried utilities. Soils at the wetland sample point were assumed hydric based on landscape position, hydrology, and the vegetation present. Soils at the upland sample point were assumed to be non-hydric due to lack of hydrology indicators and the vegetation present.

Wetland Boundary

The wetland boundary was determined based on distinct differences in vegetation and hydrology consisting of the following: 1) Transition from a community consisting of reed canary grass (FACW) and narrow-leaved cattail (OBL) to one that contained several UPL and FACU species; and 2) Transition from an area with hydrology indicators to one lacking hydrology indicators.

3.3 UPLANDS

The upland areas within the Study Area on the east side of Redwing Avenue consisted of presently cultivated cropland with a buffer dominated by smooth brome (*Bromus inermis*), with a minor component of reed canary grass, between the farmed fields and Stream A (SA) (see 3.4 Waterways). Historical aerial photos were reviewed prior to the field investigation, and no areas of concern were observed in the cultivated fields. Additionally, there were no mapped NWI wetlands in the cultivated fields. Two upland sample points were taken in the cultivated fields on the east side of Redwing Avenue north of SA: Sample Point A (SPA) and Sample Point B (SPB). Data forms for these upland sample points are included in **Appendix B**.

SPA was determined to be an upland drainage swale that had been effectively drained by tile. Vegetation in the area consisted of FACU species, namely smooth brome, common dandelion

(*Taraxacum officinale*), and red clover (*Trifolium pratense*); and soils consisted of silty clay loam and silty clay that lacked hydric soil indicators. Finally, no hydrology indicators were met.

SPB was determined to be upland. It met the vegetation indicator as a result of a small area dominated by reed canary grass and the hydrology indicator was also met through weak Geomorphic Position (D2) and the FAC-Neutral Test (D5), however the hydric soil indicator was not met.

3.4 WATERWAYS

Two waterways were identified within the Study Area: SA and Stream B (SB). Photographs of the streams are contained in **Appendix C**. The stream boundaries are shown in **Appendix A, Figure 6**. The streams are summarized in **Table 4** and described in detail in the following sections.

Table 4. Summary of Waterways Identified within the Study Area

Waterway	Flow Regime	Length (linear feet)
Stream A (SA)	**Perennial**	**2,157.15**
Stream B (SB)	**Ephemeral**	**236.56**

SA is a perennial stream that runs the length of the Study Area east/west. It was estimated in the field that the banks of the stream were 10-15 feet in height and 20 feet in width. Approximately one-half foot of water was present in the stream at the time of the investigation.

SB is an ephemeral stream that runs north/south just west of Redwing Avenue. It was estimated in the field that the banks of the stream were one-half foot in height and two to five feet in width. Approximately zero to one inch of water was present in the stream at the time of the investigation.

3.5 OTHER ENVIRONMENTAL CONSIDERATIONS

This report is limited to the identification of state and/or federally regulated wetlands and waterways within the Study Area. However, there may be other regulated environmental features within the Study Area, including, but not limited to, historical or archeological features, endangered or threatened species, and/or floodplains, etc. Federal, state, and local units of government and regional planning organizations may have regulatory authority to control or restrict land uses within or in close proximity to these features. Stantec can assist with identification and/or assessment of additional regulated resources at your request.

4.0 CONCLUSION

Stantec performed a wetland and waterway determination and delineation of the proposed PLSLWD Swamp Lake IESF Project for the PLSLWD. The purpose and objective were to identify the extent and spatial arrangement of wetlands and waterways within the Study Area.

On **May 9, 2023**, the boundaries of one emergent wetland were identified and delineated in the Study Area in accordance with state and federal guidelines and were surveyed with GPS and mapped using GIS software. There was a total of **0.13 acres of wetlands** delineated and identified within the Study Area. Adjacent uplands were composed of mixed grassland and upland forest. Two streams were also identified and delineated in the Study Area for a total of **2,393 linear feet of stream**.

Wetlands and waterways that are considered waters of the U.S. are subject to regulation under Section 404 of the Clean Water Act (CWA) and the jurisdictional regulatory authority lies with the U.S. Army Corps of Engineers (USACE). The Minnesota Department of Natural Resources (MNDNR) has regulatory authority over certain public wetlands and waters and adjacent lands under Statute 103G and Rule 6115.0250. All wetlands are protected under the Wetland Conservation Act and administered by a Local Governmental Unit (LGU). LGUs can be a City, County, Watershed District, Soil and Water Conservation District (SWCD) or other entity depending on project location and ownership. For this Study Area the **LGU** is the **Scott County SWCD**. Stantec recommends this report be submitted to the LGU and USACE for a preliminary jurisdictional review and concurrence. Finally, counties, townships and municipalities may have local zoning authority over certain types of wetlands and waterways.

Prior to beginning work at this site or disturbing or altering wetlands, waterways, or adjacent lands, Stantec recommends that the owner obtain the necessary permits or other agency regulatory review and concurrence with regard to the proposed work to comply with applicable regulations. Stantec can assist with identification and/or assessment of additional regulated resources at your request.

The information provided by Stantec regarding wetland boundaries is a scientific-based analysis of the wetland and upland conditions present in the Study Area at the time of the fieldwork. The delineation was performed by experienced and qualified professionals using standard practices and sound professional judgment. The ultimate decision on wetland boundaries rests with the applicable regulatory agencies. As a result, there may be adjustments to boundaries based upon review by a regulatory agency. An agency determination can vary from time to time depending on various factors including, but not limited to recent precipitation patterns and the season of the year. In addition, the physical characteristics of the Study Area can change over time, depending on the weather, vegetation patterns, drainage activities on adjacent parcels, or other events. Any of these factors can change the nature and extent of wetlands on the site. This wetland delineation report and the associated wetland boundaries cannot be depended on until they are approved by the applicable regulatory agencies. It is recommended to review and confirm these approvals before proceeding with any site work.

5.0 REFERENCES

Cowardin, L.M., V. Carter V., F.C. Golet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service Report No. FWS/OBS/-79/31.Washington, D.C.

Eggers, S. D., & D. M. Reed. 2015. *Wetland Plants and Plant Communities of Minnesota and Wisconsin* (V. 3.2). U.S. Army Corps of Engineers, Regulatory Branch, St. Paul, MN District. Available at: https://usace.contentdm.oclc.org/digital/collection/p266001coll1/id/2801/

Minnesota Department of Natural Resources. 1985. Final Designation of Protected (Public) Waters and Wetlands within Hennepin County, Minnesota. http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/download_lists.html

Shaw, S. P., and C. G. Fredine. 1956. Wetlands of the United States: Their extent and values to Waterfowl and other wildlife. Washington D.C. Department of the Interior, Fish and Wildlife Service, Office of River Basin Studies. Circular 39.

Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database. Available online at http://websoilsurvey.nrcs.usda.gov/ or http://datagateway.nrcs.usda.gov/. Accessed May 2023.

USACE. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station (U.S.) United States. Army. Corps of Engineers Wetlands Research Program (U.S.).

USACE. 2005. Regulatory guidance letter – Ordinary high water mark identification. Available at: https://www.nap.usace.army.mil/Portals/39/docs/regulatory/rgls/rgl05-05.pdf. Accessed May 2023.

USACE. 2010. Regional supplement to the Corps of Engineers wetlands delineation manual: Midwest region. Available at: https://usace.contentdm.oclc.org/utils/getfile/collection/p266001coll1/id/7630. Accessed May 2023.

USACE. 2020. Antecedent Precipitation Tool, Version 1.0. U.S. Army Corps of Engineers. Written by: Jason Deters. https://www.epa.gov/wotus/antecedent-precipitation-tool-apt

USACE and Minnesota Board of Water and Soil Resources (BWSR). 2015. Guidance for submittal of Delineation Reports to the St. Paul District Army Corps of Engineers and Wetland Conservation Act Local Governmental Units in Minnesota, (Version 2).

USACE. 2020. National Wetland Plant List, version 3.5. Available at: https://wetland-plants.sec.usace.army.mil/nwpl_static/v34/home/home.html. Accessed May 2023.

U.S. Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS). 2018. *Field Indicators of Hydric Soils in the United States*, Version 8.2. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS in cooperation with the National Technical Committee for Hydric

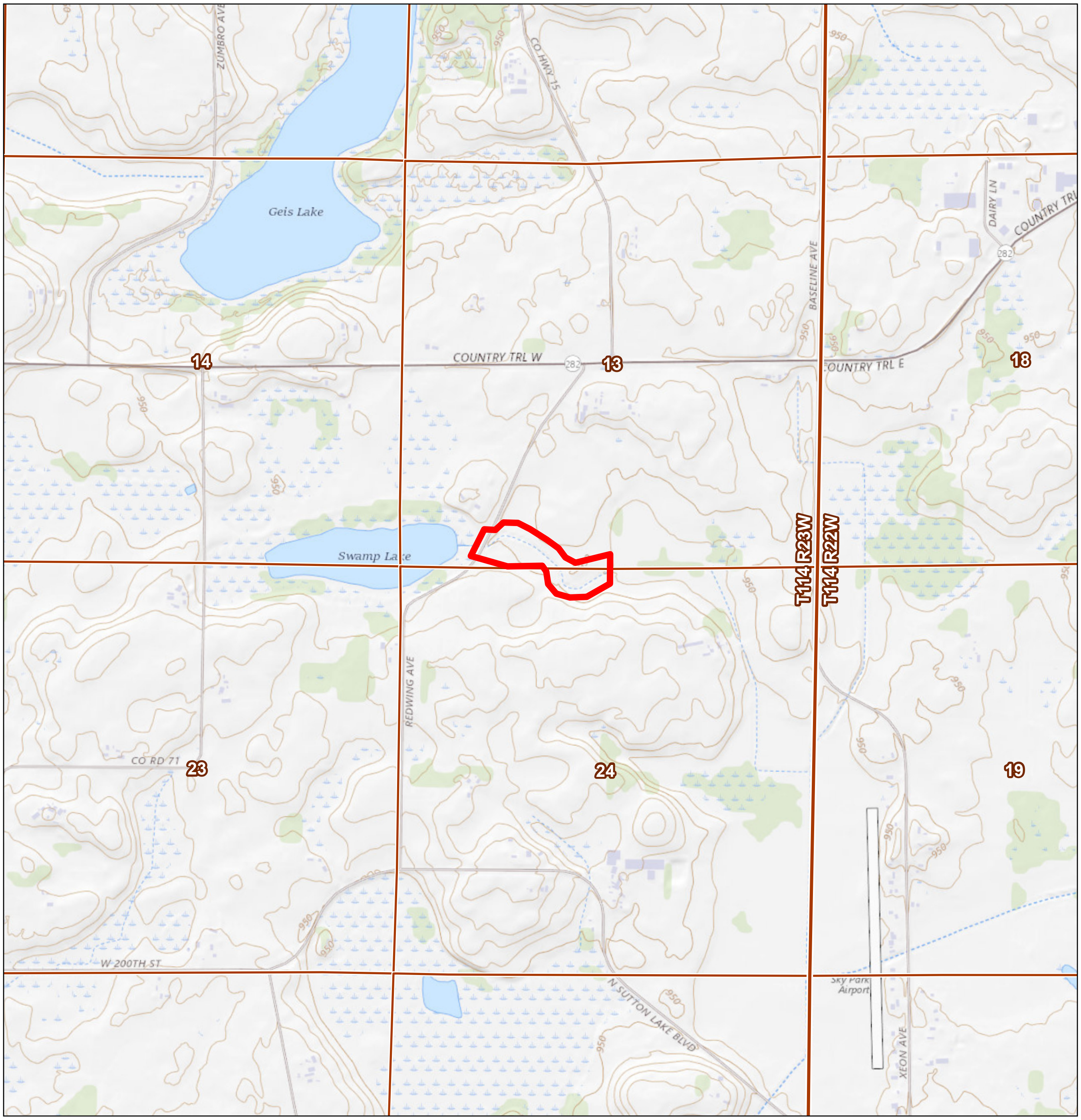
Soils.

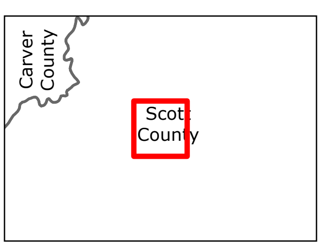
USFWS. Undated. NWI. Available at: https://fwspublicservices.wim.usgs.gov/server/rest/services/Wetlands/MapServer. Accessed May 2023.

USGS. Undated. NHD. Available at: https://hydro.nationalmap.gov/arcgis/rest/services/nhd/MapServer. Accessed May 2023.

United States Geological Survey (USGS). *Minnesota 7.5 Minute Series (Topographic) Maps.* 1:24,000. Reston, VA: United States Department of the Interior, USGS.

Appendix A Figures





Legend

Study Area

0 1,000 2,000 Feet

(At original document size of 8.5x11)
1:24,000

N

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec,PLSLWD, Scott Co.
3. Background: USGS 7.5' Quadrangle

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

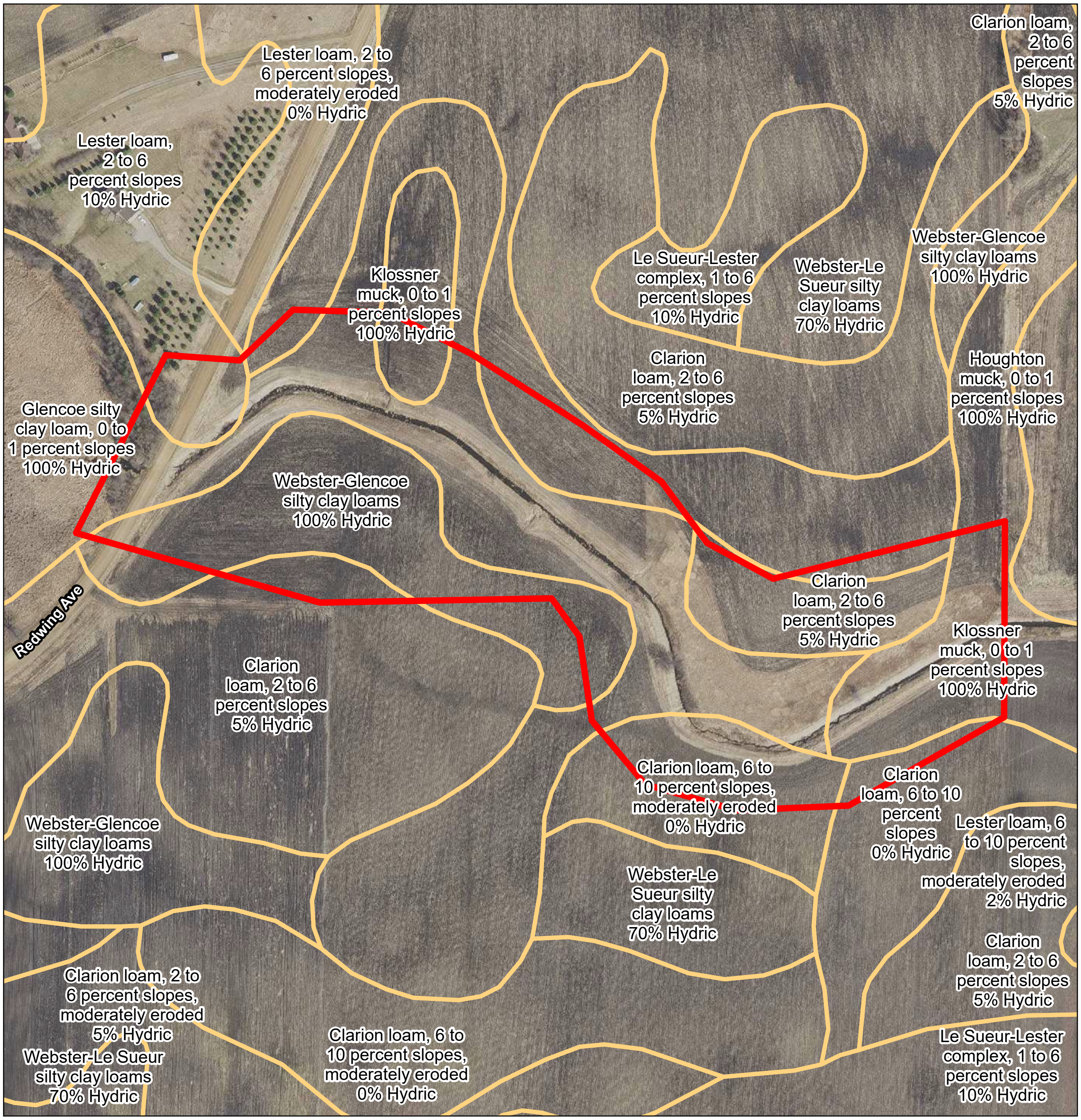
Prepared by KJM on 2023-05-18

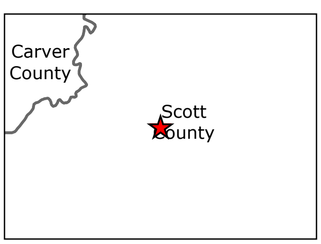
Client/Project
227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

Figure No.
1

Title
Project Location

V:\2277\active\227705785\03_data\gis_cad\gis\pro\wetlandsurvey\wetlandsurvey.aprx Revised: 2023-05-18 By: kjmueller





Legend
- Study Area
- Soil Unit and Hydric Rating

0 150 300 Feet
(At original document size of 8.5x11)
1:3,600
N

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

Prepared by KJM on 2023-05-18

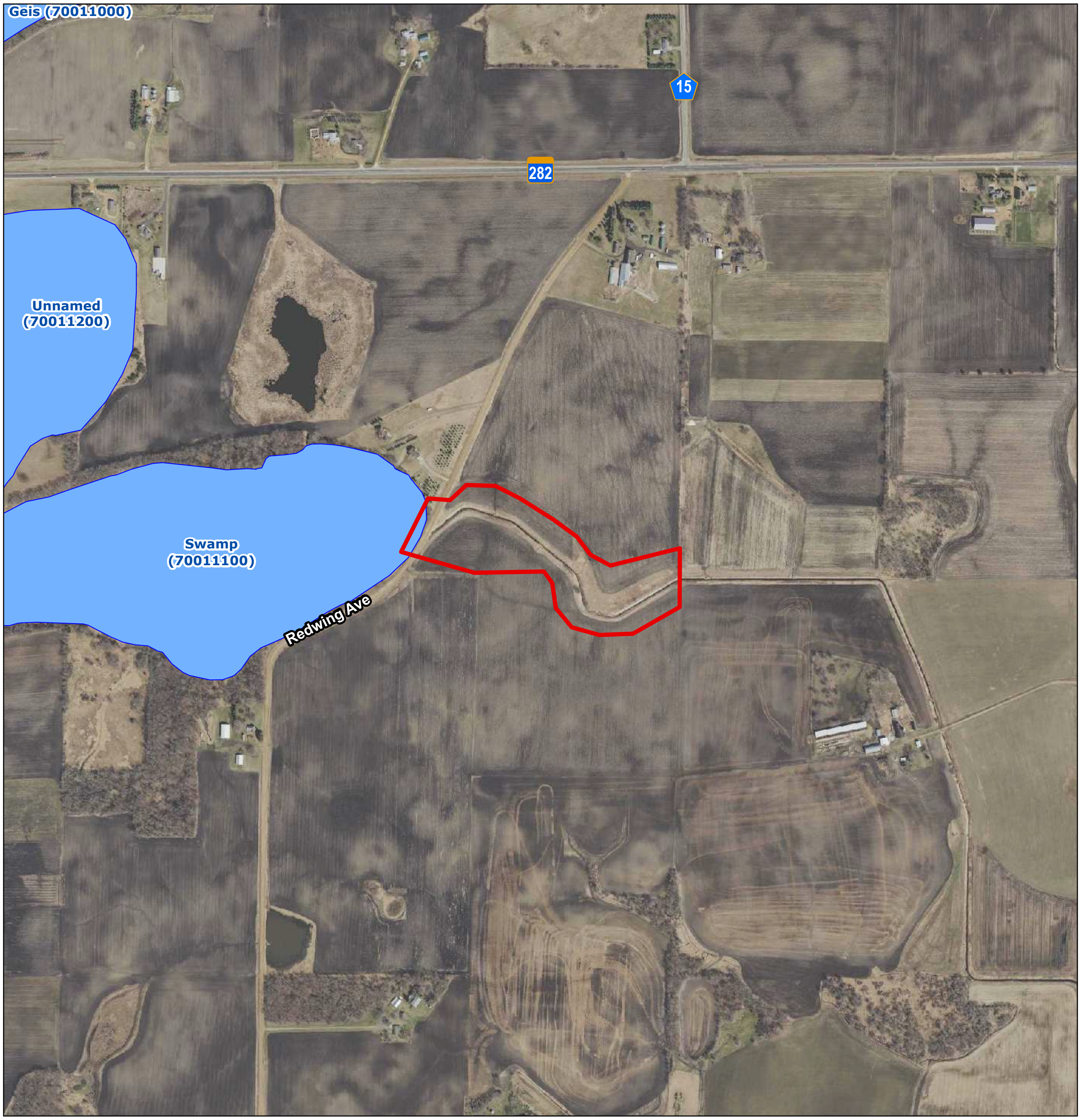
Client/Project 227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

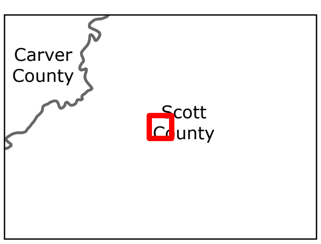
Figure No.
2

Title
Soil Survey Data Hydric Ratings

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, NRCS, ESRI
3. Background: 2020 color 7-county

V:\2277\active\227705785\03_data\gis_cad\gis\pro\wetlandsurvey\wetlandsurvey.aprx Revised: 2023-05-18 By: kjmueller





Legend
Study Area
Minnesota Public Waters Delineations
Public Waters Basins

0 500 1,000 Feet
(At original document size of 8.5x11)
1:12,000
N

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, MNDNR
3. Background: 2020 color 7-county

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

Prepared by KJM on 2023-05-18

Client/Project
227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

Figure No.
3

Title
MN Protected & Public Waters

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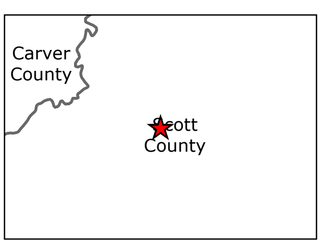


Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, MNDNR, USGS
3. Background: 2020 Color 7-county

Legend
- Study Area
- National Wetlands Inventory Feature

National Hydrography Dataset
- Stream
- Waterbody

0 250 500 Feet
(At original document size of 8.5x11)
1:6,000

N

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

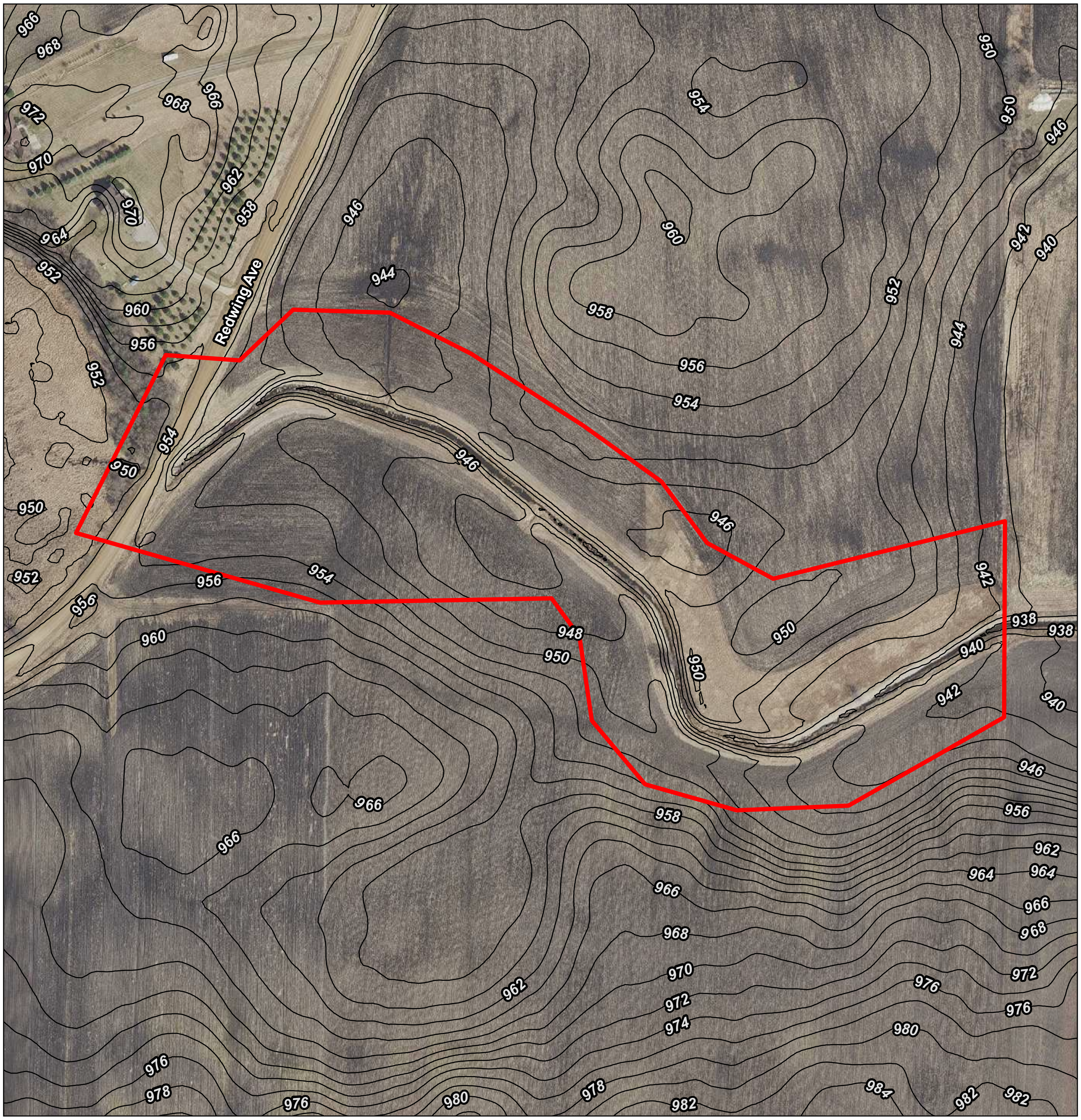
Prepared by KJM on 2023-05-18

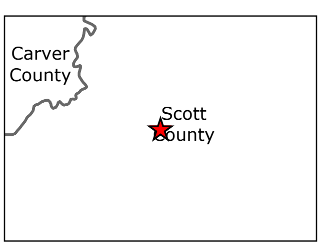
Client/Project
227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

Figure No.
4

Title
National Wetlands Inventory and National Hydrography Dataset

V:\2277\active\227705785\03_data\gis_cad\gis\pro\wetlandsurvey\wetlandsurvey.aprx Revised: 2023-05-18 By: kjmueller





Legend
—— Contour 2ft
Study Area

0 150 300 Feet
(At original document size of 8.5x11)
1:3,600

N

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

Prepared by KJM on 2023-05-18

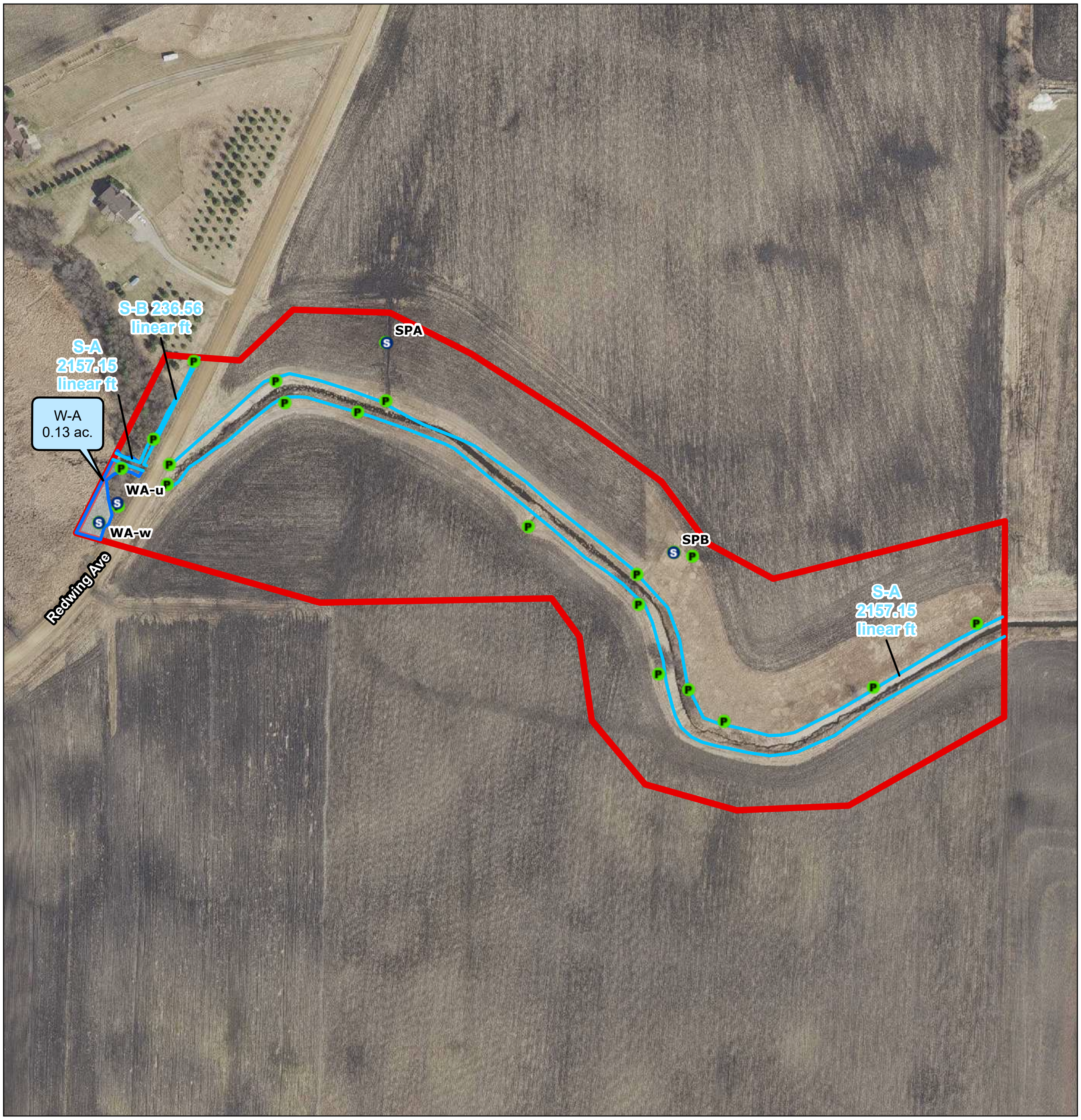
Client/Project
227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

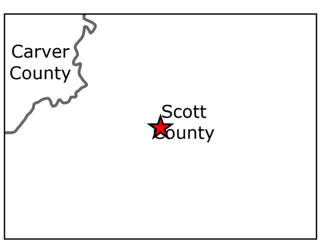
Figure No.
5

Title
Site Topography

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, MNDNR
3. Background: 2020 color 7-county

V:\2277\active\227705785\03_data\gis_cad\gis\pro\wetlandsurvey\wetlandsurvey.aprx Revised: 2023-05-18 By: kjmueller





Legend
- Sample Point
- Photo Location
- Delineated Waterbody
- Delineated Wetland Area
- Study Area

0 150 300 Feet
(At original document size of 8.5x11)
1:3,600

N

Stantec

Project Location
T114, R23, S13 & 24
Sand Creek, Scott Co., MN

Prepared by KJM on 2023-05-18

Client/Project 227705785
Prior Lake-Spring Lake Watershed District
PLSLWD Swamp Lake IESF
Wetland Delineation

Figure No.
6

Title
Field Collected Data

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec
3. Background: 2020 color 7-county

V:\2277\active\227705785\03_data\gis_cad\gis\pro\wetlandsurvey\wetlandsurvey.aprx Revised: 2023-05-18 By: kjmueller

Appendix B Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Swamp Lake Delineation — City/County: Sand Creek Twnshp — Sampling Date: 5/9/23

Applicant/Owner: PLSLWD — State: Minnesota — Sampling Point: WA-w

Investigator(s): Kathryn Keller-Miller and Mia Bauer — Section, Township, Range: T114N R23W S13

Landform (hillslope, terrace, etc.): Depression — Local relief (concave, convex, none): Concave

Slope (%): 0 to 1 — Lat: 44.674574 — Long: -93.538268 — Datum: NAD 83

Soil Map Unit Name: Glencoe silty clay loam, 0 to 1 percent slopes — NWI Classification: PEM1C

Are climatic/hydrologic conditions of the site typical for this time of the year? N (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	Is the sampled area within a wetland?	Y
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	Wetland A

Remarks: (Explain alternative procedures here or in a separate report.)

Precipitation was wetter than normal.

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size: 30)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size: 15)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5)			
1 *Phalaris arundinacea*	85	Y	FACW
2 *Typha angustifolia*	15	N	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size: 30)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across all Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100.00%	(A/B)

Prevalence Index Worksheet

Total % Cover of:			
OBL species	15	x 1 =	15
FACW species	85	x 2 =	170
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		185 (B)

Prevalence Index = B/A = 1.85

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: WA-w

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 5 cm Mucky Peat or Peat (S3)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L)**
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Very Shallow Dark Surface (TF12)
X Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric soil present? Y

Remarks:
No soil samples taken because sample point was along a roadside where buried utilities may be present. Hydric soils assumed based on observed vegetation and hydrology.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

X Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Gauge or Well Data (D9)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	X	No		Depth (inches):	3
Water table present?	Yes	X	No		Depth (inches):	0
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Swamp Lake Delineation | City/County: Sand Creek Twnshp | Sampling Date: 5/9/23

Applicant/Owner: PLSLWD | State: Minnesota | Sampling Point: WA-u

Investigator(s): Kathryn Keller-Miller and Mia Bauer | Section, Township, Range: T114N R23W S13

Landform (hillslope, terrace, etc.): Backslope | Local relief (concave, convex, none): Convex

Slope (%): 1 to 2 | Lat: 44.674679 | Long: -93.538131 | Datum: NAD 83

Soil Map Unit Name: Glencoe silty clay loam, 0 to 1 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions of the site typical for this time of the year? N (If no, explain in remarks)

Are vegetation ___, soil ___, or hydrology ___ significantly disturbed?

Are vegetation ___, soil ___, or hydrology ___ naturally problematic?

Are "normal circumstances" present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present? N

Hydric soil present? N

Indicators of wetland hydrology present? N

Is the sampled area within a wetland? N

If yes, optional wetland site ID: Upland

Remarks: (Explain alternative procedures here or in a separate report.)

Precipitation was wetter than normal.

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30)	Absolute % Cover	Dominant Species	Indicator Staus
1 *Acer negundo*	20	Y	FAC
2			
3			
4			
5			
	20	= Total Cover	
Sapling/Shrub stratum (Plot size: 15)			
1 *Prunus americana*	30	Y	UPL
2 *Lonicera tatarica*	10	N	FACU
3 *Cornus sericea*	7	N	FACW
4 *Acer negundo*	5	N	FAC
5 *Ribes missouriense*	5	N	NI
	57	= Total Cover	
Herb stratum (Plot size: 5)			
1 *Solidago canadensis*	40	Y	FACU
2 *Ribes missouriense*	20	Y	NI
3 *Cornus sericea*	5	N	FACW
4 *Acer negundo*	5	N	FAC
5 *Taraxacum officinale*	5	N	FACU
6			
7			
8			
9			
10			
	75	= Total Cover	
Woody vine stratum (Plot size: 30)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 25.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:			
OBL species	0	x 1 =	0
FACW species	12	x 2 =	24
FAC species	30	x 3 =	90
FACU species	55	x 4 =	220
UPL species	30	x 5 =	150
Column totals	127 (A)		484 (B)

Prevalence Index = B/A = 3.81

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: WA-u

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 5 cm Mucky Peat or Peat (S3)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L)**
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric soil present? N

Remarks:
No soil samples taken because sample point was along a roadside where there may be buried utilities present. Non-hydric soils assumed based on observed vegetation and hydro. Possible past fill present.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Gauge or Well Data (D9)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	
Water table present?	Yes		No	X	Depth (inches):	
Saturation present? (includes capillary fringe)	Yes		No	X	Depth (inches):	

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site Swamp Lake Delineation City/County: Sand Creek Twnshp Sampling Date: 5/9/23
Applicant/Owner: PLSLWD State: Minnesota Sampling Point: SPA
Investigator(s): Kathryn Keller-Miller and Mia Bauer Section, Township, Range: T114N R23W S13
Landform (hillslope, terrace, etc.): Depression/Swale Local relief (concave, convex, none): Concave
Slope (%): _1 Lat: 44.675548 Long: -93.536114 Datum: NAD 83
Soil Map Unit Name Klossner muck, 0 to 1 percent slopes NWI Classification: None
Are climatic/hydrologic conditions of the site typical for this time of the year? N (If no, explain in remarks)
Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes
Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N	If yes, optional wetland site ID:	Upland
Indicators of wetland hydrology present?	N		

Remarks: (Explain alternative procedures here or in a separate report.)

Precipitation was wetter than normal.

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size: 30)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size: 15)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5)			
1 *Bromus inermis*	70	Y	FACU
2 *Taraxacum officinale*	10	N	FACU
3 *Trifolium pratense*	5	N	FACU
4			
5			
6			
7			
8			
9			
10			
	85	= Total Cover	
Woody vine stratum (Plot size: 30)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)
Total Number of Dominant Species Across all Strata: 1 (B)
Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:			
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	85	x 4 =	340
UPL species	0	x 5 =	0
Column totals	85 (A)		340 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ Rapid test for hydrophytic vegetation
___ Dominance test is >50%
___ Prevalence index is ≤3.0*
___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: SPA

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-7	10YR2N	100					Silty clay loam	
7-15	10YR2/1	100					Silty clay loam	
15-24	10YR2/1	90	7.5YR 4/6	10			Silty clay	

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 5 cm Mucky Peat or Peat (S3)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L)**
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: ______
Depth (inches): ______

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Gauge or Well Data (D9)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
___ Geomorphic Position (D2)
___ FAC-Neutral Test (D5)

Field Observations:

	Yes		No		Depth (inches):	
Surface water present?	Yes		No	X	Depth (inches):	
Water table present?	Yes	X	No		Depth (inches):	19
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	16

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Area is being effectively drained, likely with tile.

Remarks:

Upland drainage swale.

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site Swamp Lake Delineation | City/County: Sand Creek Twnshp | Sampling Date: 5/9/23

Applicant/Owner: PLSLWD | State: Minnesota | Sampling Point: SPB

Investigator(s): Kathryn Keller-Miller and Mia Bauer | Section, Township, Range: T114N R23W S13

Landform (hillslope, terrace, etc.): Slight Depression | Local relief (concave, convex, none): Convave

Slope (%): _1 | Lat: 44.674433 | Long: -93.533945 | Datum: NAD 83

Soil Map Unit Name Glencoe silty clay loam, 0 to 1 percent slopes | NWI Classification: None

Are climatic/hydrologic conditions of the site typical for this time of the year? N (If no, explain in remarks)

Are vegetation ___, soil ___, or hydrology ___ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ___, soil ___, or hydrology ___ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	Is the sampled area within a wetland?	N
Indicators of wetland hydrology present?	Y	If yes, optional wetland site ID:	Upland

Remarks: (Explain alternative procedures here or in a separate report.)

Precipitation was wetter than normal.

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size: 30)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size: 15)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5)			
1 *Phalaris arundinacea*	97	Y	FACW
2 *Ambrosia trifida*	3	N	FAC
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size: 30)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC:	1	(A)
Total Number of Dominant Species Across all Strata:	1	(B)
Percent of Dominant Species that are OBL, FACW, or FAC:	100.00%	(A/B)

Prevalence Index Worksheet

Total % Cover of:			
OBL species	0	x 1 =	0
FACW species	97	x 2 =	194
FAC species	3	x 3 =	9
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		203 (B)

Prevalence Index = B/A = 2.03

Hydrophytic Vegetation Indicators:

- __ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- __ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- __ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: SPB

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-14	10YR2N	100					Silty clay loam	
14-32	10YR2/1	100					Silty clay	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

___ Histisol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ 5 cm Mucky Peat or Peat (S3)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

___ Coast Prairie Redox (A16) (**LRR K, L, R**)
___ Dark Surface (S7) (**LRR K, L)**
___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):
Type: ___
Depth (inches): ___

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9)
___ Aquatic Fauna (B13)
___ True Aquatic Plants (B14)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres on Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Thin Muck Surface (C7)
___ Gauge or Well Data (D9)
___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

___ Surface Soil Cracks (B6)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Crayfish Burrows (C8)
___ Saturation Visible on Aerial Imagery (C9)
___ Stunted or Stressed Plants (D1)
X Geomorphic Position (D2)
X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes		No	X	Depth (inches):	
Water table present?	Yes	X	No		Depth (inches):	22
Saturation present? (includes capillary fringe)	Yes	X	No		Depth (inches):	20

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C Site Photographs

Photo 1: Wetland A (WA)

Photo Taken Facing: West

Photo Description: Photo of Wetland A taken from the west side of Redwing Avenue. Type 3 wetland with reed canary grass and narrow-leaved cattails (Type 2 fringe not visible). Swamp Lake is adjacent further west.

Photo 2: WA

Photo Taken Facing: North

Photo Description: Taken from the same location as Photo 1 but looking north towards the adjacent upland. Type 3 wetland with Type 2 fringe visible to the east.

Photo 3: Sample Point A (SPA) - Upland

Photo Taken Facing: South

Photo Description: Upland drainage swale effectively drained by tile located between cropland and Stream A (SA). Smooth brome was dominant.

Photo 4: Sample Point B (SPB) - Upland

Direction Photo is Taken: Northwest

Photo Description: Upland area with a patch of dominant reed canary grass and a slight depression. Soils were determined to be non-hydric.

Photo 5: Stream A (SA)

Direction Photo is Taken: East

Photo Description: Perennial stream running the length of the Study Area. Tile outlets were located at multiple locations along the length of the steam.

Photo 6: Stream B (SB)

Direction Photo is Taken: South

Photo Description: Ephemeral stream located just west of Redwing Avenue. SB connects to SA further south near WA.

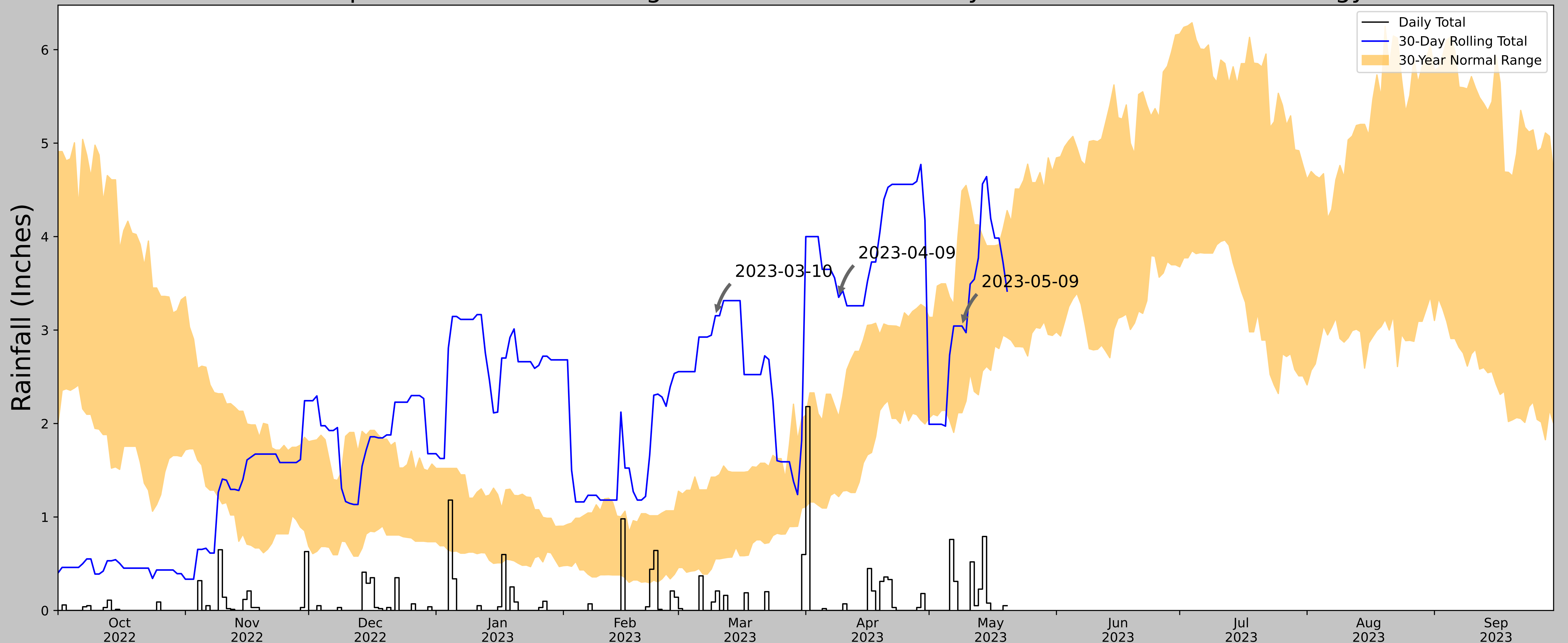
Photo 7: SA Junction

Direction Photo is Taken: East

Photo Description: Meeting point of SA with SB where SB is located to the north just out of view. The pictured culvert brings SA across Redwing Avenue to the large eastern portion of the Study Area.

Appendix D Antecedent Precipitation

Antecedent Precipitation vs Normal Range based on NOAA's Daily Global Historical Climatology Network



Coordinates	44.675240052, -93.536427110
Observation Date	2023-05-09
Elevation (ft)	942.533
Drought Index (PDSI)	Moderate wetness (2023-04)
WebWIMP H_2O Balance	Wet Season

30 Days Ending	30^{th} %ile (in)	70^{th} %ile (in)	Observed (in)	Wetness Condition	Condition Value	Month Weight	Product
2023-05-09	2.115748	4.489764	3.043307	Normal	2	3	6
2023-04-09	1.218504	2.07126	3.350394	Wet	3	2	6
2023-03-10	0.552362	1.426378	3.153543	Wet	3	1	3
Result							Wetter than Normal - 15

Weather Station Name	Coordinates	Elevation (ft)	Distance (mi)	Elevation Δ	Weighted Δ	Days Normal	Days Antecedent
JORDAN 1SSW	44.65, -93.6356	899.934	5.176	42.599	2.55	10227	90
JORDAN 4.2 SSE	44.6081, -93.6041	930.118	3.283	30.184	1.576	10	0
JORDAN 2.3 NNE	44.6942, -93.6127	741.142	3.255	158.792	1.982	53	0
CARVER 0.7 W	44.7573, -93.6416	847.113	7.42	52.821	3.731	18	0
BELLE PLAINE 1.9 WSW	44.6075, -93.7991	873.032	8.559	26.902	4.082	1	0
CARVER 1.1 NW	44.7677, -93.6469	962.927	8.151	62.993	4.181	2	0
PRIOR LAKE 2.0 W	44.7125, -93.4636	959.974	9.489	60.04	4.84	9	0
CHASKA 2NW	44.8131, -93.6311	922.9	11.271	22.966	5.331	885	0
CHASKA	44.8, -93.5833	720.144	10.677	179.79	6.724	93	0
MINNEAPOLIS FLYING CLOUD AP	44.8322, -93.4706	904.856	14.968	4.922	6.809	54	0
CHANHASSEN WSFO	44.8497, -93.5644	945.866	14.233	45.932	7.059	1	0

Figure and tables made by the
Antecedent Precipitation Tool
Version 1.0

Written by Jason Deters
U.S. Army Corps of Engineers