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MEMORANDUM

TO: Ann White Eagle, Ramsey County SWCD Director
Phil Belfiori, Administrator
Dawn Tanner, Program Development Coordinator

FROM: Emily Jennings (Lic. MN)

DATE: December 19, 2024

RE: Wilkinson Lake Field Investigations
SEH No. RAMSE 180686 14.00

SEH performed field investigations for a potential meander project on the south side of Wilkinson Lake including a survey of water levels within the stream area and geotechnical evaluation. The field data is intended to provide further information on the constructability of the potential meander. The overall project is being led by the Vadnais Lake Area Water Management Organization (VLAWMO) however Ramsey County SWCD funded the field investigations described herein. For more information on the project background, refer to the Task Order No. 2023-02: Wilkinson Meander Concept Analysis Memo dated May 20, 2024.

Survey Collection

On November 8, 2024, SEH survey staff collected survey data of the existing stream channel and the Wilkinson Lake outlet. Figure 1 shows the ground and water elevations collected. The lowest outlet weir elevation was recorded at 894.56 so we assume that this elevation is approximately the normal water level of the lake. During the time data was collected, the water elevation near the outlet was recorded at 895.30. This is not surprising to assume the lake level remains high following several months of wet and rainy conditions.

The collected data shows that the existing stream channel from the outfall north of private drive to the boardwalk (approximately 1,290 feet long) is quite flat, ranging in elevation at the thalweg from 895.0 to 892.1 (channel slope of 0.2%). The elevations taken at the outfall confirm the observation that there is some minor erosion occurring at the outfall location. Additionally, the cross-sectional information collected also suggests that the stream may be incised. The water surface elevations throughout the stream were similar (water elevation slope <0.1%) during the survey collection, with stream depth varying from approximately 1-2 feet, deepening as it approaches the boardwalk. The collected data suggests that the ditch equalizes with the anticipated lake normal water level approximately 200 feet north of the outfall. It is reasonable to assume that this elevation spreads out further north, similar to the pattern of the LiDAR contours. The approximated lake level elevation contour is shown in Figure 1.

Geotechnical Evaluation

The geotechnical site observations and considerations are summarized in the attached preliminary geotechnical memo.

Constructability and Final Recommendations

As indicated in the geotechnical considerations memo, high groundwater and soft terrain is expected in the potential meander area. Specialized equipment may be necessary to complete construction. However, weather conditions may play a significant role in the success of means and methods. Due to the uncertainty of the constructability within the wet areas, it is suggested that the any construction near the boardwalk or other inundated areas be avoided.

The recommended alignment for a potential meander is one similar to the main option as shown in the concept alignment noted as a “third” option (Figure 4 in Wilkinson Meander Concept Analysis Memo modified for this memo and attached). The oxbow remains optional while the add alternate is not recommended.

This configuration, coupled with data collected in the field, would result in the following:

- A reduction in proposed meander length from 2,400-2,600 feet to approximately 1,300 feet
- A reduction in estimated pollutant removals

Reducing the meander length to just the upstream segment removes a large portion of the floodplain available to the system. However, the expected normal water level of the lake area appears to be much further south than anticipated, resulting in less floodplain area than initially thought. Pollutant removal estimates were initially based on the connection to this floodplain using a weighted average flow available to the floodplain (more flow = more pollutant loading available for removal). Due to the decrease in floodplain area and suspected flow path of water within the floodplain relative to the revised meander configuration, our qualitative assessment based on engineering judgement is that there is now reduced flow available to the floodplain (less flow = less pollutant removal). Revised estimates following the methodology described within the Wilkinson Meander Concept Analysis Memo and aforementioned engineering judgement are a removal of 53 pounds of Total Phosphorus (TP) and 7.8 tons of Total Suspended Solids (TSS) annually. The recommendation for sampling and monitoring to better refine these removals and removal potential in the future remains.

It is also recommended that VLAWMO speak with contractors and operators of specialized equipment used in wetland construction for their expertise on the challenges and opportunities within the project area.

EKJ

Attachments
Preliminary Geotechnical Memo
Figure 1 – Wilkinson Lake Field Investigation
Figure 4B – Meander Option 3 (Figure 4 in Wilkinson Meander Concept Analysis Memo modified for this memo)

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MEMORANDUM

TO: Ann White Eagle, Ramsey County SWCD Director
Phil Belfiori, Administrator
Dawn Tanner, Program Development Coordinator

FROM: Brett W. Larsen, PE (Lic.MN)

DATE: December 6, 2024

RE: Wilkinson Lake - Preliminary Geotechnical Considerations
SEH No. RAMSE 180686 14.00

This memo is intended to provide a summary of the Wilkinson Lake geotechnical site observations and hand auger probes and to provide considerations for construction of the proposed stream meander project through the existing wetland.

BACKGROUND

Wilkinson Lake is a shallow body of water, with an average depth of 2 feet and surface area of approximately 90 acres. It is surrounded by wetlands. A stream which flows from south to north through the southernmost wetland complex before entering Wilkinson Lake is being considered for a potential meander.

SEH previously provided feasibility recommendations for restoration of the stream through the wetland to improve channel geomorphology, habitat, and water quality. Refer to SEH Memo for Task Order No. 2023-02 Wilkinson Meander Concept Analysis dated June 25, 2024, for additional discussion of the proposed meander concept and figures which illustrate alignment of the proposed meander.

WETLAND OBSERVATIONS OF SUBSURFACE CONDITIONS

Based on review of geologic maps, the wetland complex, through which the proposed stream meander will extend, is anticipated to consist of Seeleyville muck which is typically characterized poorly drained peat and organic soils. A Preliminary Geotechnical Investigation of the accessible areas in vicinity of the proposed meander was recommended as part of the next steps from the previous SEH memo. Due to wet and soft conditions anticipated, hand equipment was proposed to collect subsurface information within the wetland near the proposed meander alignment. The hand auger consisted of a 4-inch diameter bucket-type auger.

On September 9, 2024, SEH staff visited the site to attempt site exploration of the wetland. At that time standing water was observed just off the edge of the access road. Since this was notably higher than it had been observed during other periods of observation, a decision was made to delay field exploration.

Following weeks of warm and dry weather with minimal rainfall, SEH staff returned to the site on October 18, 2024. Generally, standing water levels had receded from areas observed during the September site visit but the proposed project area remained saturated, as shown in Figure 1.

Figure 1. Wet conditions observed during October 18, 2024, Visit

Four (4) hand auger borings (HAB's) were performed within the wetland as shown in locations in Figure 2.

Figure 2. Hand auger locations performed on October 18, 2024

It should be noted that hand auger borings could not be completed along the entire proposed meander due to site access, standing water, and soft ground. Locations were selected based on accessibility and proximity to the proposed alignment. Our HAB's were completed in the south portion of the meander in the general location of Options 2 and 3. The HAB's were advanced in intervals of approximately 5 inches to discretely sample and observe soil conditions as shown in Figure 3. Hand augers were desired to maximum depth of 4 feet but due to the high groundwater and soft soils, the holes were prone to collapsing. Hand augers were terminated at depths ranging from about 2 ½ to 3 feet.

Figure 3. Hand auger advancement for sampling of wetland soils

The conditions observed at each of the hand auger locations were similar. Surficial root zone overlying decomposed (sapric) peat. Sapric peat is the most decomposed where plant structure is no longer visible, and it contains little to no intact plant fiber. Table 1 summarizes the depths and observations of soils from the hand auger holes.

Table 1. Summary of Subsurface Condition Observations from Hand Augers

Hand Auger Location	Surficial Root Zone Thickness (in)	Depth[1] of Water (in)	Depth[1] of Termination of Hand Auger (in)	Description of Material underlying root zone
HA1	11	7	29	Black to dark brown, sapric peat
HA2	10	0	30	Black to dark brown, sapric peat
HA3	5	6	30	Black to dark brown, sapric peat
HA4	9	9	39	Black to dark brown, sapric peat
1. Depth as measured below existing ground surface at the time the hand auger was performed.				

WETLAND CONSTRUCTION CONSIDERATIONS

The site exploration confirms presence of significant peat deposits in area of the proposed stream meander which extend to depths greater than proposed for excavation of the channel. The presence of deep peat deposits presents constructability and design challenges for the project. Peat is characterized as having low shear strength (in this case ability to support construction equipment and to resist scour), high compressibility, and high water content.

Construction of the proposed stream meander will primarily involve excavating the existing surficial root zone and portions of underlying peat to develop a new channel. The new channel is expected to extend approximately 2 feet below the existing ground surface. Based on observations at the site, this will require complete removal of the existing root mat and extend below groundwater depending on the time of year the excavations are performed.

The existing root mat once removed will expose soft saturated peat which will be highly susceptible to disturbance under construction traffic and provide minimal support to construction equipment or laborers. Any construction in the wetland will require construction matting to support the weight of construction equipment. Usage of low ground contact (tracked) construction equipment is also recommended. Since even installation and movement of matting may be prohibitive usage of amphibious excavators could be considered. These excavators are equipped with specialized undercarriage which includes floatation ballast and hydraulic systems to operate in soft terrain.

Material which is excavated from the new channel alignment will need to be removed and relocated in upland areas to reduce disturbance to the wetland. To reduce geotechnical instability, the meander banks should be constructed no steeper than 10H:1V. Initial excavation of the slopes is anticipated to be challenging due to saturation and high groundwater level within the wetland. It is recommended that the meander be constructed in the dry. Strong consideration should be made to restrict work within wetland to periods of drought or during winter when water levels are anticipated to be lowest, and the ground is frozen. If construction proceeds during wet periods of the year and/or when the water level is high, contractors will need to be prepared to lower groundwater in localized areas of planned excavations.

The peat once exposed along the steam banks and where it remains as the meander bed substrate will be highly susceptible to scour and erosion. Once the channel is graded the banks should be covered as quickly as possible with seed and erosion control fabric. Where peat/muck remain in the meander bed, consideration should be given to the potential for increased sediment loading during bankflow discharge which may cause aggradation or degradation of the stream. Meander design should take this into account as changes to the stream that increase slope or water depth can increase shear stress, thus increasing erosion of the banks and bed.

bwl

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Top of Weir = 895.03

Top of Weir = 895.16

Top of Weir = 895.32

Top of Weir = 894.56
Lowest Weir Elevation

Approximate
Lake
Outlet
Configuration

Top of Weir = 895.10

Top of Weir = 895.35

Top of Weir = 895.09

Top of Weir = 895.18

Water Surface = 895.30

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Stream Thalweg = 892.10
Water Surface = 895.37

Stream Thalweg = 893.19
Water Surface = 895.50

Approx. HA1

Stream Thalweg = 893.36
Water Surface = 895.49

Stream Thalweg = 893.44
Water Surface = 895.68

Stream Thalweg = 894.07
Water Surface = 895.66

Approx. HA2
Water Observed
At Surface

Stream Thalweg = 893.71
Water Surface = 895.80

Stream Thalweg = 893.89
Water Surface = 895.80

Approx. HA3

Stream Thalweg = 894.64
Water Surface = 895.85

Approx. HA4

Approximate
Elevation Equal
to Lake Level

Stream Thalweg = 894.62
Water Surface = 895.79

Stream Thalweg = 895.03
Water Surface = 895.94

Stream Thalweg = 894.74
Water Surface = 896.49

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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SEH

N

0 25 50 100
Feet

Project: RAMSE 180686
Print Date: 12/17/2024

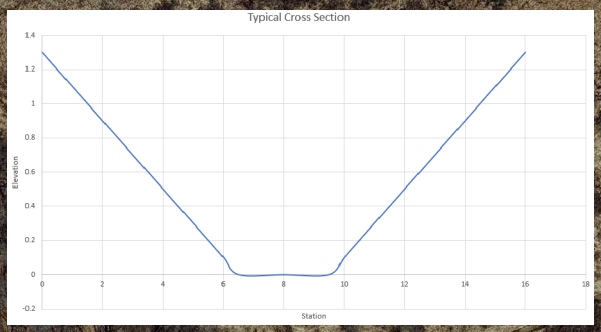
Map by: ejennings
Projection:
Source:

Wilkinson Lake Field Investigation

VLAWMO

Figure
1

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.



Approximate 895 Contour

Possible earlier termination of meander main option

Legend

- Add Alternate
- Main Option
- Main Option - Oxbow

0 100 200 400 Feet

N

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SEH

Project: VADLA 171749
Print Date: 5/17/2024

Map by: mchristenson
Projection: Ramsey County
Source: UMN, MnDNR

Meander Option 3

Wilkinson Meander Feasibility
North Oaks, MN

Figure 4B

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