

Technical Memorandum

To: Phil Belfiori and Dawn Tanner – Vadnais Lake Area Watershed Management Organization
From: Tyler Olsen and Erin Anderson Wenz – Barr Engineering Co.
Subject: Summary Memo for Wilkinson Lake 319 Water Quality Improvement Project
Date: April 14, 2022
Project: 23621418
c: Don Pereira, Lauren Grouws, Mark Houge – North Oaks Company

1 Project Background

Barr Engineering Co. (Barr) has drafted this memo for the Vadnais Lake Area Watershed Management Organization (VLAWMO) to provide a summary of work completed to-date on the Wilkinson Lake water quality improvement project. The purpose of the project is to design a water quality improvement project within the agricultural and conservation easement held by the Minnesota Land Trust (MLT) on North Oaks Company (NOC) property.

In March of 2021, Barr completed a feasibility study for three conceptual alternatives for the water quality project. These alternatives were presented to stakeholders including NOC, VLAWMO, MLT, and permitting agencies for review and informal comment. A summary memo of the conceptual alternatives is included as an attachment to this memo.

Following the development of these concepts, Barr completed additional investigative services to better inform the design of the project. These services included the development of temporary and permanent easements for construction and maintenance as well as geotechnical investigation (i.e. soil borings and laboratory analysis). The legal easements were recorded with Ramsey County in March of 2022. A summary of the geotechnical findings is included as an attachment to this memo and includes a description of the soils in the potential project location as well as the soil boring logs.

2 Recommendations

Based on the information gathered to-date for the Wilkinson Lake water quality project, Barr has compiled the following guidance for future design considerations. These considerations include design suggestions as well as recommendations for further investigation to complete prior to final design.

- The geotechnical data suggests that the deep-water wetland restoration with ponding areas should be situated as north as possible within the easement where there are fewer organic soils. Any proposed structural components should be located in or tied into upland areas with confirmed suitable soils to provide adequate stability. Additionally, this location will allow for improved maintenance access.

- A piezometer was installed in the project area as part of this scope. We suggest that VLAWMO monitor water levels within the piezometer throughout 2022 to better understand hydrology within the wetland/project area.
- Barr suggests VLAWMO conduct water quality monitoring within the agricultural ditch system in 2022 to characterize nutrient and sediment loading to Wilkinson Lake.
- A re-meander of the agricultural ditch through the wetland may be feasible based on the soil type and approximate slope of the existing ditch. However, the sinuosity of the meandering channel would be low for a typical wetland environment. Additionally, a meandering channel would provide little water quality benefit to downstream Wilkinson Lake. Consideration may be given for future phases of the Wilkinson subwatershed improvements to meander the agricultural ditch downstream of the North Oaks farm road.
- A full detailed site survey should be completed prior to final design to better inform grade changes and key elevations within the overall system.
- Barr suggests that wetland soil samples be collected to gage the potential for phosphorus leaching within the wetland after construction. Results from this analysis will indicate whether additional inundation of the wetland may export phosphorus.
- The future design should evaluate whether filtration media should be included to filter outflows from the project, especially if wetland soil samples indicate high potential for phosphorus leaching.
- Additional soil borings should be collected in remaining critical areas. Geotechnical modeling should be completed with all soil borings and lab results to determine the appropriate design needs for project components within the wetland.
- Detailed hydraulic, hydrologic and water quality modeling of the system should be completed to understand project performance for various types of storm events.

Attachments:

1. North Oaks and Wilkinson Lake Improvements Design Memo – March 30, 2021 – Barr Engineering Co.
2. Geotechnical Investigation Summary – April 12, 2022 – Barr Engineering Co.

Attachment 1: North Oaks and Wilkinson Lake Improvements Design Memo

North Oaks and Wilkinson Lake Improvements

1.0 Introduction

Barr Engineering Co. (Barr) has drafted this memo to provide a narrative for the conceptual design of several potential water quality improvement projects within the agricultural and conservation easements held by the Minnesota Land Trust (MLT) on North Oaks Company (NOC) property. The projects presented in this memo provide a range of possibilities for implementation through the Section 319 grant program. It should be noted that because the designs are in the conceptual stage, they are subject to change depending on future permitting, funding, stakeholder engagement, and final design considerations. Alternatives for Project 1 will be submitted for the spring 2021 Section 319 funding cycle, which will cover final design and construction.

2.0 Background

NOC hired Barr to create conceptual designs for stormwater management projects to be implemented on the company property, including its easements held through the MLT. The goal of the projects is to improve water quality in Wilkinson Lake (downstream of NOC property) by reducing loading of nutrients and sediment. Wilkinson Lake is listed by the Minnesota Pollution Control Agency (MPCA) as impaired for excess nutrients (phosphorus). The Vadnais Lakes Area Watershed Management Organization (VLAWMO) has completed a TMDL and several feasibility studies to identify ways to reduce phosphorus loading from the direct drainage area to Wilkinson Lake (Wilkinson subwatershed). Most recently, VLAWMO began working with the MPCA and Environmental Protection Agency (EPA) to secure Section 319 grant funding for projects that will help remove Wilkinson Lake from the MPCA's impaired waters list. In its planning process, VLAWMO identified NOC as a major partner in accomplishing this goal; its holdings are located at a critical point in the Wilkinson subwatershed where the majority of runoff from the subwatershed flows through an agricultural ditch system (see Photo 1) before entering Wilkinson Lake. Water quality monitoring (conducted by VLAWMO) shows that the runoff in these ditches has high total phosphorus (TP) concentrations and makes up a significant portion of the loading to Wilkinson Lake. However, the monitoring data also suggests that the high pollutant concentration in the ditch is driven by loading from areas east of Centerville Road in the Birch and Tamarack Lake subwatersheds.

Barr worked with NOC and VLAWMO to create conceptual designs that met several shared goals and would help remove Wilkinson from the impaired waters list. The focus of these efforts is on the agricultural ditch that runs through NOC property and within the MLT's agricultural and conservation easements. By treating poor water quality in the ditch before it enters Wilkinson Lake, we can maximize water quality improvement. Centralizing the treatment along the ditch also provides an opportunity to restore degraded areas in the easements and increase recreational use through added trails and interactive design features.



Photo 1: Existing agricultural ditches and surrounding wetland

The following sections summarize the proposed conceptual designs as of March 2021 and next steps in the process of design and securing 319 funding.

3.0 Proposed Conceptual Design

This section outlines the proposed concept design. Alternative configurations for the three project components are included in the sections below.

The focus area of this project is located in the upstream wetland in the agricultural easement. The project would be implemented between the future Red Forest Way and Gate Hill development. Currently, there are several agricultural ditches that intersect in this location and drain the surrounding wetlands. These ditches also convey flow from eastern subwatersheds (Tamarack and Birch Lakes) to Wilkinson Lake. Below are details for three alternative configurations for the upstream pond. These alternative configurations are also shown on Figures 1 through 3. It should be noted that the final design may not reflect these exact configurations but would be located within the red boxes outlined on the figures.

Project 1a (Figure 1): A pond would be excavated in upland area outside of the wetland boundary. The existing ditch would be realigned adjacent to the pond to allow flows above baseflow to spill into the pond and add a meandering aesthetic.

Project 1b (Figure 2): A smaller pre-treatment basin would be excavated in-line with the ditch to treat baseflow and small event flow. A high flow bypass would be constructed to the west of the basin to reduce the impact of high flows in the basin (scour, sediment resuspension, etc.). The pre-treatment basin would discharge into an excavated wetland basin with a meandering flow path to add improved wetland habitat and a meandering aesthetic.

Project 1c (Figure 3): A large pond would be excavated in-line with the ditch to treat baseflow and small event flow. The pond excavation would remove existing agricultural ditches to improve

aesthetics in the area. A high flow bypass would be constructed to the west of the basin to reduce the impact of high flows in the basin (scour, sediment resuspension, etc.).

For Options 2 and 3, the proposed basin would be constructed in the wetland. Several agencies will likely require permitting prior to construction of these options, including the United States Army Corps of Engineers (USACE) and the Board of Water and Soil Resources (BWSR) under the Wetland Conservation Act (WCA). Regulated activities in the wetland may include filling (grading above existing wetland bottom), excavation, and functional change. Wetland mitigation (replacement, banking/credits purchase) may be needed depending on the functional assessment of the existing wetland area and the extent of impact determined by the regulatory agencies.

Below in Table 1 is a summary of pros, cons, and unknowns for the proposed upstream pond configurations. The unknowns will be investigated and resolved prior to final design. The shape and placement of the basins shown on Figures 1

Table 1. Pros and cons for upstream pond alternatives

Project Component	Pros	Cons	Unknowns
Project 1a: Upland Pond	<ul style="list-style-type: none"> Minimal work within the wetland 	<ul style="list-style-type: none"> High excavation costs Smaller water quality treatment (off-line basin) Need to establish maintenance access. More frequent maintenance relative to Project 1c 	<ul style="list-style-type: none"> Flow regime in the ditch for hydraulic design
Project 1b: Pre-treatment Basin and Wetland with Meander	<ul style="list-style-type: none"> Moderate water quality treatment Habitat creation Lower excavation costs 	<ul style="list-style-type: none"> Work within wetland Need to establish maintenance access More frequent maintenance relative to Project 1c 	<ul style="list-style-type: none"> Potentially complex wetland permitting Wetland soil types (i.e., deep peat layer may cause constructability issues) Existing wetland function (may impact complexity of permitting) Flow regime in the agricultural ditch (impacts hydraulic design)
Project 1c: In-line Pond	<ul style="list-style-type: none"> Significant water quality treatment Habitat creation Lower excavation costs 	<ul style="list-style-type: none"> Work within wetland Need to establish maintenance access 	<ul style="list-style-type: none"> Potentially complex wetland permitting Wetland soil types (i.e., deep peat layer may cause constructability issues) Existing wetland function (may impact complexity of permitting) Flow regime in the agricultural ditch (impacts hydraulic design)

4.0 Next Steps

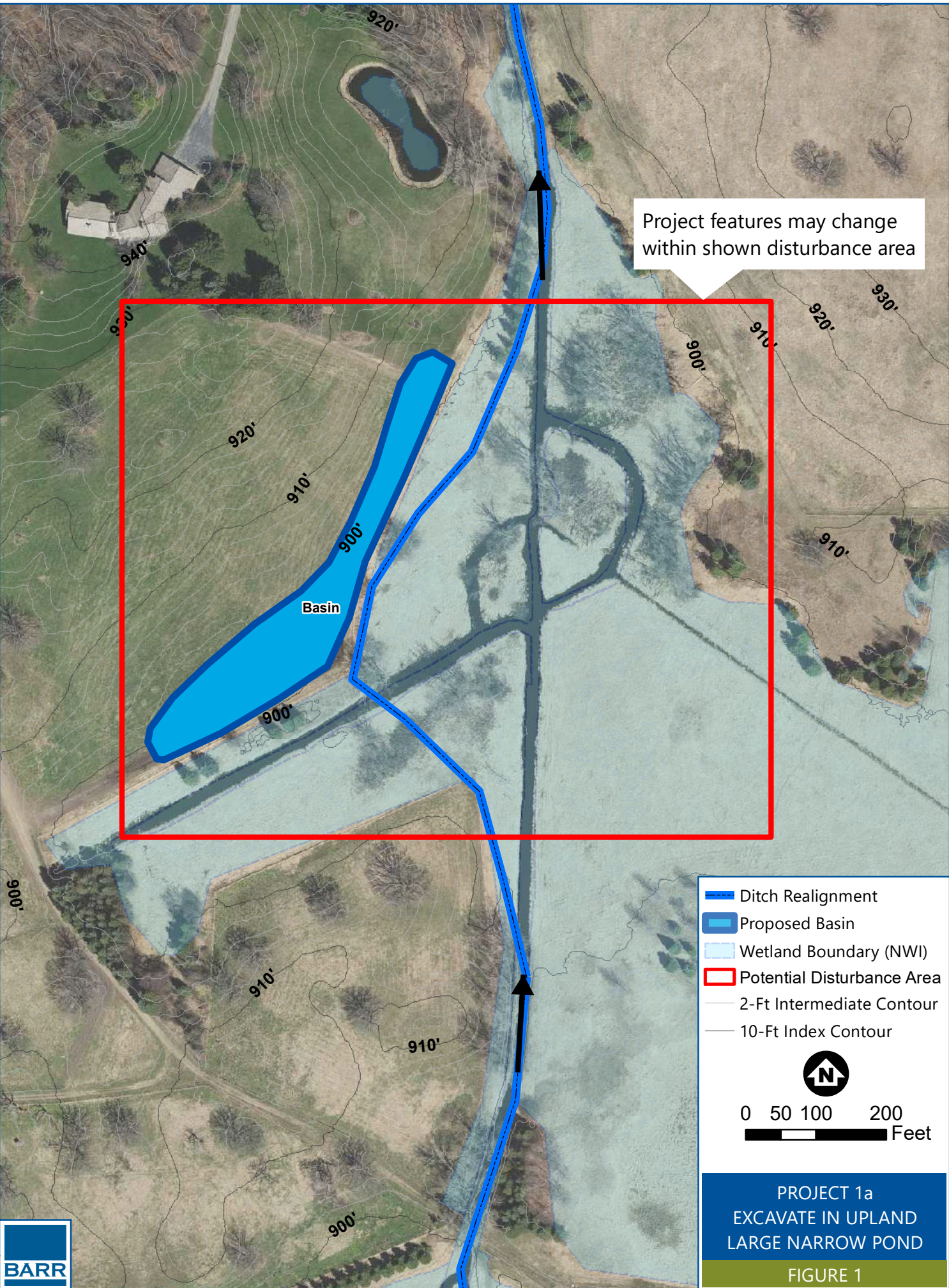
VLAWMO is in the process of securing Section 319 grant funding for the Wilkinson Lake subwatershed. The district was selected as a priority watershed to receive grant funding over the next 16 years. The first grant cycle will open late spring 2021, and subsequent cycles will open every four years following (2025, 2029, and 2033). Each grant cycle will have approximately \$540,000 in total grant funding available (for engineering, plans, specifications, and construction), with a required 40% local match.

In discussions with VLAWMO staff, the projects located on NOC property will be eligible for funding in any of the grant cycles. If funding is secured in 2021, design and construction of this project will most likely take place in 2022, based on the timeline of the distribution of funds. The activities outlined under each phase below are subject to change.

Prior to applying for funding in the spring 2021, the following activities will be accomplished:

- High-level pollutant-removal estimates
- Conceptual-level cost estimating
- Preparation of funding application
- Coordination with all stakeholders (NOC, VLAWMO, MLT, Saint Paul Regional Water Services)

The designs, pollutant-removal estimates, cost estimates, and approximate schedule will be shared with the VLAWMO board in April 2021 for approval. The RFP for the first round of funding will be announced in April 2021 and will remain open for 60 days, closing in June 2021.



Project features may change within shown disturbance area

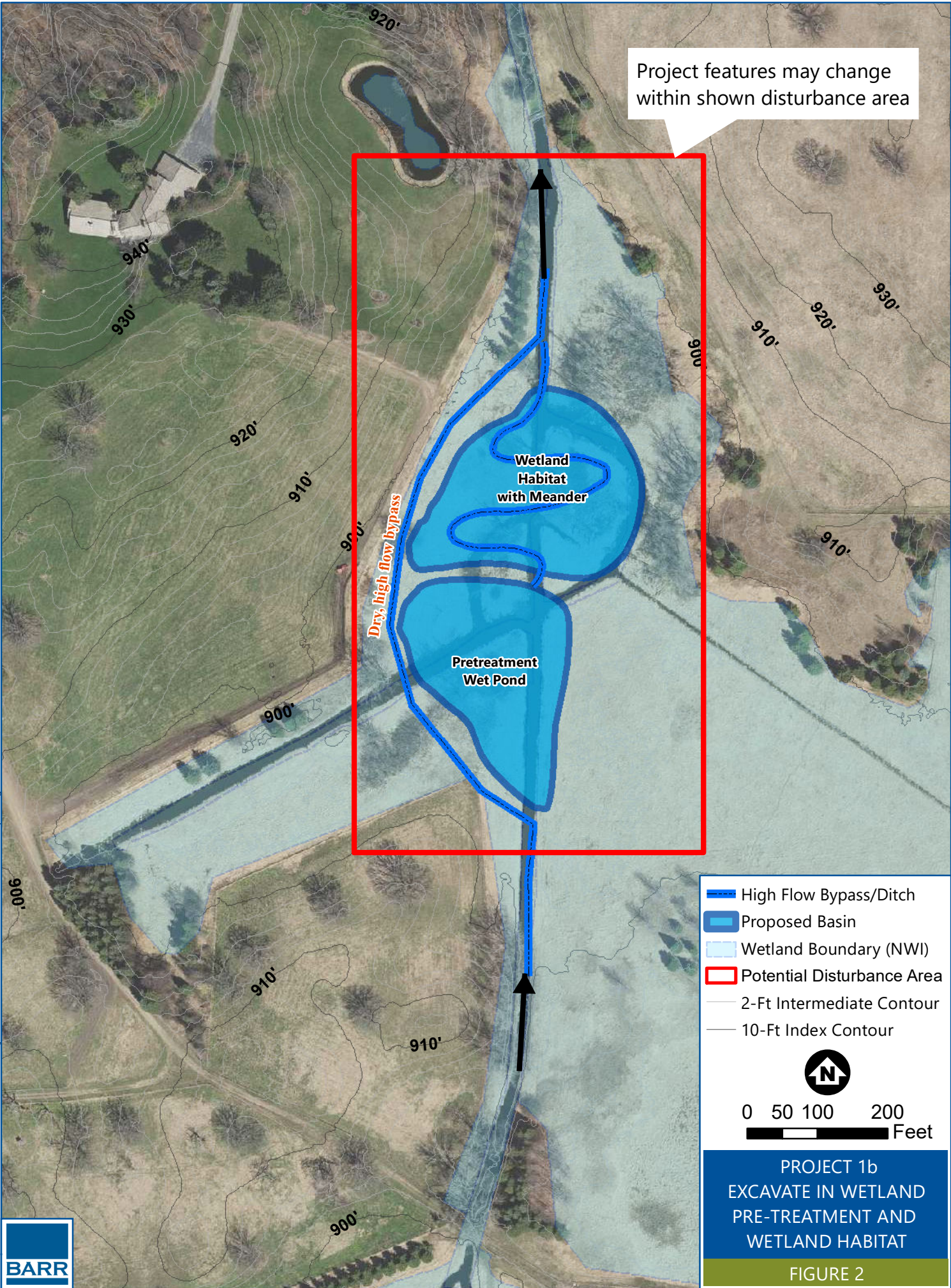
- Ditch Realignment
- Proposed Basin
- Wetland Boundary (NW1)
- Potential Disturbance Area
- 2-Ft Intermediate Contour
- 10-Ft Index Contour

N

0 50 100 200 Feet

PROJECT 1a
EXCAVATE IN UPLAND
LARGE NARROW POND
FIGURE 1

Project features may change within shown disturbance area



- High Flow Bypass/Ditch
- Proposed Basin
- Wetland Boundary (NWI)
- Potential Disturbance Area
- 2-Ft Intermediate Contour
- 10-Ft Index Contour

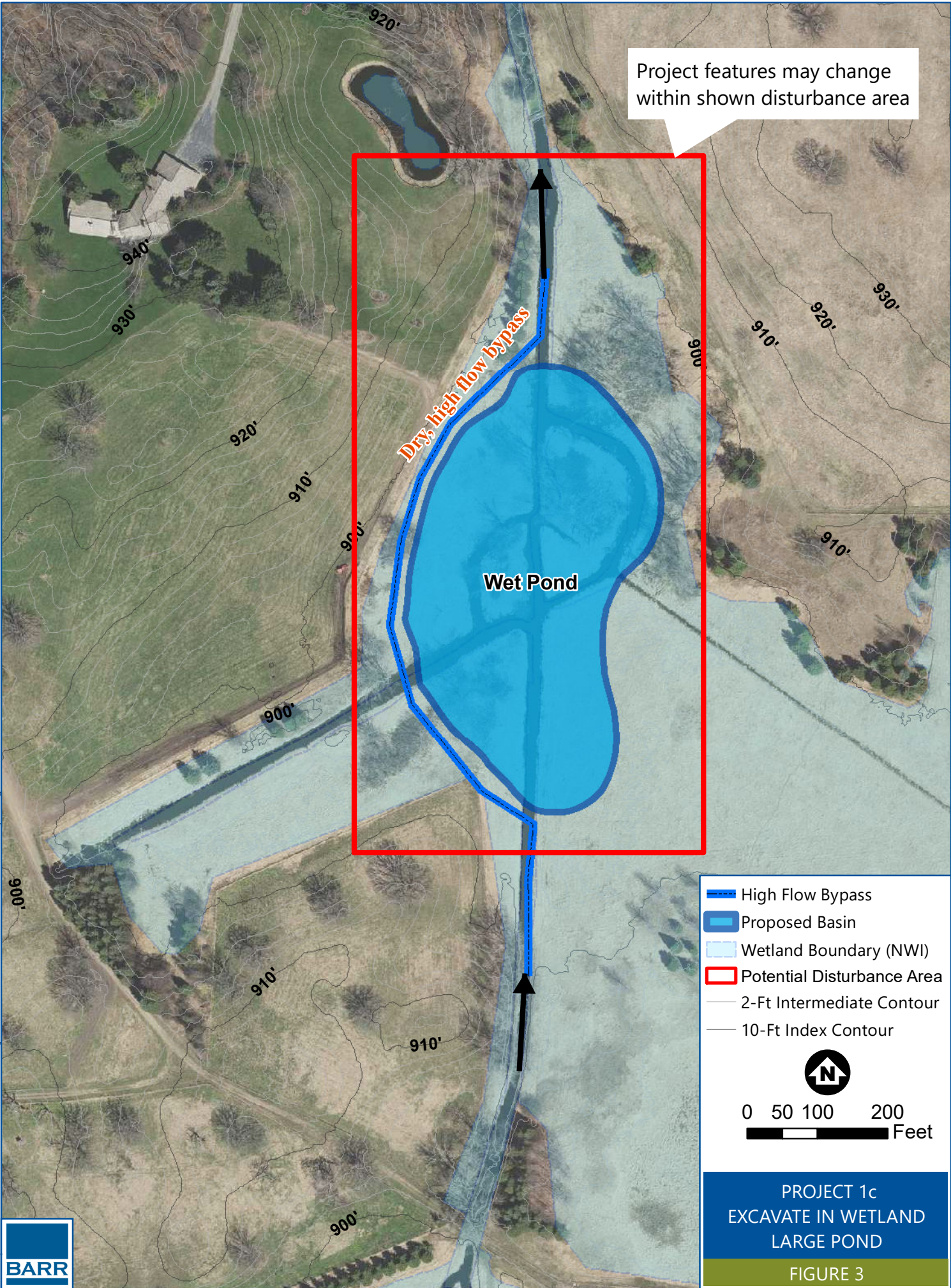


0 50 100 200 Feet

PROJECT 1b
EXCAVATE IN WETLAND
PRE-TREATMENT AND
WETLAND HABITAT

FIGURE 2

Project features may change within shown disturbance area



Dry, high flow bypass

Wet Pond

- High Flow Bypass
- Proposed Basin
- Wetland Boundary (NWI)
- Potential Disturbance Area
- 2-Ft Intermediate Contour
- 10-Ft Index Contour



0 50 100 200 Feet

PROJECT 1c
EXCAVATE IN WETLAND
LARGE POND

FIGURE 3



Barr Footer: ArcGIS 10.7.1, 2021-03-23 15:12 File: I:\Projects\23\62\1373\Users\TAO2\NorthOaks_ConceptDesign_Phase1.mxd User: tao2

Attachment 2: Geotechnical Investigation Summary