Lake Ridge Estates Stormwater Retrofit Feasibility Study

Stantec Consulting Services Inc.

Stantec

Prepared for:
Prior Lake-Spring Lake Watershed District
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Project/File:
227707416

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Revision Schedule

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
1	First Draft	T. Beneke	6/2/25	J. Wochenske	6/2/25	Nick Wyers	6/2/25
2	Second Draft	T. Beneke	6/5/25	J. Wochenske	6/5/25	Nick Wyers	6/5/25
3	Final Draft	T. Beneke	6/9/25	J. Wochenske	6/9/25	Nick Wyers	6/9/25

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Approved by: ______________________________

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Executive Summary

The Lake Ridge Estates subwatershed was identified as a potential opportunity for water quality treatment as part of the Fish Lake Management Plan. The Plan proposed that a feasibility study be conducted to better refine sediment and phosphorus delivery from this area of the greater Fish Lake watershed to evaluate the potential for improved water quality treatment through retrofits of the four pre-existing stormwater ponds. Stantec was originally contracted to provide multiple options for conceptual designs of pond retrofits, and then refine design details, estimated costs, and expected pollutant removals for a single option for each pond based on directive from Prior Lake-Spring Lake Watershed District. However, during the conceptual design stage it was learned that the magnitude of pollutant loading from this subwatershed was substantially less than originally thought and that there are likely far more cost-effective options for water quality treatment elsewhere in the Fish Lake watershed. Therefore, Prior Lake-Spring Lake Watershed District, Spring Lake Township, and Stantec agreed that verification of the Fish Lake watershed boundary was a more effective use of project funding than refining the suite of conceptual design options. Stantec verified that the Lake Ridge Estates subwatershed is approximately 58% smaller than originally thought due to the absence of hydrologic connectivity east of Lake Ridge Drive, which significantly reduces expected pollutant loading from the subwatershed to Fish Lake. The estimated total phosphorus loading from the subwatershed is approximately 7 lbs/year, compared with the total watershed reduction target of 103 lbs/year in the Fish Lake Management Plan. Although retrofit treatment opportunities in the Lake Ridge Estates subwatershed are not likely to have substantial impacts on Fish Lake water quality goals, two of the four ponds may be opportunities for each reducing total phosphorus loading to Fish Lake by greater than 1 lbs/year. Should the Spring Lake Township pursue a pond dredging, adding on a water quality retrofit element (ie. filter, outlet) may be a worthwhile partnership opportunity with the District.

1 Introduction

Below is a summary of conceptual stormwater pond retrofit designs that Stantec developed for the Lake Ridge Estates Stormwater Retrofit Feasibility Study. This memo is being submitted in conjunction with results from the sediment survey.

The original scope of work assumed that Stantec would develop retrofit concepts for all four stormwater ponds in the Lake Ridge Estates watershed and then refine the design of a single retrofit option for each pond as identified by Prior Lake-Spring Lake Watershed District (PLSLWD). However, the conceptual design stage of the project found that the Lake Ridge Estates contributing area is 58% smaller than originally estimated, as the eastern portion of the original watershed boundary does not contribute. The smaller contributing area to these ponds reduces the overall pollutant loading estimates from this area, relative to what had been estimated previously. Therefore, any potential water quality benefits from pond retrofits are reduced from what was anticipated at the outset of the project.

The reduced watershed size in modeling revealed low water quality benefits for retrofits options, and in turn led to a change in scope, where Stantec did not advance retrofit design further and conducted a field visit to verify hydrologic connectivity in the watershed and confirm drainage not only in the Lake Ridge Estates subwatershed but also the entire contributing area to Fish Lake.

2 Project Background

2.1 Engagement

The project periodically engaged both the PLSLWD board and the Spring Lake Township board, and landowners were engaged periodically via direct invitations to board meetings and consultations on private property access for pond surveying.

The PLSLWD board and Spring Lake Township board were both briefed on initial project findings on March 18, 2025, and April 10, 2025, respectively. These briefings resulted in the change of scope, where Stantec did not refine a retrofit option for each pond and instead confirmed the Fish Lake watershed boundary and hydrologic connectivity.

One outcome of early landowner discussions was a shift in what is referred to as "Pond 4" in this report, as the original Pond 4 of interest was not built, and the Pond 4 referred to in the remainder of this report was previously not known about. The map included in Appendix B shows the initial location of where Pond 4 was thought to be located (orange) and the location of the Pond 4 summarized in the remainder of this report (blue).

2.2 Retrofit Types Selected for Analysis

The following alternatives were selected by Stantec for evaluation within this study based on review of the opportunities and limitations within the project areas, which include dredging, filter bench installation, outlet modifications, and pond expansion. The alternatives were applied to each pond within the study area and modeled using a combination of PCSWMM, P8, and estimated pollutant treatment efficiencies from the MN Stormwater Manual. The value of each retrofit option was evaluated primarily based on (1) additional water quality treatment for total phosphorus (TP) and total suspended sediment (TSS) but also was informed by (2) the estimated benefits to flooding resiliency.

Initially, additional options were evaluated that either would actively alter the pond volume, allowing for increased water quality treatment volume, or would require the installation of a manufactured filtration device. These options include smart outlets, active/predictive pumping, irrigation use, and proprietary filter devices. However, the initial capital cost, operation and maintenance cost, and utility requirements evaluated against the potential water quality treatment benefits do not make these cost effective options. For example, a typical smart outlet for a single pond would likely cost ~$100,000-150,000 for initial installation, with an additional service fee of ~$12,000 per year, based on recent installation quotes for other projects Stantec is supporting. A smart outlet would require a dedicated power source and optimally cellular connectivity, adding to the total cost estimate. These costs are not tenable given the low magnitude of the estimated pollutant delivery to these ponds. The installation and operating costs of other proprietary devices explored were also deemed not cost-effective given the limited opportunity for water quality treatment weighed against estimated costs. In summary, four retrofits were found to be worthy of consideration: dredging, filter bench installation, outlet modifications, and pond expansion.

2.2.1 Pond Expansion

Pond expansion refers to increasing the surface area of the pond, which differs from dredging in that the perimeter of the pond and surface dimensions are increased. Dredging simply refers to vertical excavation of material while maintaining the same surface area and dimensions. Pond expansion increases the water quality treatment capacity as well as improves flood mitigation, and both benefits are a product of increasing pond volume.

2.2.2 Dredging

The dead pool volume of ponds, or the volume of water that is in the pond at the normal water elevation, impacts the residence time and subsequently, the settling of particulates within the water column. Dredging, or physically removing sediments from ponds, increases that dead pool volume. Pond dredging is considered routine maintenance that is expected to occur every 25 years or when the ponding depth is 50% full. This maintenance timeline depends on the contributing drainage area and the sediment depths in the pond. Dredging to increase the dead pool volume was largely limited to the current footprint of each pond due to land rights restrictions. There were some cases with opportunity to combine dredging with expansion of pond footprint as elevation contours and existing property use allowed. The cost estimates provided in this memo were based on lab analysis results summarized in the March 3, 2025 memo, *Sediment Survey – Lake Ridge Estates Stormwater Retrofit Feasibility*.

2.2.3 Filter Bench

Gravity sand filter benches, or simply filter benches, utilize vertical depth capacity (head) available in ponds between the normal water level and the overflow outlet (live storage) to filter water through a filter media along a portion of a pond’s perimeter, before discharging filtered water downgradient. Filter benches can be active or passive, utilizing pumps or gravity, which drives cost and the quantity of water that can be treated. Gravity systems rely on rainfall events to pass water through filters, while active systems regularly direct water through filters regardless of precipitation patterns. Ponds 1 and 4 have sufficient head difference available to make a gravity filter bench a feasible option. Water quality treatment capacity of a filter bench is driven by the surface area of a filter; therefore, encroachment of the filter bench footprint into the existing pond surface area was considered, as there are trade-offs between reductions in pond surface area and increases in filter bench surface area. Meaning, filter bench areas were optimized given land use constraints and estimated pollutant removals within the ponds.

Iron-enhanced sand filter benches, which bind dissolved phosphorus, may be an additional opportunity. However, in the absence of monitoring data for these ponds Stantec does not recommend iron-enhanced sand filter media currently. Prescribing iron-enhanced sand filter media should be informed by phosphorus sample concentrations that demonstrate significant properties of dissolved phosphorus.

2.2.4 Outlet Modifications

The outlet control structure of a pond controls the normal water level and spillway elevations of the basin. It was decided that outlet modifications would be considered as an alternative for this study and would be considered as a component of other evaluated options including the filter benches and pond expansion. Outlet modifications include installation of pipes or outlet control structures to control water elevations, modifying existing outlet control structures by raising or lowering pond walls, or installing an orifice in the weir wall.

2.3 Opportunity Identification

Stantec developed a summary of potential retrofit options based on for the four existing ponds/depressions in the Lake Ridge Estates subwatershed. Pond locations are illustrated in Appendix B. General descriptions of the retrofit types are summarized below, with Stantec’s assessment of the feasibility of each retrofit type across all four ponds.

3 Existing Conditions

3.1 Watershed Boundary Survey

The initial watershed boundary shapefile provided by PLSLWD estimated the Lake Ridge Estates contributing area to be approximately 137 acres, with a significant portion of cultivated cropland along the eastern boundary to the south of 200th St. E and west of Panama Ave. However, initial evaluation of LiDAR-based elevations suggested that a large part of the area, 80 acres, does not contribute to Fish Lake and drains internally or to the watershed to the east. To confirm this change in contributing area Stantec staff evaluated hydrologic connectivity in the Lake Ridge Estates subwatershed during a field visit. Stantec also evaluated connectivity for the remainder of the broader Fish Lake watershed, as LiDAR-based evaluations presented questions about connectivity elsewhere, particularly in the southwest region (near the intersection of Malibu Ave. and 210th St. E.) and the Norwest region (near the intersection of Fairlawn Ave. and 200th St. E.).

While the field visit was limited to publicly accessible roadways and visual observation, Stantec is confident that the area denoted in red in Figure 1 below does not contribute to Fish Lake and therefore does not drain to any of the four stormwater ponds evaluated in this project. Stantec staff could not locate a culvert connecting the north and south sides of 200th St. E. near the intersection of Fairlawn Ave. However, PLSLWD staff reported that a culvert was identified on a previous site visit, and Stantec was able to visually identify water routing through the culvert in a 2010 aerial image from the Scott County GIS webpage (https://gis.co.scott.mn.us/sg3/). Stantec also confirmed connectivity in the low-lying area in the southwest portion of the watershed, north and south of 210th St E, just east of Malibu Ave. However, while there is connectivity, field observations indicate that there is substantial storage capacity in this area, and that water may only be routed across 210th St E, to the north, under large flow events. Therefore, the only changes to the Fish Lake watershed boundary were to the Lake Ridge Estates subwatershed.

The 80 acre area, east of the Lake Ridge Estates, that was removed from the Fish Lake watershed is comprised of a mix of low density residential, agricultural, and open water. Approximately 19 acres is agricultural, 1.7 acre is open water, and the remaining 59.3 acres is low density residential. Using literature values from the Wisconsin Lake Modeling Suite (WiLMs) model guidance Stantec estimates that the TP load attributed to this area would be approximately 22.5 lbs/year. This TP load does not drain to Fish Lake, and instead drains to the east of the Fish Lake subwatershed.

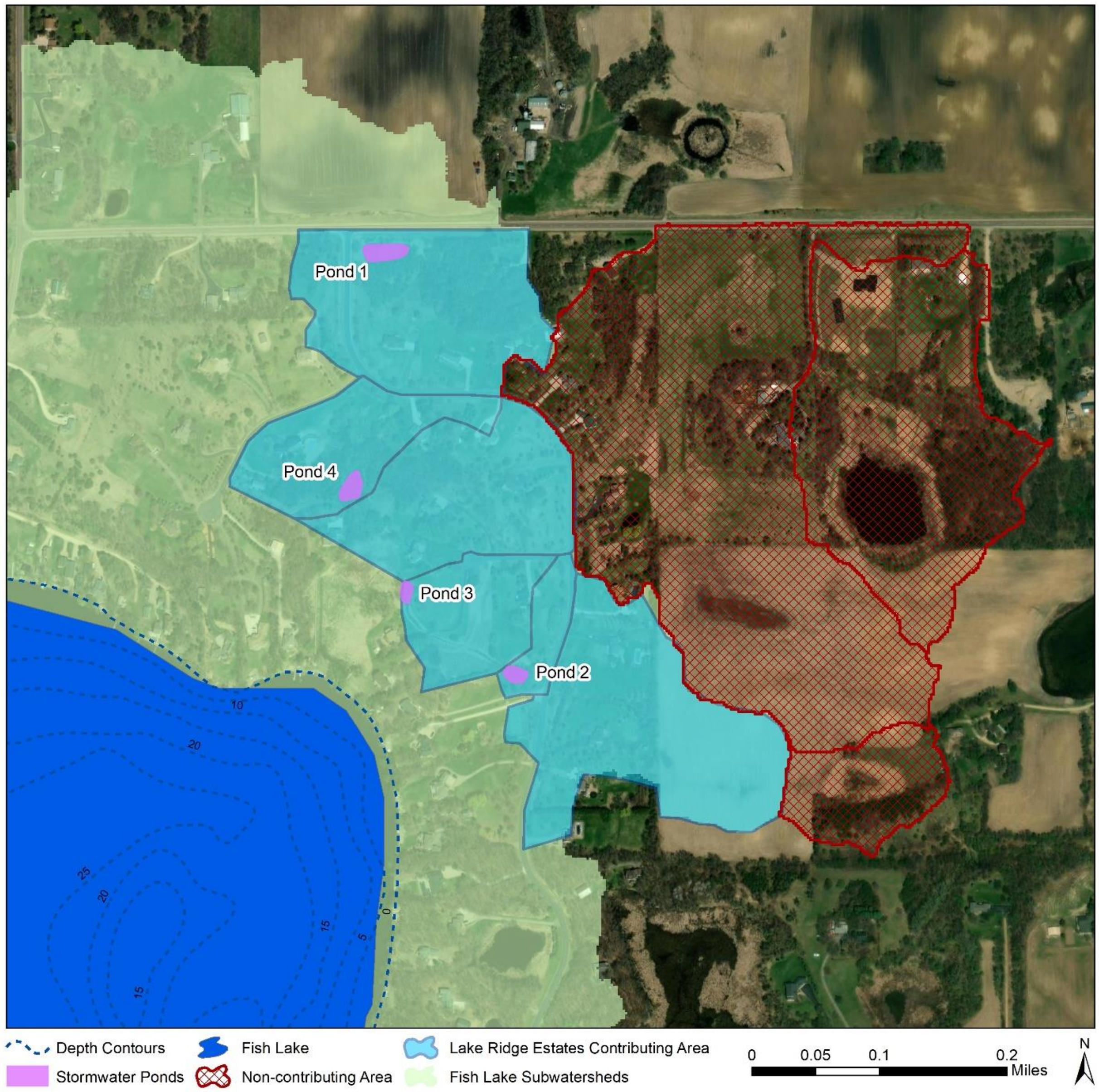


Figure 1. Map of the Lake Ridge Estates contributing area, the Fish Lake watershed boundary, and areas identified as non-contributing based on field observations and LiDAR evaluation.

3.2 Watershed Loading

The P8 model, which simulates pollutant removals, estimated TP and TSS inflows to each pond relative to previous total watershed loading estimates to Fish Lake. Using total watershed contributions estimated in the Fish Lake Management Plan[1] for comparison, these estimated loads are relatively small. The Lake Ridge Estates subwatershed is currently contributing an estimated 7 lbs/year out of the 343 lbs/year estimated watershed load in the Fish Lake Management Plan. If all alternatives were implemented, less than 3 lbs/year of additional TP would be removed from the watershed load, compared to the watershed reduction goal of 103 lbs.

The estimated TP loads from the Lake Ridges Estates subwatershed are a product of (1) the small size of the contributing area to each watershed and (2) the composition of land use/soils/impervious cover. The contributing area to each pond, the estimate average annual watershed TP load delivered to each pond, and the estimated removals under existing conditions are summarized in Table 1.

Table 1. Summary of existing conditions for the Lake Ridge Estates ponds.

Name	Contributing Area (acres)	TP (lbs/year)		Removal (%)
		Inflow[2]	Removal	
Pond 1	14.7	1.9	0.8	40%
Pond 2	17.9	3.3	0.5	16%
Pond 3	5.7	3.6	0.4	11%
Pond 4	7.4	1.0	0.3	30%

As a validation step of watershed loading estimated by P8, model estimates were cross-checked against vetted literature values. The P8 model estimates an areal mass loading rate of 0.16 lbs/acre/year of TP from the watershed. The Wisconsin Lake Modeling Suite (WiLMs) model guidance was used for comparison, which estimates that low density urban land use “most likely” yields 0.09 lbs/acre/year of TP, with a range of 0.05 to 0.23 lbs/acre/year. Therefore, the model simulation of the watershed TP loading is likely accurate.

[1] Fish Lake Management Plan. December 7, 2023. Prepared by Emmons and Olivier Resources, Inc. (EOR). Prepared for the Prior Lake-Spring Lake Watershed District.

[2] Inflow TP estimates to each pond area cumulative and account for estimated removals under existing conditions. Pond 2 drains to Pond 3, such that the inflow TP estimate at Pond 3 accounts for direct watershed loading to Pond 2, estimated TP removals in Pond 2, and additional watershed loading between Pond 2 and Pond 3.

4 Retrofit Costs and Benefits

Table 2, below, summarizes the applicable options for pond retrofits. Dredging and outlet modifications are feasible for all pond locations, but elevation and/or property boundaries constraints presented challenges for filter bench installation and pond expansion in some cases. The challenges related to site access and construction are reflected in the costs summarized in Table 3, including tree removal, site restoration, wetland avoidance, etc.

Table 2. Summary of modification options to the four pond locations in the Lake Ridge Estates subwatershed.

Pond Name	Dredging	Filter Bench	Pond Expansion	Outlet Modification
Pond 1	X	X		X
Pond 2	X		X	X
Pond 3	X		X	X
Pond 4	X	X		X

Table 3, below, summarizes the estimated cost of each conceptual design, and the anticipated total phosphorus (TP) and total suspended sediment (TSS) removals for each design. The pollutant removals are represented as additional removals relative to what is being treated under current conditions. Cost estimates were based on evaluating 2024 costs of similar efforts and estimating cost increases for 2025. A more detailed suitability assessment that includes a comprehensive evaluation of all pond considerations evaluated is attached in Appendix A.

Table 3. Summary of retrofit costs and WQ benefits. Total cost reflects engineering, labor, materials, and costs.

Pond ID	Retrofit Description	Increase Footprint of Normal Water Level	Estimated Total Cost ($)	Additional TP Removal (lbs/yr)	Additional TSS Removal (lbs/yr)
Pond 1	Dredging		$77,000	0.01	2
	Outlet Modification	X	$35,000	0.06	14
	Dredging & Outlet Modification	X	$85,000	0.08	20
	Dredging, Outlet Modification & Filter Bench	X	$103,000	1.08	533
Pond 2	Dredging		$81,000	0.14	26
	Dredging and Pond Expansion	X	$90,000	0.18	39
	Dredging, Pond Expansion, and Outlet Modification (Raised Outlet)	X	$117,000	0.39	92
	Dredging, Outlet Modification (Raised Outlet) and Greater Pond Volume Increase	X	$149,000	0.38	95
Pond 3	Dredging		$68,000	0.05	15
	Dredging & Pond Expansion	X	$86,000	0.15	45
Pond 4	Dredging		$93,000	0.20	67
	Dredging & Outlet Modification		$102,000	0.20	67
	Dredging, Outlet Modification, and Filter Bench		$120,000	1.3	618

Pollutant removals were estimated by leveraging hydraulics data from the PCSWMM H&H model for simulating the current and proposed scenarios in P8. In the absence of monitoring data to calibrate the P8 model the default pollutant settings were used. However, the hydrology of the model was calibrated by adjusting the daily hydrograph to H&H modeling estimates.

Filter benches were not explicitly modeled in P8. Filter bench treatment was coarsely estimated assuming the filter bench would be at capacity (3 inches/hour) 10% of the time, annually. These same estimates assume filter bench inflow concentrations of 0.29 mg/L TP and 72 mg/L TSS, using event-mean concentrations from MPCA's stormwater manual for "mixed" land use. It was also assumed that only 50% of TP is particulate-bound and capable of filtration using a standard sand filter media.

Note that it assumed that all dredging costs would be the responsibility of Spring Lake Township, which is the entity responsible for stormwater pond maintenance in the Lake Ridge Estates subwatershed. If the Township should proceed with dredging, the District may consider funding accessory retrofit modifications which represent a marginal cost and provide water quality benefits. For example, dredging Pond 1 is estimated to cost $77,000. For that same pond, dredging, modifying the outlet, and adding a filter bench is estimated to cost $103,000. In this scenario, the marginal cost for PLSLWD to include outlet modification and filter bench installation would be $26,000, for an estimated increase in average annual TP removal of 1.07 lbs/year.

4.1 Concept Drawings

Appendix C contains concept drawings for the footprint of the retrofit options for each pond.

4.2 Summary of Benefits and Limitations

The following is a bulleted description of key benefits and limitations as they relate to retrofits for each of the ponds.

4.2.1 Pond 1

Key benefits

- All options increase dead pool storage.
- Landscape and property boundaries allow for a filter bench, offering additional water quality treatment.
- Because this pond was originally designed as a treatment pond, there is an option to simply modify the outlet and increase treatment volume without incurring dredging costs.

- Water quality modeling suggests that outlet modification, in the absence of dredging, provides the most cost-effective removal of TP/TSS.
- Unregulated sediment disposal decreases dredging costs.
- Survey of this pond suggests that the outlet wall may be leaking and would benefit from outlet modification. Sealing of the wall will result in more consistent and control volume in the pond.

Key limitations & caveats

- Numerous tree removals would be required for all options.
- Sealing of the existing outlet wall will result in higher normal water levels in the pond. This water level will match the original intended design, but will be higher than existing conditions.

4.2.2 Pond 2

Key benefits

- All options increase dead pool storage.
- Options that involve an outlet modification would result in improved flood protection to adjacent home/driveway to the southwest.
- Increased water quality treatment capacity provides beneficial treatment of the agricultural area to the east of Lake Ridge Estates.

Key limitations & caveats

- Outlet modification options would encroach on neighboring lawn to create required pond area and/or berm.
- There is an existing low lying area east of the pond across Lake Ridge Drive that has been described as having wet conditions. Any option including a pond expansion may result in an increased likelihood of wet conditions in this low lying area. Limitations to draining these areas are the culvert size and elevation. Large runoff events may result in extended periods of inundation in this area if alterations to the current culvert were not made.
- Regulated sediment disposal increases dredging costs.

4.2.3 Pond 3

Key benefits

- All options increase dead pool storage.

Key limitations & caveats

- There may be potential impacts to the adjacent wetland from pond expansion.
- Determination of whether sediment disposal would be unregulated is unclear and requires further conversation with MPCA and/or landfills to confirm classification of dredge material.

4.2.4 Pond 4

Key benefits

- All options increase dead pool storage.
- Outlet modification options provide additional flood protection for adjacent property to the south.
- The combination of dredging, outlet modification, and a filter bench provides the greatest estimated water quality benefit of all retrofit options evaluation.
- Unregulated sediment disposal decreases dredging costs.

Key limitations & caveats

- Significant tree removal required for all options.

5 Recommendations

Given the low magnitude of TP generated in the Lake Ridge Estates subwatershed, it would likely be more cost effective to focus watershed TP reductions in other areas of the Fish Lake watershed. For example, the District may find more value in projects outlined in the Fish Lake Management Plan such as the Fish Lake West Wetland Restoration or the Fairlawn Lane Lake Inlet where the potential for removals is much greater, and thus could have a larger impact on Fish Lake water quality outcomes. However, if Spring Lake Township proceeds with maintenance dredging, the best opportunity for water quality treatment would be outlet modification and filter bench installation in Pond 1 and Pond 4, at an approximate $30,000 marginal cost for each. Implementing these retrofits in addition to dredging would have an estimated increase in removals exceeding 1 pound per year for each pond. It is Stantec’s opinion that there would be additional value in sampling stormwater inflows at Pond 1 and Pond 4 to understand the dissolved phosphorus properties of the inflows and thereby inform further decision-making regarding potential for additional removals by adding iron-enhanced filter media to bind dissolved phosphorus.

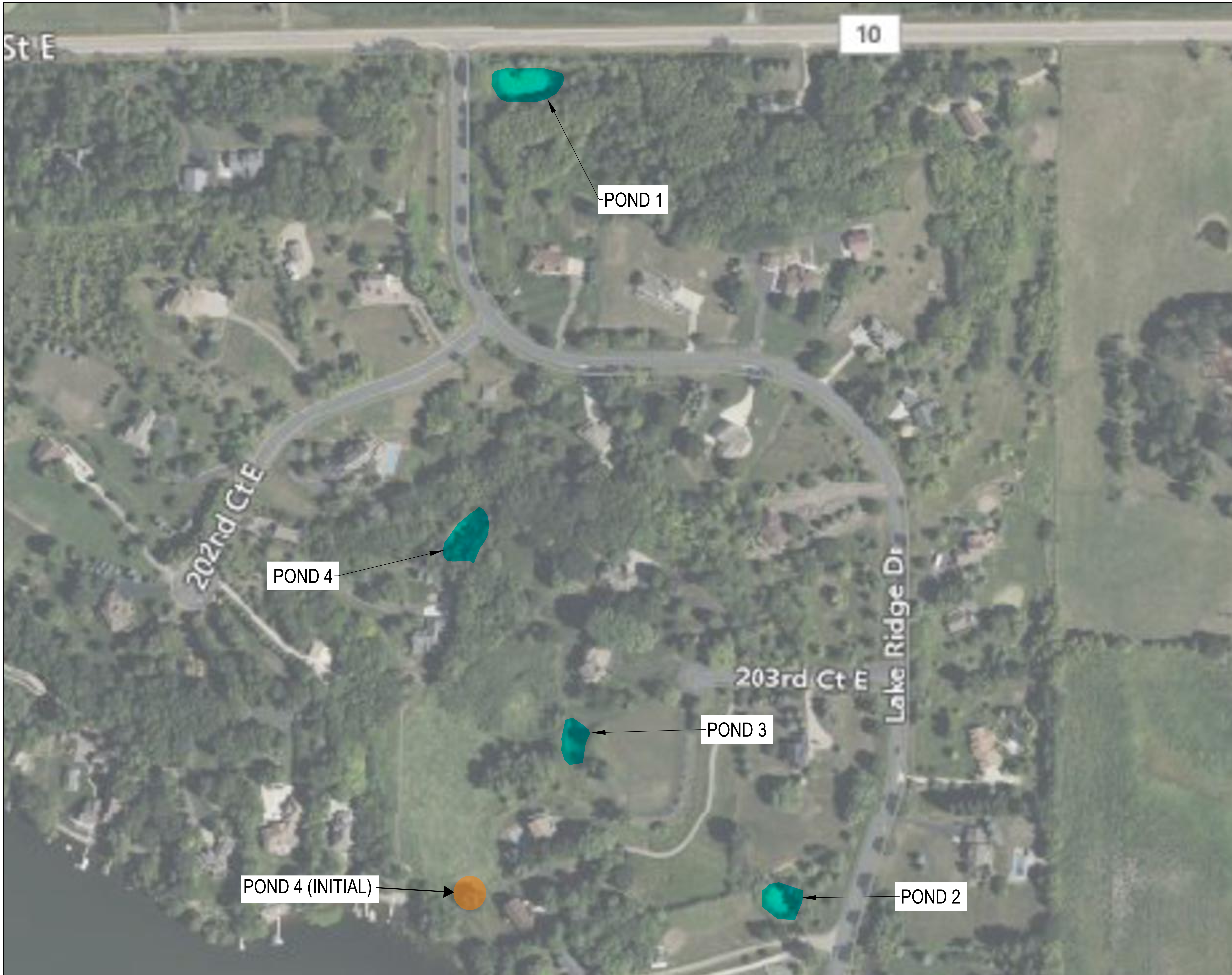
Appendix A Pond Retrofit Feasibility

Parameters and their value used to evaluate feasibility for pond retrofit considerations in each pond. A higher value represents higher feasibility whereas lower value represents lower feasibility.

Name	Consideration	Water Quality	Water Quantity	Ecological Integrity	Capital Costs	O & M Costs	Life Cycle Costs	Permitting Hurdles	Land Rights & Access	Maintenance Requirements	Utilities & Site Constraints	Probable Costs
Pond 1	Dredging	2	2	1	2	2	2	3	2	3	3	2
	Outlet Modification	1	2	1	3	3	3	3	2	3	3	3
	Sand Filter Bench	3	2	1	3	2	2	3	2	2	3	3
	Iron-Enhanced Sand Filter Bench[3]											
	Smart Outlet	2	3	1	1	1	1	3	2	1	1	1
	Active/Predictive Pumping	2	3	1	1	1	1	3	2	1	1	1
	Irrigation	1	1	1	1	1	1	2	2	1	1	1
Pond 2	Dredging	3	2	1	2	2	2	2	2	3	3	2
	Outlet Modification	1	3	1	3	3	3	3	1	3	3	3
	Sand Filter Bench	3	2	1	3	2	2	3	2	2	3	3
	Iron-Enhanced Sand Filter Bench[2]											
	Smart Outlet	2	3	1	1	1	1	3	2	1	1	1
	Active/Predictive Pumping	2	3	1	1	1	1	3	2	1	1	1
	Irrigation	1	1	1	1	1	1	2	2	1	1	1
Pond 3	Dredging	2	2	1	2	2	2	2	2	3	3	2
	Outlet Modification	1	2	1	3	3	3	3	2	3	3	3
	Sand Filter Bench	3	2	1	3	2	2	3	2	2	3	3
	Iron-Enhanced Sand Filter Bench[2]											
	Smart Outlet	2	3	1	1	1	1	3	2	1	1	1
	Active/Predictive Pumping	2	3	1	1	1	1	3	2	1	1	1
	Irrigation	1	1	1	1	1	1	2	2	1	1	1
Pond 4	Dredging	2	2	1	2	2	2	3	2	3	3	2
	Outlet Modification	2	3	1	2	3	3	3	2	3	3	3
	Sand Filter Bench	3	2	1	2	2	2	3	2	2	3	3
	Iron-Enhanced Sand Filter Bench[2]											
	Smart Outlet	2	3	1	1	1	1	3	2	1	1	1
	Active/Predictive Pumping	2	3	1	1	1	1	3	2	1	1	1
	Irrigation	1	1	1	1	1	1	2	2	1	1	1

[3] In the absence of monitoring data for these ponds Stantec does not recommend iron-enhanced sand filter media currently. Prescribing iron-enhanced sand filter media should be informed by phosphorus sample concentrations that demonstrate significant properties of dissolved phosphorus.

Appendix B Pond Locations



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GRAPHIC SCALE

100 0 100 200

(IN FEET)
1 inch = 100 ft.

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PROJECT TITLE:

LAKE RIDGE ESTATES FISH LAKE FEASIBILITY

PRIOR LAKE-SPRING LAKE WATERSHED DISTRICT (PLSLWD)
SCOTT COUNTY, MN

ISSUE NO:	DESCRIPTION:	DATE:

CERTIFICATION:

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DATE: ____________

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DWN BY: JTW	CHK'D BY: NW	APP'D BY: NW
ISSUE DATE:	XX/XX/XXXX	
ISSUE NO.:	X	

SHEET TITLE:

EXISTING POND LOCATIONS

SHEET NO.:

Appendix C Concept Drawings

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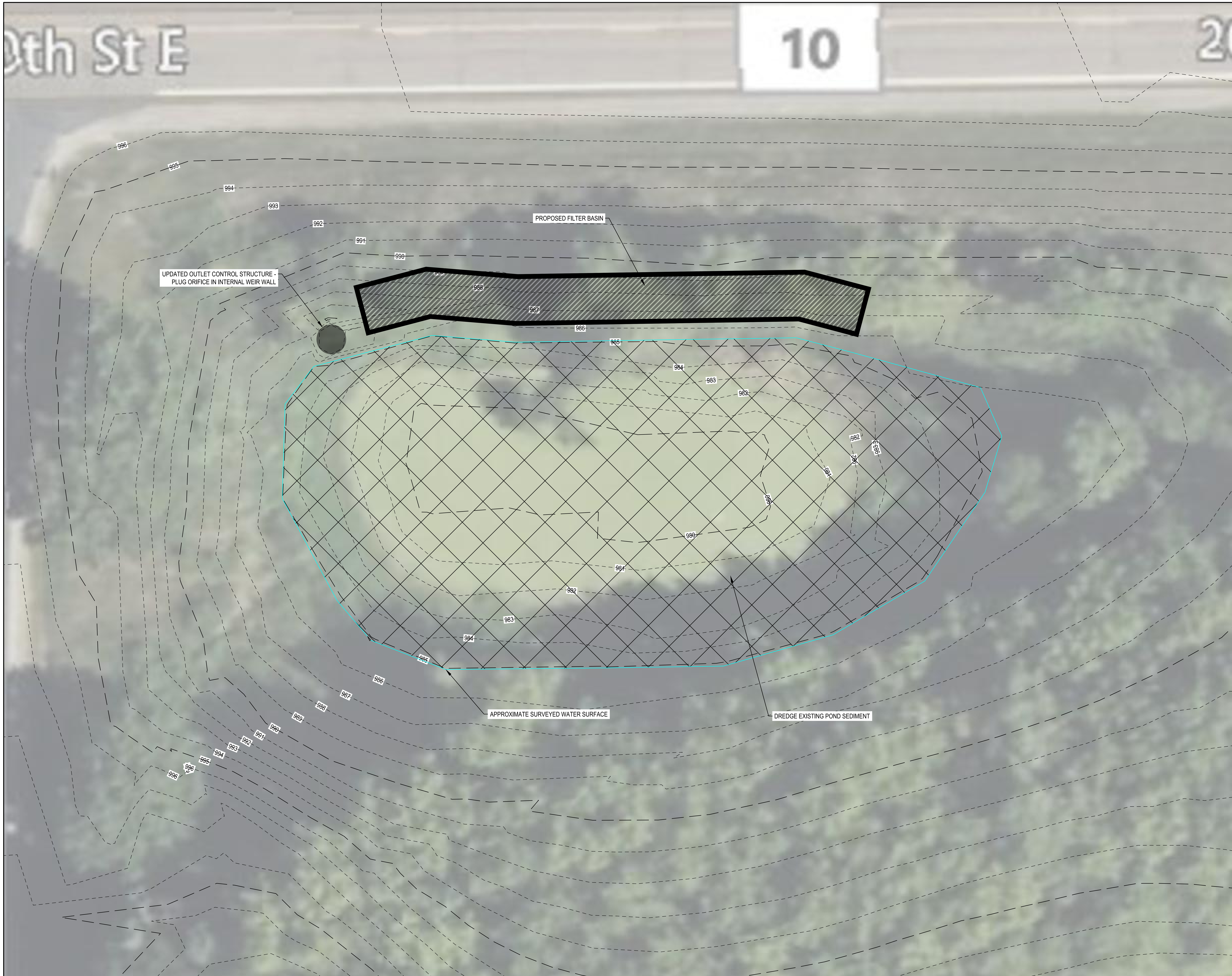

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GRAPHIC SCALE

10 0 10 20

(IN FEET)
1 inch = 10 ft.

OPTION 1 - DREDGE POND SEDIMENT

OPTION 2 - DREDGE POND SEDIMENT AND UPDATE OCS

OPTION 3 - DREDGE POND SEDIMENT, UPDATE OCS, AND INSTALL SAND FILTER

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CLIENT:

PLSLWD

PROJECT TITLE:

LAKE RIDGE ESTATES FISH LAKE FEASIBILITY

PRIOR LAKE-SPRING LAKE WATERSHED DISTRICT (PLSLWD)
SCOTT COUNTY, MN

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JTW	NW	NW

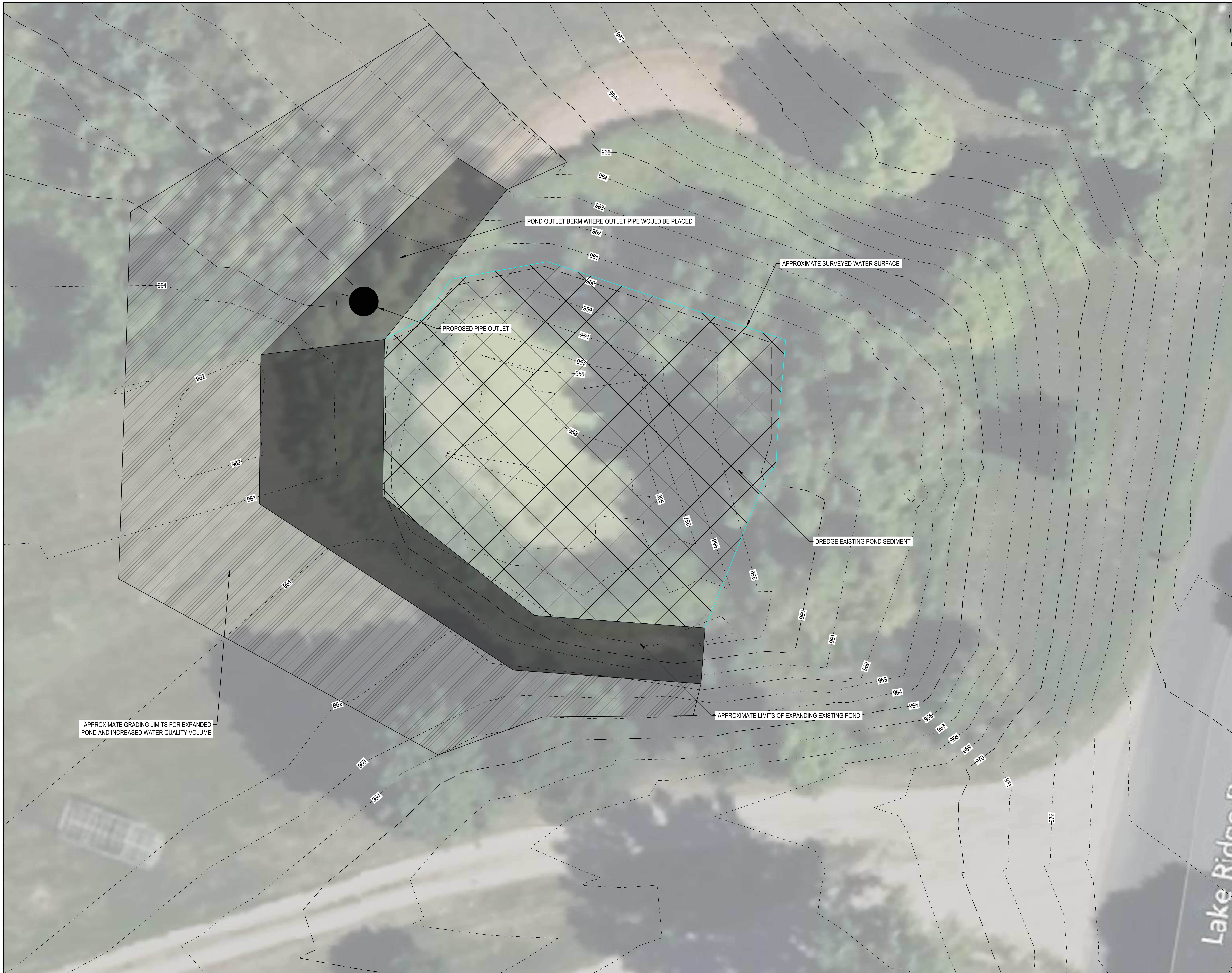
ISSUE DATE: XX/XX/XXXX

ISSUE NO.: X

SHEET TITLE:

POND 1 OPTIONS

SHEET NO.:



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GRAPHIC SCALE
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(IN FEET)
1 inch = 10 ft.

OPTION 1 - DREDGE POND SEDIMENT

OPTION 2 - DREDGE POND SEDIMENT AND EXPAND POND

OPTION 3 - DREDGE POND SEDIMENT, PIPE OUTLET, AND EXPAND POND

OPTION 4 - DREDGE POND SEDIMENT, PIPE OUTLET, EXPAND POND, AND INCREASE WATER QUALITY VOLUME

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SUITE 300
GOLDEN VALLEY, MN 55427
PHONE: 763-252-6800
FAX: 952-831-1268
WWW.STANTEC.COM

CLIENT: PLSLWD

PROJECT TITLE:

LAKE RIDGE ESTATES FISH LAKE FEASIBILITY

PRIOR LAKE-SPRING LAKE WATERSHED DISTRICT (PLSLWD)
SCOTT COUNTY, MN

ISSUE NO.: | DESCRIPTION: | DATE:

CERTIFICATION:
I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

LICENSE NO.: ______
DATE: ______

NOT FOR CONSTRUCTION

PROJECT NO.: 227707416		
DWN BY: JTW	CHK'D BY: NW	APP'D BY: NW
ISSUE DATE: XX/XX/XXXX		
ISSUE NO.: X		

SHEET TITLE:
POND 2 OPTIONS

SHEET NO.:

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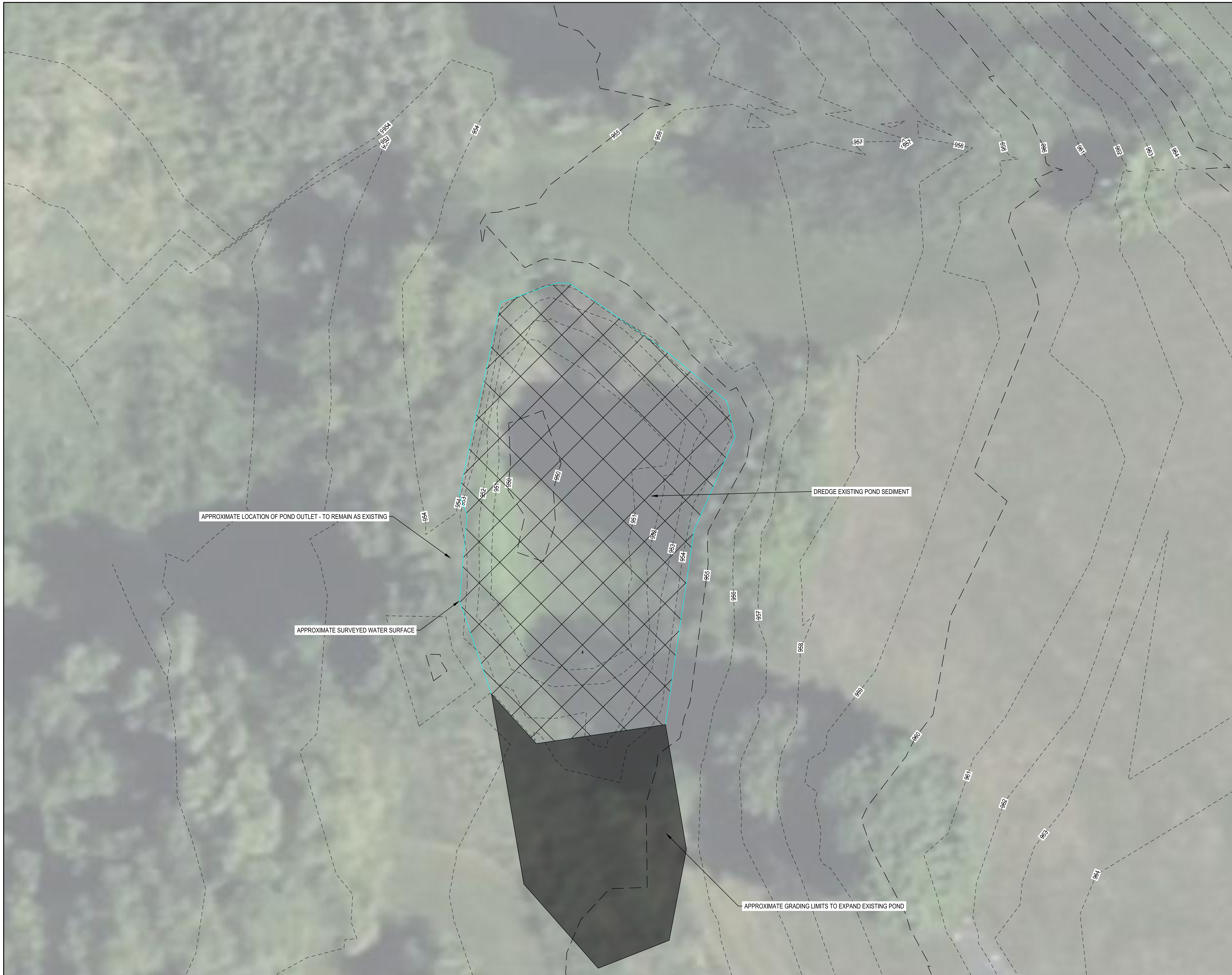

GRAPHIC SCALE

10 0 10 20

(IN FEET)

1 inch = 10 ft.

OPTION 1 - DREDGE POND SEDIMENT

+ OPTION 2 - DREDGE POND SEDIMENT AND EXPAND POND

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CLIENT:

PLSLWD

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PROJECT NO.: 227707416

DWN BY:	CHK'D BY:	APP'D BY:
JTW	NW	NW

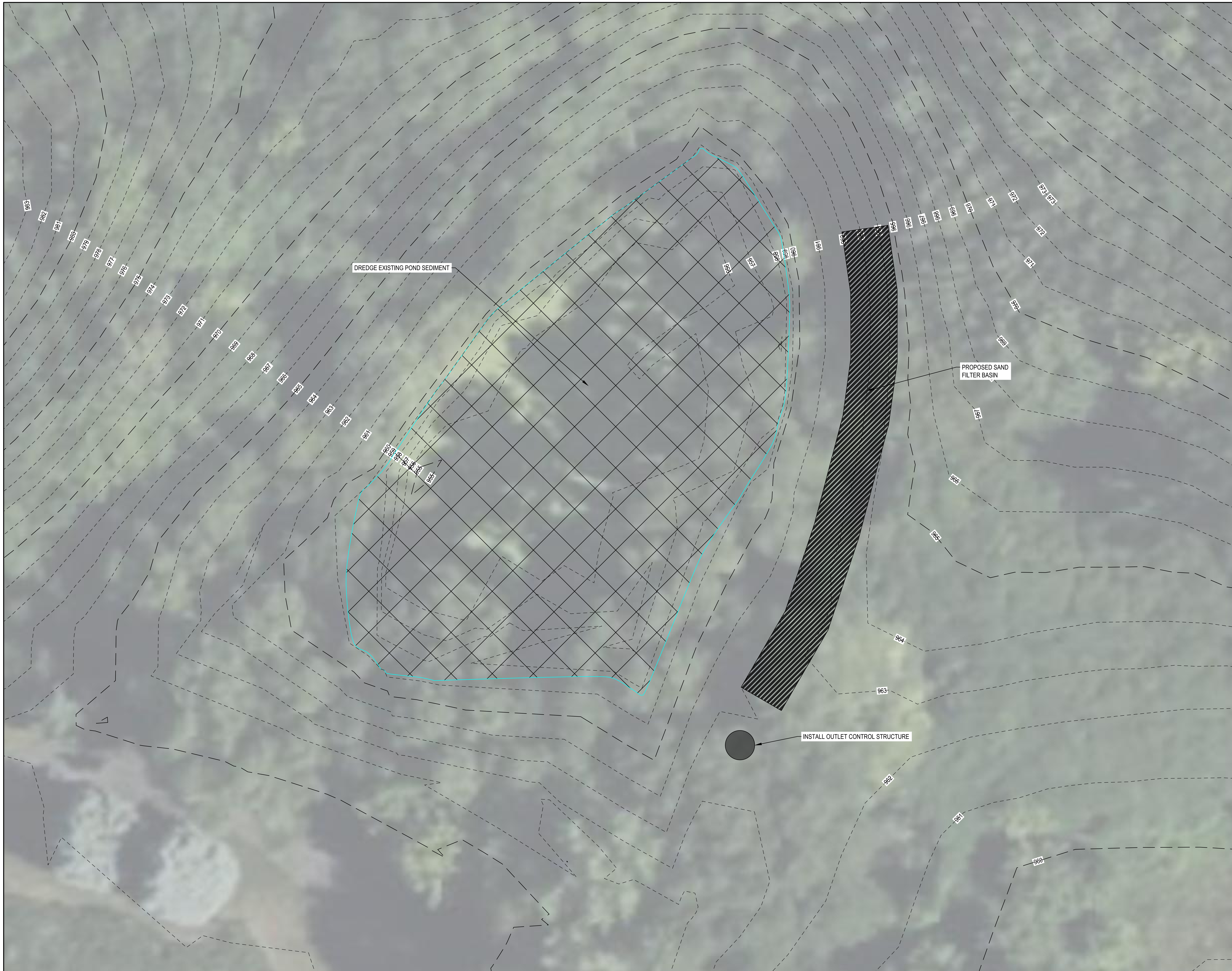
ISSUE DATE: XX/XX/XXXX

ISSUE NO.: X

SHEET TITLE:

POND 3 OPTIONS

SHEET NO.:



N

GRAPHIC SCALE

10 0 10 20

(IN FEET)
1 inch = 10 ft.

OPTION 1 - DREDGE POND SEDIMENT

OPTION 2 - DREDGE POND SEDIMENT AND UPDATE OCS

OPTION 3 - DREDGE POND SEDIMENT, UPDATE OCS, AND INSTALL SAND FILTER

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PROJECT NO.: 227707416		
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ISSUE DATE: XX/XX/XXXX		
ISSUE NO.: X		
SHEET TITLE: POND 4 OPTIONS		
SHEET NO.: ----		

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