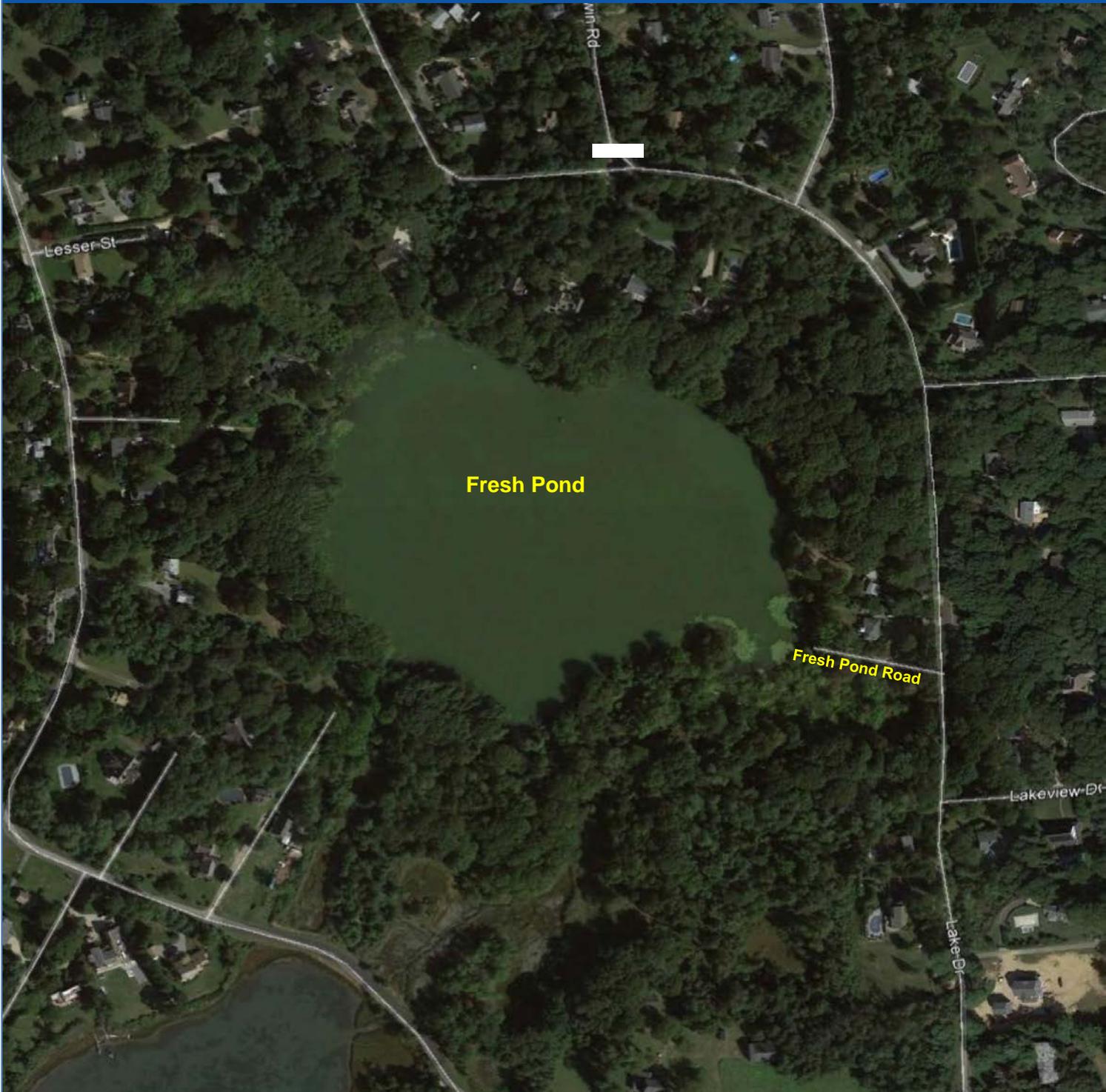


FRESH POND IN-WATERBODY NUTRIENT CONTROL Solution Permitting & Engineering



Prepared for:
Town of Shelter Island
38 North Ferry Road
Shelter Island, NY 11964-0907

September 28, 2022

Environmental Engineers/Consultants

LOMBARDO ASSOCIATES, INC.

188 Church Street, Newton, Massachusetts 02458

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1. INTRODUCTION

The Fresh Pond Feasibility Study for In-Waterbody Control of Nutrients dated July 25, 2022 recommended:

1. **Withdraw 100,000 gallons per day (gpd)** from bottom waters (hypolimnion)
2. **Filter and aerate water to remove P** from the water, adding iron if needed
 - ✓ By precipitating iron-phosphate
3. **Return treated water to Fresh Pond** hypolimnetic layer far from withdrawal facilities
 - ✓ Significant nitrogen removal is expected to occur
4. **Operate withdraw / treatment system - approximately March through November**
 - ✓ Remove ~ 32 +/- kg P / year, recognizing that annual removal will decrease over time as P is removed
5. **Operate withdraw / treatment system for estimated 7 – 10 +/- years**
 - ✓ Remove the 125 +/- kg of available P in the Pond sediments.

The project is to be implemented in the following phases:

- I. **Pilot Project** - to obtain data to optimize the full-scale design.
- II. **Full-Scale System** - Restore Pond's water quality

The project's Executive Summary along with conceptual designs are presented in Appendix A.

Per the Town of Shelter Island's request, Lombardo Associates, Inc. (LAI) submits this proposal for the following activities:

1. NYSDEC Permitting
2. Engineering Design (Plans, Specifications & Design Basis Report) for
 - a. Pilot Project and
 - b. Full Scale System

With the completion of these activities, the Town will submit grant applications for the construction and operation of the Pond restoration efforts.

2. SCOPE OF WORK

Task 1 NYSDEC Permitting

For a project permitting pre-application meeting, LAI will prepare the following NYSDEC required documents:

1. Application Checklist requirements
 - a. Project Plans showing
 - i. wetland boundaries
 - ii. limits of clearing grading and ground disturbance
 - iii. sediment & erosion control measures
 - b. Color photos of project site
 - c. Survey of property – stamped and signed
 - d. Water depth measurements
 - e. Location map and proposed machinery routes
 - f. Letter designating LAI as authorized agent
 - g. Staking of proposed structure and photograph
2. Joint Application Form 04-2020
3. Structural Archaeological Assessment Form (SAAF)
4. Short Environmental Assessment Form (EAF)
5. SHPO Assessment

The Permitting Project Plans will be prepared in Task 2 Engineering Design.

LAI will have performed a sediment thickness survey and updated bathymetric map for Fresh Pond. The maps will be very valuable for providing basis for locating hypolimnetic withdraw & return and engineering of treatment system equipment.

Task 2 Plans & Specifications

LAI will prepare Permitting Project Plans to support the Task 1 permit application efforts and Plans and Specifications and Design Basis Report for construction of the Pilot Project and Full-Scale System.

Permitting Project Plans

The Permitting Project Plans will provide plan and section views of the proposed Pilot and Full-Scale Systems, along with the permit required surveys, wetland delineations, sediment and erosion control components, etc.

Pilot and Full-Scale Plans, Specifications & Design Basis Report

LAI will prepare Plans, Specifications (P&S) and Design Basis Reports (DBR) for the Pilot and Full Scale hypolimnetic withdrawal piping, water treatment and return water piping systems, along with the supporting infrastructure of:

- ✓ Access road and dock on Fresh Pond. The dock will house the water treatment system.
- ✓ Electric service from the local electric service provider

Engineering will include structural for the dock, civil engineering for the access road & sediment & erosion control, and electrical engineering for power acquisition and distribution.

The P&S and DBR will be submitted to NYSDEC and any other relevant regulatory agencies for project construction permitting for the Pilot and Full-Scale projects separately as described below.

Pilot Project Documents

The Pilot documents will include the hypolimnetic withdrawal and return piping system which will be sized for Full Scale Project use, to/from a location on Fresh Pond Road adjacent to the Pond. The Pilot system will include water treatment equipment assembled on a skid mounted unit.

Full Scale Documents

The Full-Scale Documents will have the access road and dock along with full scale treatment system. Water withdrawal and return piping will be modified to be located at the dock.

Task 3 Algae Harvesting Permitting Documents

Utilizing conceptual plans developed by the Town and submittals of the proposed contractor, Solitude, for floating aquatic plants harvesting, LAI will prepare plans and specifications for receiving the harvested plants on Fresh Pond Road. Preliminary Plans are work to be performed over 1 – 2 days as follows:

- Use one lane of Fresh Pond Road, with appropriate sediment and erosion control devices, for unloading harvested materials along the designated perimeter location on the Pond's shoreline behind hay bales. Drainage would be back to Fresh Pond.
- Dewatering is to occur for 12-24 hours on Fresh Pond Road before removal and disposal by the Shelter Island Highway Department.
- Solitude's Scope of Work includes mobilization, demobilization of in water equipment and delivery/set-up of haybales.

3. BUDGET & SCHEDULE

Lombardo Associates, Inc. proposes to perform the Section 2 described Scope of Work for a fixed fee of one hundred and fifty-four thousand and five hundred and seven dollars (\$154,507.) based upon the Table 3-1 level of effort and expenses. Figure 3-1 presents the proposed schedule.

Table 3-1 Project Budget

| Fresh Pond HW Project Budget - Labor + Expenses | | | | | | | | | | | | | Date: | 9/28/2022 |
|---|---|-----------------------------|-------------------------|-----------------------|-------------------------|------------------------|-----------------------|-------------------|-------------|-------------------------|-------------------|------------------|------------------|-----------|
| Task | Task No. | Task Description | Principal PSL 225 | Sr. Engr KW 175 | Proj. Engr GR 140 | Engineer TBD 110 | GIS Spec MC 110 | Proj. Asst. 60 | Total Hours | Labor Sub-total (\$) | Expense Sub-total | Total Task Fee | Total Fees | |
| 1 | Permitting | | | | | | | | | | | | | |
| | 1.1 | NYSDEC Pre-Application | 40.00 | 4.00 | 32.00 | | 24.00 | | 100 | \$ 16,820 | \$ 36,740 | \$ 53,560 | \$ 78,219 | |
| | 1.2 | Meetings | 12.00 | 2.00 | 12.00 | | 8.00 | | 34 | \$ 5,610 | \$ 1,668 | \$ 7,278 | | |
| | 1.3 | Misc | 24.00 | | 24.00 | | 4.00 | | 52 | \$ 9,200 | \$ 1,276 | \$ 10,476 | | |
| | 1.4 | Algae Harvest | 14.00 | | 16.00 | | 4.00 | | 34 | \$ 5,830 | \$ 1,075 | \$ 6,905 | | |
| | | Subtotal | 90.00 | 6.00 | 84.00 | 0.00 | 40.00 | 0.00 | 220 | \$ 37,460 | \$ 40,759 | \$ 78,219 | | |
| 2 | P&S + DBR - Pilot & Full Scale | | | | | | | | | | | | | |
| | 3.1 | Permitting Project Plans | 12.00 | 8.00 | 32.00 | | 16.00 | | 68 | \$ 10,340 | \$ 4,466 | \$ 14,806 | \$ 69,383 | |
| | 3.2 | Construction Documents | 12.00 | 24.00 | 60.00 | | 32.00 | | 128 | \$ 18,820 | \$ 6,765 | \$ 25,585 | | |
| | 3.3 | Equipment Supply & Assembly | 12.00 | 6.00 | 40.00 | | 8.00 | | 66 | \$ 10,230 | \$ 3,507 | \$ 13,737 | | |
| | 3.4 | Final Report | 18.00 | | 20.00 | | | | 38 | \$ 6,850 | \$ 8,406 | \$ 15,256 | | |
| | | Subtotal | 54.00 | 38.00 | 152.00 | 0.00 | 56.00 | 0.00 | 300 | \$ 46,240 | \$ 23,143 | \$ 69,383 | | |
| 3 | Algae Harvesting Permitting | | | | | | | | | | | | | |
| | 3.1 | NYSDEC Pre Application docs | 8.00 | | 16.00 | | 4.00 | | 28 | \$ 4,480 | \$ 334 | \$ 4,814 | \$ 6,905 | |
| | 3.2 | Oversight | 6.00 | | | | | | 6 | \$ 1,350 | \$ 741 | \$ 2,091 | | |
| | | Subtotal | 14.00 | 0.00 | 16.00 | 0.00 | 4.00 | 0.00 | 34 | \$ 5,830 | \$ 1,075 | \$ 6,905 | | |
| GRAND TOTAL | | | 158.00 | 44.00 | 252.00 | 0.00 | 100.00 | 0.00 | 554 | \$89,530 | \$64,977 | \$154,507 | \$154,507 | |

Fresh Pond HW Project Budget - Expenses

| Estimated Direct Costs | | | | | | | | | | | |
|------------------------|---|-------------|-------------------------------|----------------|-----------------------|----------------|-----------------|--------------------|-------------------------------|----------------|---------------------|
| Task No. | Task Description | Travel | | Subcontractors | | | | Printing & Telecom | Wetlands Flagging + Elect Eng | Misc Other | Task Expenses Total |
| | | Air / Trips | Hotel / Car & Meals / Dollars | Survey ST | Sediment Thick & Bath | Erosion | Stru | | | | |
| 1 | Permitting | | | | | | | | | | |
| 1.1 | NYSDEC Pre-Application | 2 | \$1,000 | \$3,450 | \$12,650 | \$3,450 | \$5,635 | \$505 | \$8,050 | \$2,000 | \$ 36,740 |
| 1.2 | Meetings | 2 | \$1,000 | | | | | \$168 | | \$500 | \$ 1,668 |
| 1.3 | Misc | 1 | \$500 | | | | | \$276 | | \$500 | \$ 1,276 |
| 1.4 | Algae Harvest | 1 | \$500 | | | | | \$175 | | \$400 | \$ 1,075 |
| | Subtotal | 6 | \$3,000 | \$3,450 | \$12,650 | \$3,450 | \$5,635 | \$1,124 | \$8,050 | \$3,400 | \$ 40,759 |
| 2 | Proof of Concept | | | | | | Equip | | | | |
| 2.1 | Project Implementation Plan | | \$0 | | | | | \$0 | | | \$ - |
| 2.2 | Equipment Acquisition | | \$0 | | | | | \$0 | | | \$ - |
| 2.3 | Sampling / Analysis | | \$0 | | | | | \$0 | | | \$ - |
| 2.4 | Final Report | | \$0 | | | | | \$0 | | | \$ - |
| | Subtotal | - | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$0 | \$ - |
| 2 | P&S + DBR - Pilot & Full Scale | | | erosion | Elect eng | Str Eng | | | | | |
| 3.1 | Permitting Project Plans | | \$0 | \$2,000 | | | | \$310 | | \$2,156 | \$ 4,466 |
| 3.2 | Construction Documents | | \$0 | | | \$6,000 | | \$565 | | \$200 | \$ 6,765 |
| 3.3 | Equipment Supply & Assembly | | \$0 | | \$3,000 | | | \$307 | | \$200 | \$ 3,507 |
| 3.4 | Final Report | | \$0 | | | | \$8,000 | \$206 | \$0 | \$200 | \$ 8,406 |
| | Subtotal | - | \$0 | \$2,000 | \$3,000 | \$6,000 | \$8,000 | \$1,387 | \$0 | \$2,756 | \$ 23,143 |
| 4 | Algae Harvesting Permitting | | | | | | | | | | |
| 3.1 | NYSDEC Pre Application docs | | \$0 | | | | | \$134 | | \$200 | \$ 334 |
| 3.2 | Oversight | 1 | \$500 | | | | | \$41 | | \$200 | \$ 741 |
| | Subtotal | 1 | \$500 | \$0 | \$0 | \$0 | \$0 | \$175 | \$0 | \$400 | \$ 1,075 |
| GRAND TOTAL | | 7 | \$3,500 | \$5,450 | \$15,650 | \$9,450 | \$13,635 | \$2,686 | 8050 | \$6,556 | 64,977 |

| Schedule | | Fresh Pond Shelter Island In-Waterbody Nutrient Control - Permitting + Engineering Design | | | | | | | | | |
|--|--------------------------------|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Months after Receipt of Authorization to Proceed | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Task | Activity Description | Dec-22 | Jan-23 | Feb-23 | Mar-23 | Apr-23 | May-23 | Jun-23 | Jul-23 | Aug-23 | Sep-23 |
| 1 | Permitting | █ | █ | █ | █ | | | | | | |
| 2 | P&S + DBR - Pilot & Full Scale | | | █ | █ | █ | █ | █ | █ | | |
| 3 | Algae Harvesting Permitting | | | | | | | | | █ | █ |
| | Algae Harvesting Performed | | | | | | | | | █ | █ |

Figure 3-1 Project Schedule

APPENDIX A – FRESH POND SOLUTION PLAN – EXECUTIVE SUMMARY

FRESH POND IN-WATERBODY NUTRIENT CONTROL FEASIBILITY STUDY & ENGINEERING REPORT - EXECUTIVE SUMMARY

Shelter Island's Fresh Pond in-waterbody nutrient control feasibility study and engineering report determined that the

Pond's impaired water quality is due to sediment phosphorus (P) release

(primarily iron-phosphate being solubilized) during anaerobic conditions caused by Hypolimnetic Oxygen Demand (HOD), that is primarily from Sediment Oxygen Demand

Based upon field measurements,

- ✓ HOD was estimated at 65 kg of oxygen / day
- ✓ Sediment Phosphorus Release was estimated at 31.7 kg/year with 125 kg of available P in the surficial sediment

The recommended solution to restore the Pond's water quality is to remove phosphorus from Pond sediments by the following methods, as illustrated on Figures ES-1, ES-2 and ES-3:

1. **Withdraw 100,000 gallons per day (gpd) from bottom waters (hypolimnion)**
2. **Filter and aerate water to remove P from the water**
 - ✓ By precipitating iron-phosphate
 - ✓ Iron will be added, if needed/desired, to maximize phosphorus removal
3. **Return treated water to Fresh Pond hypolimnetic layer far from withdrawal facilities**
 - ✓ Nitrogen removal likely to occur
4. **Operate withdraw / treatment system - approximately March through November**
 - ✓ Remove 32 +/- kg P / year, recognizing that removal will decrease as P is removed
5. **Operate withdraw / treatment system for estimated 7 – 10 +/- years**
 - ✓ Remove the 125 +/- kg of available P in the Pond sediments.

The project will be implemented in the following phases:

- I. **Proof of Concept – to document the scientific validity of the proposed process**
- II. **Pilot Project - to obtain data to optimize the full-scale design.**
- III. **Full-Scale System - Restore Pond's water quality !**

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38 North Ferry Road
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July 25, 2022



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FRESH POND IN-WATERBODY NUTRIENT CONTROL FEASIBILITY STUDY & ENGINEERING REPORT - EXECUTIVE SUMMARY



FRESH POND IN-WATERBODY NUTRIENT CONTROL FEASIBILITY STUDY & ENGINEERING REPORT - EXECUTIVE SUMMARY

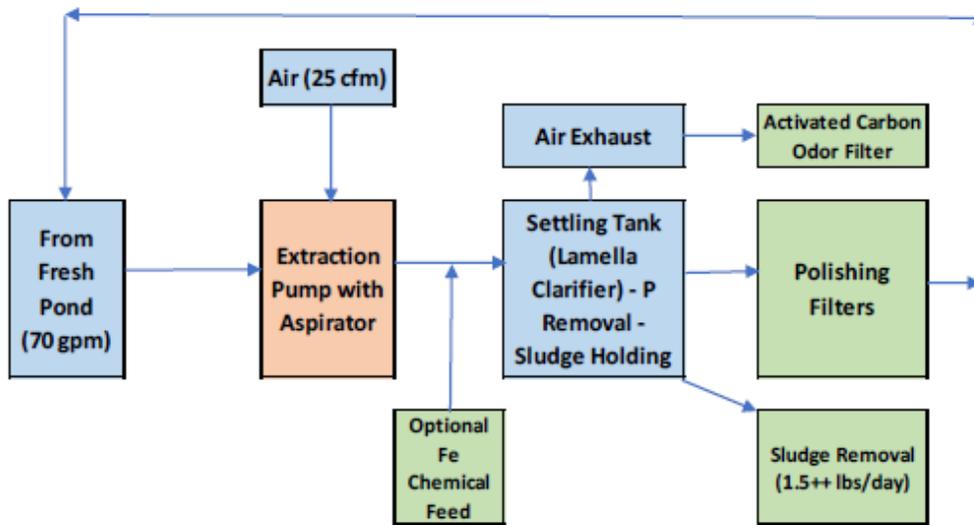
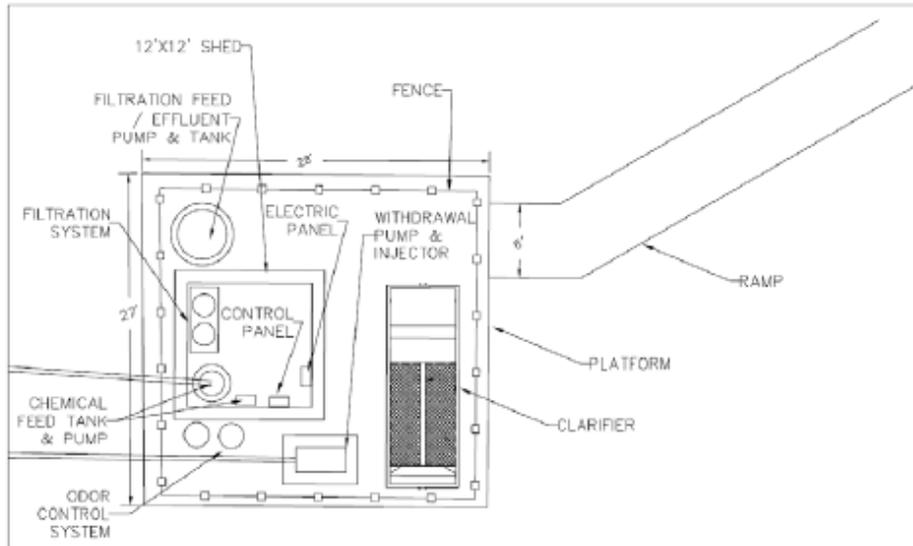


Figure ES-2 Hypolimnetic Withdraw, Treatment & Discharge System – Process Flow Diagram & Layout

FRESH POND IN-WATERBODY NUTRIENT CONTROL FEASIBILITY STUDY & ENGINEERING REPORT - EXECUTIVE SUMMARY

