PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

PROPERTY OWNER NAME(S): County of Ramsey, a political subdivision of the State of Minnesota, through Ramsey County Parks and Recreation and Ramsey County Soil and Water Conservation Division ("**Owner**")

PROPERTY ADDRESS: Tamarack Nature Center, 5287 Otter Lake Rd, White Bear Township, MN 55110 ("**Property**")

PROPERTY ID NUMBER (PID): Parcel ID: 103022330003
SECTION 10 TOWN 30 RANGE 22 SUBJ TO RDS THE FOL; EX W 697 FT OF E ...OF W 1/2 OF SEC 10 TN 30 RN 22

EFFECTIVE DATE: February 1, 2025 TERMINATION DATE: December 31, 2025

By executing this Property Access Agreement ("Agreement"), the Owner understands that the Vadnais Lake Area Water Management Organization ("VLAWMO") desires to enter onto the above-listed Property to carry out certain work, as described generally below. This temporary access agreement is an extension of the original access agreement that was approved and executed by all parties as of April 24, 2024. That temporary access agreement covered phase 1 of the alum project and ended during 2024. Phase 1 included an updated proposed access route to the staging area, which is included in **Exhibit A.**

The work consists of an alum treatment, divided into up to four phases, to treat internal phosphorus loading in Tamarack Lake. Tamarack Lake is an impaired water as designated by the Minnesota Pollution Control Agency (MPCA) for nutrients. The work is the result of a preceding feasibility study that is included in the attached contract documents, which is included in **Exhibit B**.

Phase 1 of the alum treatment was completed during fall 2024. Additional phases may be possible during the following year (2025), based on early post monitoring data collected as of October 2024. The decision for timing of remaining phases of the application will be a result of monitoring conducted by VLAWMO and upon recommendation by the project engineer. The Owner is willing to grant access to the Property on the terms and conditions provided by this Agreement and with ongoing collaboration between both parties. A focus of ongoing communication, especially regarding site access and staging specifics, will be regular updates and accommodation of potential nature center activities. An important and sensitive activity window will happen October 24-November 1 because Tamarack Nature Center has a high-attendance activity. VLAWMO and the Owner will coordinate around this window of time with additional sensitivity to ensure that the project activities are not interfering with the event. The right of entry granted herein shall apply to VLAWMO, its employees, agents, and contractors, collectively referred to herein as VLAWMO. Owner and VLAWMO agree as follows:

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1. Right of Entry. Owner hereby grants to VLAWMO, its employees, agents, and contractors a temporary and non-exclusive license to enter upon the Property for the purpose of performing the following work (collectively, the "**Work**"):

   The work consists of staging and conducting an alum treatment in Tamarack Lake in up to four phases. Phase 1 was completed during fall 2024. **Exhibit A** shows the updated access route to the staging area, while **Exhibit B** includes the use area for product delivery, staging, and application. The final use area will be defined by the contractor and is anticipated to be the same as what was completed in phase 1. Staging may include temporary parking of vehicles, use of carts to deliver product to the observation platform, and set up and loading from the observation platform. Chemical delivery and maintenance will be conducted consistent with contract documents. Conducting the alum treatment will include a contractor using the parking lot area and vehicle access trails to bring one or more small boats (e.g., pontoon or other similar watercraft) near the application location. Once supplies are close to the application area, they will be transported along the boardwalk using wheeled carts or hand-carried. The small watercraft will be launched at or near the observation platform. Product will be loaded onto the watercraft and applied to the lake in accordance with the description provided by the contractor in the contract documents. Staging will begin prior to each phase of the alum treatment, with communication and coordination between VLAWMO and the Owner. The application of alum during each phase is anticipated to take a few days over the course of 1-2 weeks, dependent upon weather and pH response in the lake. Monitoring will be conducted by the project engineer during the alum application as per MPCA requirements, and VLAWMO will conduct ongoing monitoring once the application has been completed. Additional phases will be conducted in the same manner as phase 1 and will be timed according to recommendations made by the project engineer.

   The Owner authorizes VLAWMO, at VLAWMO's reasonable discretion, to enter upon and temporarily bring onto the Property such equipment and materials as may be reasonably needed to perform the Work. Owner represents and warrants that it is the fee owner of the Property and has the authority and right to enter into this Agreement on behalf of all owners of the Property.

2. Term. This Agreement shall commence as of the Effective Date and terminate on the Termination Date as indicated above unless extended by mutual written agreement of the parties. Following completion of the Work, VLAWMO agrees to reasonably

restore the Property to its prior condition in the event that it is damaged as a result of the work. All such restoration work shall be completed before the indicated termination date.

3. Fees and Costs. VLAWMO shall be solely responsible for the costs of all labor, services, equipment, and materials used in conducting the Work at the Property and shall not permit any lien or encumbrance upon the Property resulting from its activities thereon. VLAWMO is also responsible for all costs associated with restoring the Property.

4. Property Damage. If VLAWMO causes damage to the Property or Owner's personal property while performing the Work, VLAWMO shall repair the Property or replace the damaged item at its own cost.

5. Insurance. VLAWMO shall require the contractor completing the work to maintain workers' compensation insurance (unless exempt under law) and commercial general liability insurance with coverage limits of no less than $1,000,000 per occurrence, $2,000,000 general aggregate, $2,000,000 products/completed operations total limit, $1,000,000 personal injury, and advertising liability. An umbrella or excess liability policy over primary liability insurance coverages is an acceptable method to provide the required commercial general liability and employer's liability insurance amounts.

   Additional insurance requirements include:

   Auto Liability: If the contractor is driving on behalf of the county but not transporting clients as part of the contractor's services under this contract, a minimum of $500,000 combined single limit auto liability, including hired, owned and non-owned.

   Work Comp: Workers' Compensation as required by Minnesota Law. Employer's liability with limits of $500,000/$500,000/$500,000.

   Additional Insured: The County must be named as an additional insured on all policies and no work can commence until certificates of insurance are delivered to the County.

   If requested, the Contractor shall provide the VLAWMO and the Owner a certificate of insurance showing all insurance coverages it has in effect. The Contractor shall have the Owner named as an additional insured on its commercial general liability policy.

6. Indemnify. VLAWMO will, and will cause its contractors to, indemnify, hold harmless, and defend Owner and its respective officials, agents, and employees against any and all liability, losses, costs, damages, expenses, claims, or actions, including attorney's and expert witness's fees, which Owner or its officials, agents, or employees may sustain, incur, or be required to pay, arising out of or by reason of any act or omission of VLAWMO, its contractors, officials, agents, or employees, arising directly or indirectly from VLAWMO's or its contractor's or contractors' presence on the Property, activities on the Property, acts and/or omissions with respect to the Property and/or Work, and/or from the performance, or failure to adequately or safely perform the Work.

7. Binding Effect. This Agreement shall be binding upon, and inure to the benefit of, the parties' respective successors and assigns.

8. Governing Law. This Agreement shall be interpreted in accordance with and be governed by the laws of the state of Minnesota.

9. Entire Agreement. This Agreement is the full, complete, and entire agreement of the parties with respect to the subjects hereof, and any and all prior writings, representations, and negotiations with respect to those subjects are superseded by this Agreement. This Agreement may only be amended by the parties hereto by a written and signed instrument.

IN WITNESS WHEREOF, the undersigned parties have executed this Agreement as of the dates indicated below.

OWNER:

_____
Signature

Mark McCabe
Printed Name

11/26/2024
Date

Approved as to form:

Kathleen Ritter
Assistant County Attorney

VLAWMO:

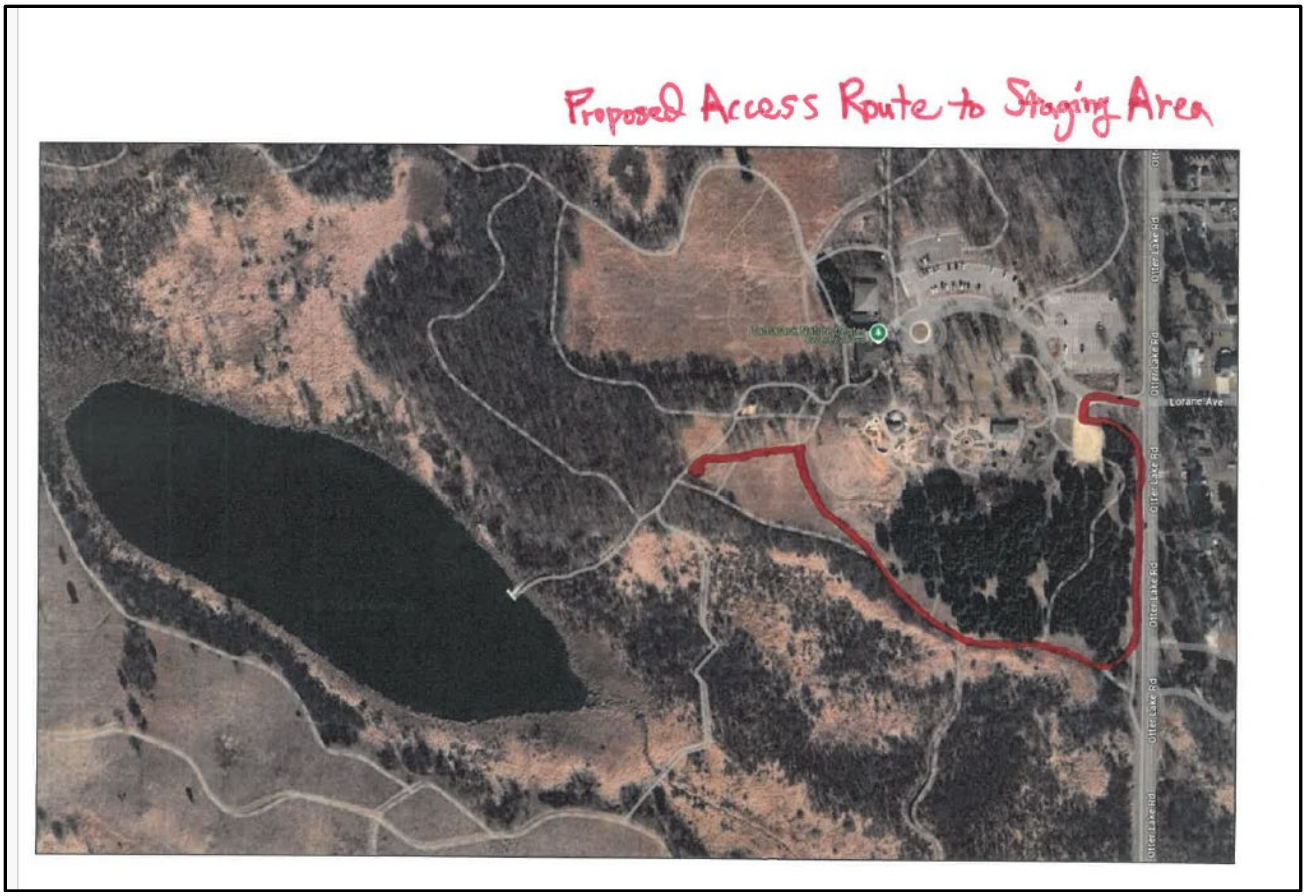
_____
Signature

_____
Printed Name

_____
Date

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit A: Map of access route to the staging area



PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit B: Contract documents

Attached, beginning on following page

CONTRACTOR SERVICES AGREEMENT

(Tamarack Lake Aum Treatment Project)

THIS CONTRACTOR SERVICES AGREEMENT ("**Agreement**") is made and entered into this 28 day of August 2024, by and between Vadnais Lake Area Water Management Organization, a Minnesota joint powers entity ("**VLAWMO**"), and Lake Restoration, Inc., 12425 Ironwood Circle, Rogers, MN 55374 ("**Contractor**"). VLAWMO and Contractor may hereinafter be referred to individually as a "party" or collectively as the "parties."

RECITALS

A. VLAWMO desires to undertake the 2024 Alum Treatment for Tamarack Lake in White Bear Township ("**Project**").

B. The Project is anticipated to involve up to four applications, which would apply up to a total of approximately 78,580 pounds of aluminum sulfate.

C. VLAWMO is working with Barr Engineering as the engineer for this Project ("**Engineer**").

D. The Project involves the Contractor providing all personnel and equipment required to deliver and apply alum within Tamarack Lake ("**Lake**") to mitigate the internal release of phosphorus from Lake sediment as further described in the Request for Quotations attached hereto as Exhibit A (collectively, the "**Contract Documents**").

E. The Contractor will access the Lake through the Tamarack Nature Center property located at 5287 Otter Lake Road ("**Property**"), which is owned by Ramsey County. VLAWMO entered into a property access agreement, which is attached hereto as Exhibit C, ("**Access Agreement**") that sets out the terms and conditions for the use of the Property for the Project.

F. VLAWMO sought written quotes for the Project and selected Contractor to perform the work to complete the Project based on its quote, which is attached hereto as Exhibit B ("**Quote**").

G. Due to delays resulting from efforts to obtain quotes, only one application with up to approximately 20,000 pounds of aluminum sulfate is possible in 2024 and so the Project is broken into multiple phases, with the first phase ("**Phase One**") being the one application in 2024 and additional phases working toward achieving application of the full calculated dose ("**Additional Phases**") being the remaining applications in 2025 and beyond as determined through monitoring data and upon successful negotiation and amendment between VLAWMO and Contractor.

H. Contractor desires to undertake and complete the Project for VLAWMO in accordance with the terms and conditions of this Agreement. VLAWMO and Contractor negotiated some changes to the original draft of this Agreement prior to execution and the parties intend the language in this document to be controlling.

AGREEMENT

In consideration of the mutual promises and agreements contained herein, and intending to be legally bound, VLAWMO and Contractor hereby agree as follows:

1. Scope of Work. Contractor agrees to perform all work and provide all services needed to complete the Project in accordance with the Contract Documents and the terms and conditions of this Agreement (collectively, the "**Work**").

   (a) Contractor agrees to furnish all materials, all necessary tools, and equipment, and to perform all the work and labor necessary to complete the Project. The Project shall be completed in accordance with the terms and conditions of this Agreement, Contractor's Quote, and the Contract Documents.

   (b) Contractor agrees to diligently perform all Work required to complete the Project and to comply in all respects with the Contract Documents. VLAWMO may conduct such inspections of the Work as it may determine is needed. VLAWMO has the right to reject any Work or materials it reasonably determines is defective or unsuitable, or that otherwise does not comply with the Contract Documents or the terms of this Agreement. If VLAWMO rejects any Work or materials, Contractor is responsible for, at its own cost, promptly removing and replacing such defective Work or materials with approved work or materials as needed to comply with the Contract Documents.

   (c) Contractor shall only access the Lake via the routes identified by VLAWMO ("**Access Routes**") and then only in accordance with the terms and conditions of the Access Agreement.

   (d) Contractor shall take all reasonable steps to avoid damaging the Access Routes. If any damages do occur, Contractor is solely responsible at its own cost for repairing all such damages to restore the property to at least the same condition as prior to Contractor utilizing the property as part of the Access Routes.

   (e) Contractor shall be responsible for any damage to or loss of its equipment caused by its performance of this Agreement. Contractor shall also be responsible, if necessary, for placing and maintaining such traffic control devices as may be required to warn the travelling public of the Work being performed. The selection and placement of traffic control devices if required to provide the Work shall be consistent with the standards established in the Minnesota Manual on Uniform Traffic Control Devices.

   (f) Contractor will select the means, methods, and manner for performing the Work.

2. Performance and Payments Bonds. The parties agree performance and payment bonds are not required for this Project.

3. Schedule. Contractor agrees to promptly commence the Work on the Project after VLAWMO has received all required documents and authorizes the start of the Work. Contractor agrees to prosecute the Work diligently and to have the Work required to complete Phase One to the

satisfaction and approval of VLAWMO on or before October 23, 2024 ("**Phase One Completion Deadline**"). Contractor agrees to notify VLAWMO in writing of any and all causes of delay of Work, or any part thereof, within 24 hours after such cause of delay shall arise. If the reason for the delay is reasonably determined by VLAWMO to be outside Contractor's control, such as fire, flood, epidemic, pandemic, strikes, wars, acts of God, acts of public authorities, or delays or defaults caused by public carriers, VLAWMO shall reasonably extend the Phase One Completion Deadline and in such case Contractor shall only become liable for liquidated damages provided for herein for failure to perform during any delay after the time is so extended.

4. Liquidated Damages. Time is of the essence for this Agreement. If Contractor fails for any reason, except upon written consent of VLAWMO, to complete the Project on or before the Phase One Completion Deadline, VLAWMO shall have the right to deduct from any money due or which may become due to Contractor, the amount of two hundred dollars ($200.00) per day for each and every day elapsing between the time stipulated for the completion and the actual date of completion, in accordance with the terms thereof; or if no moneys shall be due Contractor, VLAWMO shall have the right to recover such sum; such deduction to be made or such sum to be recovered not as a penalty, but as liquidated damages. Contractor agrees that it will be difficult for VLAWMO to determine the amount of all damages that VLAWMO would incur as a result of delay and that the liquidated damages set forth in this paragraph are reasonable. Liquidated damages shall not apply to delays directly resulting from the Engineer indicating the application of the materials is not allowed.

5. Compensation.

   (a) This is a unit price, not to exceed amount, contract. VLAWMO agrees to pay Contractor the unit price for each unit identified in Contractor's Quote, which is attached hereto as Exhibit B, to complete Phase One of the Project. VLAWMO will only pay Contractor for the actual units utilized to complete the Project. The quoted unit prices shall only apply to the Work done in Phase One. The parties will reach agreement on the unit prices for Additional Phases as provided herein prior to the Contractor providing any Work on that phase.

   (b) If Contractor properly performs the work, VLAWMO shall, from month to month before completion of the Work, and pursuant to invoices from Contractor, pay Contractor up to 95 percent of the amount already earned under the Agreement. When the work is 95 percent or more completed, upon the sole determination of VLAWMO staff, such portions of the retained price shall be released only as VLAWMO determines it need not be retained to protect the interest of VLAWMO in the satisfactory completion of the Agreement. The balance shall be retained by VLAWMO until the final performance and completion of this Agreement by Contractor to the satisfaction, approval, and acceptance of VLAWMO including provision by Contractor of Minnesota Department of Revenue Form IC-134 or other authorized proof of Contractor's compliance with applicable state laws.

   (c) VLAWMO agrees to pay an additional amount of $ 7,500 commensurate with increased cost to the Contractor for the insurance level that is required by the landowner

(Ramsey County) for Phase 1 of the project. If the same level of insurance will be required by the landowner for Additional Phases, compensation by VLAWMO to the Contractor for the additional insurance cost will be part of the good faith negotiation for the Additional Phases.

(d) No claim for extra work done or materials furnished by Contractor will be made by Contractor or allowed by VLAWMO, nor shall Contractor do any work or furnish any materials not covered by the Contract Documents, unless such work or materials is ordered in writing by VLAWMO. Any such work or materials which may be done or furnished by Contractor without such written order first being given, shall be at Contractor's own risk and expense.

6. Additional Phases of Work. The feasibility and scope of Additional Phases of Work will depend on factors the parties cannot determine at this time including, but not limited to, the effect of the Phase One Work, monitoring data, securing an extension of the Access Agreement, and the labor and material costs for 2025 and beyond. VLAWMO will monitor the results of the Phase One Work through the fall and into the spring of 2025. VLAWMO will then determine the need for and scope of Additional Phases of Work in succession, with the full dose being the final goal for application. Contractor agrees to provide VLAWMO updated mobilization/demobilization and aluminum sulfate costs for Additional Phases of Work. If VLAWMO desires to move forward with any portion of Additional Phases of Work, the parties agree to work in good faith to negotiate an amendment or amendments to this Agreement that set out the scope, timing, and cost for each Phase, as monitoring demonstrates that the timing is appropriate. The amendment(s) will be attached and made part of this Agreement. Except as expressly provided in the amendment(s), the terms of this Agreement shall apply to each successive Phase of Work. No Additional Phases of Work shall occur without the parties entering into an amendment, unless VLAWMO authorizes the Work and Contractor agrees to utilize the negotiated unit prices as for the Phase of Work. Otherwise, if the parties are not able to reach agreement on an amendment(s), either party may terminate this Agreement with respect to Additional Phases of Work upon 10 days written notice to the other party.

7. Non-Discrimination. Contractor agrees that in the hiring of common or skilled labor for the performance of any work under this Agreement or any subcontract hereunder, no Contractor, material supplier, or vendor, shall, by reason of race, color, sex, creed, national origin, disability, age, sexual orientation, status with regard to public assistance, or religion, discriminate against any person or persons who are qualified and available to perform the work to which such employment relates; that neither Contractor nor any subcontractor, material supplier, or vendor, shall in any manner discriminate against, or intimidate, or prevent the employment of any such person or persons from the performance of work under this Agreement or any subcontract hereunder on account of race, color, sex, creed, national origin, disability, age, sexual orientation, status with regard to public assistance, or religion.

8. Insurance. VLAWMO shall require the contractor completing the work to maintain workers' compensation insurance (unless exempt under law) and commercial general liability insurance with coverage limits of no less than $1,000,000 per occurrence, $2,000,000 general aggregate, $2,000,000 products/completed operations total limit, $1,000,000 personal injury, and advertising liability. An umbrella or excess liability policy over primary liability insurance

coverages is an acceptable method to provide the required commercial general liability and employer's liability insurance amounts.

Additional insurance requirements include:

Auto Liability: If the contractor is driving on behalf of the county but not transporting clients as part of the contractor's services under this contract, a minimum of $500,000 combined single limit auto liability, including hired, owned and non-owned.

Professional Liability: Professional liability of no less than $1,000,000 per claim and $3,000,000 aggregate limit.

Work Comp: Workers' Compensation as required by Minnesota Law. Employer's liability with limits of $500,000/$500,000/$500,000.

Additional Insured: The County must be named as an additional insured on all policies and no work can commence until certificates of insurance are delivered to the County.

If requested, the Contractor shall provide the VLAWMO and the Owner a certificate of insurance showing all insurance coverages it has in effect. The Contractor shall have Ramsey County and VLAWMO named as an additional insured on its commercial general liability policy.

9. Indemnification. Contractor will indemnify, defend, and hold harmless VLAWMO, Ramsey County, its officers, board members, employees and agents from any and all actions, claims, costs, reasonable attorney's fees, damages and liabilities of any nature arising out of or by reason of any act or omission of Contractor, its officers, agents, Contractors or employees, in the execution, performance, or failure to adequately perform Contractor's obligations pursuant to this Contract. This indemnification, defense, and hold harmless obligation to protect VLAWMO includes, but is not limited to, claims of trespass or damage to private property resulting from Contractor accessing the Lake. Contractor is not required to indemnify, defend, or hold VLAWMO harmless against its negligence. This obligation shall survive the termination of this Contract. Nothing in this Contract shall constitute a waiver by VLAWMO of any statutory limits or immunities from liability whether provided in Minnesota Statutes, Chapter 466 or elsewhere.

10. Independent Contractor. Contractor and its employees are not employees of VLAWMO. Nothing in the Agreement is intended or should be construed in any manner as creating or establishing the relationship as employer/employee, co-partners, or a joint venture between VLAWMO and Contractor. It is agreed that Contractor and its employees will act as an independent Contractor and acquire no rights to tenure, workers' compensation benefits, unemployment compensation benefits, medical and hospital benefits, sick and vacation leave, severance pay, pension benefits or other rights or benefits offered to employees of VLAWMO. The manner in which the Project is to be performed shall be controlled by Contractor; however, the nature of the services and the results to be achieved shall be specified by VLAWMO.

11. Term. This Agreement shall commence on the date first written above and shall terminate once the Additional Phases of Work are completed and Contractor is compensated for that Work, unless it is terminated earlier as provided herein.

12. Termination.

(a) VLAWMO may terminate this Agreement upon 30 days' written notice, except that if Contractor is in default and fails to cure the default within ten days following written notice by VLAWMO, VLAWMO has the right to terminate this Agreement immediately upon written notice of termination. Contractor will be paid for the Work properly rendered prior to the effective date of termination.

(b) VLAWMO may delay or terminate this Agreement prior to the initiation of the Work if it reasonably determines the Project cannot reasonably proceed due to changed Lake conditions, interference with the Access Routes, or other occurrence that interferes with Contractor's ability to reasonably perform the Work.

(c) The following provisions of this Agreement shall survive expiration, termination, or cancellation of this Agreement: Indemnification; Insurance; Governing Law; Data Practices; and Audit.

13. Amendments. Any amendment to this Agreement must be in writing and signed by both parties.

14. Assignment. No assignment or attempted assignment of this Agreement or of any rights hereunder shall be effective without the prior written consent of VLAWMO.

15. Authority. Each of the undersigned parties warrants it has the full authority to execute this Agreement.

16. No Personal Liability. No officer, agent or employee of VLAWMO shall be personally liable to Contractor, or any successor in interest, in the event of any default or breach by VLAWMO on any obligation or term of this Agreement.

17. Notices. Any notice, demand, or other communication under this Agreement by either party to the other shall be sufficiently given or delivered if it is dispatched by registered or certified mail, postage prepaid, return receipt requested, or delivered personally to the addresses listed in the preamble to this Agreement, or at such other address with respect to either such party as that party may, from time to time, designate in writing and forward to the other as provided in this section.

18. No Agency. Contractor acknowledges that nothing contained in this Agreement nor any act by VLAWMO or Contractor shall be deemed or construed by Contractor or by any third person to create any relationship of third-party beneficiary, principal and agent, limited or general partner, or joint venture between VLAWMO and Contractor.

19. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall constitute one and the same instrument.

20. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the state of Minnesota. Any disputes, controversies, or claims arising out of this Agreement shall be heard in the state or federal courts of Minnesota, and all parties to this

Agreement waive any objection to the jurisdiction of these courts, whether based on convenience or otherwise.

21. Compliance with Laws. Contractor warrants that all work performed pursuant to this Agreement shall be in compliance with all federal, state and local laws, ordinances, regulations, rules, and standards.

22. Entire Agreement. This Agreement, any attached exhibits and any addenda or amendments signed by the parties shall constitute the entire Agreement between VLAWMO and Contractor, and supersedes any other written or oral agreements between and VLAWMO and Contractor.

23. Severability. In the event that any one or more of the provisions of this Agreement, or any application thereof, shall be found to be invalid, illegal or otherwise unenforceable, the validity, legality, and enforceability of the remaining provisions in any application thereof shall not in any way be affected or impaired thereby.

24. Waivers. No failure by any party to insist upon the strict performance of any covenant, duty, agreement, or condition of this Agreement or to exercise any right or remedy consequent upon a breach thereof, shall constitute a waiver of any such breach of any other covenant, agreement, term, or condition, nor does it imply that such covenant, agreement, term or condition may be waived again.

25. Third Party Rights. The parties to this Agreement do not intend to confer on any third party any rights or benefits under this Agreement.

26. Data Practices. Any and all data created, collected, received, stored, used, maintained, or disseminated by the parties pursuant to this Agreement shall be administered in accordance with, and is subject to the requirements of the Minnesota Government Data Practices Act, Minnesota Statutes, Chapter 13.

27. Audit. Contractor agrees that VLAWMO, the Minnesota State Auditor, and Minnesota Legislative Auditor, or any of their duly authorized representatives, at any time during normal business hours and as often as they may reasonably deem necessary, shall have access to and the right to examine, audit, excerpt and transcribe any books, documents, papers, and records that are relevant and involve transactions relating to this Agreement for six years following termination of this Agreement.

IN WITNESS THEREOF, the parties hereto have executed this Agreement as of the day and year written above.

VLAWMO:

By: _____

Its: Board chair

By: _____

Its: Administrator

August 28, 2024

Contractor:

By: Paul Kretsch

Paul Kretsch

Its: V.P. Sales & Marketing

EXHIBIT A
Request for Quotations

[attached hereto]

REQUEST FOR QUOTATIONS

2024 ALUM TREATMENT FOR TAMARACK LAKE
WHITE BEAR TOWNSHIP, MINNESOTA
VADNAIS LAKE AREA WATERSHED MANAGEMENT ORGANIZATION

This Request for Quotations was prepared by Barr Engineering Company.

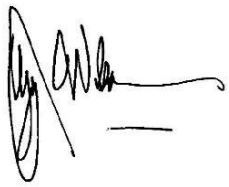
Barr Engineering Company
4300 MarketPointe Drive, Suite 200
Bloomington, MN 55435

2024 ALUM TREATMENT FOR TAMARACK LAKE
WHITE BEAR TOWNSHIP, MINNESOTA
VADNAIS LAKE AREA WATERSHED MANAGEMENT ORGANIZATION

TABLE OF CONTENTS

CERTIFICATION

I hereby certify that these specifications were 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.



Gregory J. Wilson, P.E.
Reg. No. 25782 Date April 29, 2024

REQUEST FOR QUOTATIONS
2024 ALUM TREATMENT FOR TAMARACK LAKE
WHITE BEAR TOWNSHIP, MINNESOTA
VADNAIS LAKE AREA WATERSHED MANAGEMENT ORGANIZATION AND
RAMSEY COUNTY

The Vadnais Lake Area Watershed Management Organization (Owner) is requesting written quotations for conducting an alum treatment of Tamarack Lake in White Bear Township, Minnesota. The Work (as defined below) includes delivering and applying aluminum sulfate and sodium aluminate (referred to as alum) to the lake to mitigate the internal release of phosphorus from lake sediment. The Work is to be completed by October 23, 2024. Quotations must be submitted to the Owner in accordance with the requirements herein by **noon CST on Thursday, May 23, 2024.**

The form of the contract to be entered by the selected contractor and the Vadnais Lake Area Watershed Management Organization is provided in Attachment 1. Respondents must prepare a quote based upon the requirements of the contract form, attached drawings (Figures 1 and 2) and technical specifications. The quotes provided in response to this request must represent full reimbursement for all costs associated with completing the scope of work.

A. Scope of Work

The Work includes:

1. Mobilize and demobilize labor, equipment, and materials, as needed.
2. Deliver and apply alum to the lake.
3. Maintain and protect shoreline areas used for access to lake and areas used for parking of equipment and materials.
4. Install and remove all appropriate signage and buoys (if used) in a timely manner.
5. Restore all land areas directly or indirectly disturbed by the Work.

B. Contractor Qualifications

1. The quote must include documentation of past relevant experience, including documentation of past relevant experience with at least three examples of simultaneous application of liquid aluminum sulfate and liquid sodium aluminate to lakes of 10 acres or larger in size. Furthermore, Contractor must have the necessary equipment utilizing a barge or similar vessel with an Engineer approved microprocessor injection system that allows for uniform application of liquid aluminum sulfate and sodium aluminate at variable boat speeds, as provided in Section 02400 of the Specifications.

2. The Owner reserves the right to make inquiries regarding whether a respondent has the practical knowledge, experience, available personnel, equipment, and financial resources for the timely and professional completion of the Work. The Owner also reserves the right to make inquiries regarding past performance of a respondent on previous contracts. The object of this review and subsequent inquiries is to provide the Owner with the best available information regarding the capabilities of the respondent to complete the Work as specified in the Contract Documents and minimize the risk of awarding work to an unqualified Contractor.

3. The Owner reserves the right to reject all quotes or any quote providing insufficient or unsatisfactory evidence to demonstrate the respondent's ability to perform the Work. Failure on the part of any respondent to have carried out previous contracts satisfactorily, to show adequate experience, or to possess necessary equipment or labor for completion of the work, may be deemed sufficient cause for disqualification of said respondent.

4. The Owner will exercise its discretion to select from among the respondents the Contractor it determines is most likely to complete the Work in a timely and satisfactory manner in accordance with the Contract Documents and specifications.

C. Examination of Contract Documents and Site

1. It is the responsibility of each respondent before submitting a price quote to examine this request for quotations and all attachments (the Contract Documents, as defined in the Agreement form in Attachment 1) and become thoroughly familiar with all terms, conditions, and requirements; visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work; and notify Owner of all conflicts, errors or discrepancies in the request for quotations and all attachments.

2. A site visit is recommended. Portions of the site (shown in Figure 1) are available for inspection during normal working hours with prior notice to the Engineer, who will notify VLAWMO and Ramsey County, at least 48 hours in advance.

3. Any questions shall be directed to:

Greg Wilson, PE
Senior Water Resources Engineer
Barr Engineering Co.
952.832.2672
gwilson@barr.com

D. Work Schedule

1. The Work will begin immediately after Owner issues a notice to proceed to Contractor and must be completed by October 23, 2024. Following notice to proceed, Contractor will notify Engineer and Owner 5 days in advance of the beginning of the Work to allow for notification to Ramsey County.

E. Price Quote Form

1. The undersigned Contractor proposes and agrees, if this quote is accepted, to enter into an agreement with the Owner in the form included in the Contract Documents (Attachment 1), and to perform all work as specified or indicated in the Contract Documents for the prices in its quote and within the times indicated, in accordance with the terms and conditions of the Contract Documents. Contractor accepts all terms and conditions of the request for quotes. A submitted quote will remain subject to acceptance for 45 days after the date for submission of quotes stated above.

2. In submitting this quote, the Contractor represents that it has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents, and hereby acknowledges receipt of the following addenda:

Addendum No.	Addendum Date

3. The price quote form may be completed in ink, by typewriter, or by computer program.
4. The address and telephone number for communications regarding the price quote must be shown on the price quote form.

Item	Description	Unit	Estimated Quantity	Unit Price	Extension
1.1	Mobilization to Tamarack Lake	LS	1		
1.2	Liquid Aluminum Sulfate Application to Tamarack Lake	Gallons	7,600		
1.3	Liquid Sodium Aluminate Application to Tamarack Lake	Gallons	3,800		
				Total Quote	

GRAND TOTAL OF BASE PRICE QUOTE EXTENSIONS

(in words)_____Dollars

($_____)

F. Submission of Price Quotes

1. All price quotes shall be submitted on the unaltered forms included with the quotation. The blank spaces on the form shall be filled in correctly in ink, typewritten or printed where

indicated for each and every item for which a quantity is given, and the respondent shall clearly indicate the prices for which he/she proposes to do each item of the Work.

2. All costs to complete the Work will be considered to be included in the quoted price and no additional compensation will be provided.
3. The price quote submittal must include documentation of past relevant experience, in a format of choice, including documentation of past relevant experience with at least three examples of simultaneous application of liquid aluminum sulfate and liquid sodium aluminate to lakes of 10 acres or larger in size.
4. The price quote form including required attachments shall be submitted by email to Greg Wilson at gwilson@barr.com or by mail to:

   Barr Engineering Company
   4300 MarketPointe Drive, Suite 200
   Bloomington, MN 55435
   Attn: Greg Wilson gwilson@barr.com
5. Price quotes must be received not later than **noon CST, May 23, 2024**.

G. Review and Signing of Agreement

1. Owner will notify the Contractor selected to complete the Work of its selection on or before the close of business June 27, 2024, and will provide the required number of unsigned counterparts of the Contract Documents for the Work.
2. The respondent shall review Attachment 1, noting all insurance requirements. Attachment 1 includes baseline terms regarding indemnification, insurance, property, and data management. Owner is disinclined to negotiate the terms of the Contract Documents but encourages respondents to call to discuss any terms. Modification of terms in the Agreement is solely at Owner's discretion.
3. Within ten calendar days after receiving notice of selection, the selected Contractor must sign and deliver the required number of counterparts of the Contract Documents with attachments to Owner, in accordance with the instruction for delivery in the notice, along with the required evidence of insurance and any other required submittals.

H. Definitions

1. Terms used in the Contract Documents have the following meanings:
   a. **Agreement**– the template document included in the Contract Documents titled Agreement between Vadnais Lake Area Watershed Management Organization and Contractor, to be completed and executed by Vadnais Lake Area Watershed Management Organization and the selected Contractor (Attachment 1).
   b. **County** – the County of Ramsey, fee title holder of the Site.
   c. **Contract Documents**– the documents listed in the recitals of the Agreement.
   d. **Engineer**– Barr Engineering Co., the owner's agent, responsible for project oversight on behalf of the Owner.
   e. **Owner**– Vadnais Lake Area Watershed Management Organization.
   f. **Project** – is synonymous with the Work.

g. **Site**– the area within which the Work is to be performed, shown in Figures 1 and 2.

h. **Selected Contractor or Contractor** – the respondent selected by Owner to complete the Work. The selected contractor becomes the Contractor on execution of the agreement.

i. **Work**– pursuant to the Contract Documents, furnishing all materials, equipment, and labor to complete the scope of work in Section A of this request for quotations and the items in the Price Quote Form.

Communications concerning this price quote shall be addressed to the address of respondent at the address indicated below.

This quotation is submitted by:

Firm Name: _____

By (Typed or Printed): _____

Signature: _____

Title: _____

Official Address: _____

_____

_____

_____

Phone: ( ) _____

Federal Tax I.D. No. _____

Date: _____

Experience With Alum Applications to Lakes (Yes or No): _____

Contact Information for Project Reference(s): _____

TECHNICAL SPECIFICATIONS

REQUEST FOR QUOTATIONS
2024 ALUM TREATMENT FOR TAMARACK LAKE
WHITE BEAR TOWNSHIP, MINNESOTA
VADNAIS LAKE AREA WATERSHED MANAGEMENT ORGANIZATION

Division 1 – General Specifications

SECTION 01000

SUMMARY OF WORK

PART 1: GENERAL

1.01 CONTRACT DOCUMENTS

A. The Contract Documents are as defined in the Agreement. The terms of the Contract Documents apply to these Specifications as fully as though repeated herein.

B. The format of these Specifications is based upon the CSI MASTERFORMAT, however differences in format and subject matter location do exist. It is the respondent's sole responsibility to thoroughly read and understand these Specifications and request written clarification of those portions which are unclear.

C. Division of the Work as made in these Contract Documents is for the purpose of specifying and describing work to be completed. There has been no attempt to make a classification according to trade or agreements, which may exist, between Contractor, Subcontractors, or trade unions or other organizations. Such division and classification of the Work shall be the Contractor's sole responsibility.

1.02 EXISTING SITE CONDITIONS AND USES

A. Project limits and treatment zone are shown on Figures 1 and 2 (Drawings).

B. Owner has acquired an access agreement for the Site, as shown in Figure 1. Access to Tamarack Lake will be provided with the locations for boat ingress/egress and truck parking to be identified by Engineer and the Contractor as part of a pre-project site visit.

1.03 WORK COVERED BY CONTRACT DOCUMENTS

A. The overall scope of the Work which is more fully described in these Contract Documents includes, but is not necessarily limited to, furnishing all labor, tools, equipment, and materials necessary to:

1. Mobilize and demobilize labor, equipment, and materials, as needed.
2. Deliver and apply alum and sodium aluminate to the treatment zone of the lake.
3. Maintain and protect shoreline areas used for access to lake and areas used for material application.
4. Restore all land areas directly or indirectly disturbed by the Work.

B. It is the intent of the Contract Documents to cover all aspects of the Work. Should there be some item or items not shown on the Drawings or not described in these Specifications which are required for the Work, those items and the furnishing of all labor, materials, and

equipment shall be considered incidental to the Work and no additional compensation will be provided.

C. The Work includes the furnishing of all labor, equipment, tools, machinery, materials, and other items required for alum and sodium aluminate treatment of Tamarack Lake as specified. Equipment furnished shall be in safe operating condition and of adequate size, capacity, and condition for the performance of the Work.

D. Contractor shall be solely responsible for the coordination of its activities regarding the Work with the activities of Subcontractors and Engineer.

1.04 WORK BY ENGINEER

A. Engineer will obtain a permit from the Minnesota Pollution Control Agency for aluminum treatment of Tamarack Lake and will provide documentation of approval to Contractor. Contractor shall request such information from Engineer a minimum of five days prior to the time when such information is needed.

1.05 OWNER FURNISHED PRODUCTS

A. Owner will not furnish any products for this Project.

1.06 CONTRACTOR USE OF PREMISES

A. Definition of Site: The Site is defined as the area within the project limits shown on Figure 1. Within the project limits, the Contractor shall limit ingress/egress and operations, including materials and equipment parking, to Tamarack Lake and the access areas as shown on Figure 1, which is the area over which Owner will obtain the necessary access and use rights. Any disturbance inside the project limits to existing facilities, pavements, sidewalks, and/or vegetation and outside the project limits shall be fully restored in-kind or better at the Contractor's expense. Contractor shall coordinate and finalize parking areas with the Owner prior to beginning the Work to ensure that public access to Tamarack Lake and pedestrian and vehicle traffic is maintained throughout the duration of the Work. Contractor is subject to the conditions of the property access agreement as described in Attachment 2, including limiting the transport of equipment or supplies along the boardwalk using wheeled carts or hand-carried.

B. Hours of Operation: Contractor will ascertain hours approved by Ramsey County for conducting the Work and limit conduct of operations in accordance with same and all other local laws and regulations.

C. Unfavorable Treatment Conditions:

1. No portion of the Work shall occur under conditions which would adversely affect the quality of the Work pursuant to the criteria of Paragraph 3.02 of Section 02400, and the judgment of Engineer as necessary to apply those criteria, unless special means or precautions, approved by the Engineer, are taken to perform the Work in a proper and satisfactory manner.

1.07 SEQUENCE OF WORK

A. Alum application shall be conducted such that the Work is completed by October 23, 2024.

B. Contractor shall determine the sequence of Work required to efficiently progress with the Work.

1.08 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01000

SECTION 01010

MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 GENERAL

A. This Section of the Specifications describes the measurement and payment for the Work to be done under the items listed on the Quote Form.

B. Each unit or lump sum price stated on the Quote Form shall constitute full compensation as herein specified for each item of work completed in accordance with the requirements of the Contract Documents including Figure 1, Figure 2, and Specifications, including all clean up and restoration.

C. All costs in connection with the Work, including furnishing all materials, supplies and appurtenances; providing all equipment and tools; and performing all necessary labor, coordination, supervision, and management to fully complete the Work shall be included in the unit prices or unit lump sum prices quoted on the Quote Form. All Work not specifically set forth as a separate cost item herein shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the amounts and prices submitted on the Quote Form. The quote price shall include all work necessary to complete all of the Work. Variation in the supply of alum, sodium aluminate or any other component of the Work will not be a basis for a change in the contract price.

1.02 ESTIMATED QUANTITIES

A. All estimated quantities for Unit Price items in the Quote Form are approximate and are to be used only as a basis for determining the initial Contract Price. The actual amount of work to be done or materials to be furnished under the Unit Price items may differ from the estimated quantities. The basis of payment for work or materials placed will be the actual quantities of work performed or material placed. The Contractor agrees to make no claim for damages, anticipated profits, or otherwise due to any difference between the quantities of Work actually performed or materials placed, and the estimated quantities included in the Quote Form.

1.03 INTENT OF QUOTE FORM ORGANIZATION

A. Payment for all Work shall be in accordance with the terms and conditions set forth elsewhere in the Contract Documents and the Contractor's Quote prices set forth in Contractor's conformed Quote Form. The cost items set forth in the Quote Form subdivide the Work for purposes of measurement and payment only and are intended to represent the entire and complete Project as set forth in the Contract Documents. The cost items set forth in the Quote Form shall constitute full compensation to Contractor for providing all supervision, labor, materials, equipment, tools, and supplies, and overhead and profit to complete the Work in complete accordance with the Contract Documents.

B. The following paragraphs provide additional descriptions of the quote line items subject to the provisions of paragraphs 1.01, 1.02, and 1.03 of this Section

1. Some of the Quote items are based on unit lump sum prices. Partial progress payment for those unit lump sum items shall be made in accordance with monthly estimates of percent completed for each item included in the breakdown in Contractor's approved Schedule of Values.

2. Quote items are based on Unit Prices. For those items, progress payments shall be based on the actual quantities of each item of Work completed in accordance with the Contract Documents.

C. The procedures for submitting and processing progress payments are set forth elsewhere in the Contract Documents.

1.04 QUOTE ITEMS

A. Mobilization/Demobilization

1. Method of Measurement: Mobilization/Demobilization will be measured on the basis of a single lump sum (L.S.) unit.

2. Basis of Payment: Contractor will be paid a lump sum (L.S.) price for mobilization/ demobilization on completion of the Work. The lump sum price shall be payment in full for the costs of all supervision, labor, materials, equipment, overhead and profit, and performing all operations as are necessary for mobilization to and demobilization from the Work site, all complete as specified. This item shall include the Contractor's premium for any special insurance obtained for this project; development and maintenance of appropriate health and safety plan; equipment mobilization and demobilization; lake use restrictions signage and control of other watercraft during application; site restoration not specifically paid for elsewhere in this Specification, site cleanup; preparing and transmitting the required submittals; obtaining all licenses required of the Contractor to complete all aspects of the Work unless otherwise identified elsewhere in these Specifications; spill protection; and all incidentals and other items not specifically paid for but included in the total scope of the Work.

B. Application of Aluminum Sulfate to Tamarack Lake

1. Method of Measurement: Liquid aluminum sulfate will be measured as gallons applied to the lake to achieve the specific dose determined by the Engineer as described in Section 02400. At the end of each day, Contractor shall provide Engineer with documentation of total number of gallons applied that day along with percent aluminum in the liquid aluminum sulfate. Excess alum not applied directly to the lake shall not be included in this measurement.

2. Basis of Payment: Contractor will be paid a unit price per gallon of aluminum sulfate applied, all complete as specified. This unit price shall be payment in full for the costs of all supervision, materials, equipment, labor, supplies, profit and overhead, and perform all operations necessary to transport and apply the chemical to selected areas, all complete as specified.

C. Application of Sodium Aluminate to Tamarack Lake

1. Method of Measurement: Liquid sodium aluminate will be measured as gallons applied to the lake to achieve the specific dose determined by the Engineer as described in Section 02400. At the end of each day, Contractor shall provide Engineer with documentation of total number of gallons applied that day along with percent aluminum in the liquid sodium aluminate. Excess chemical not applied directly to the lake shall not be included in this measurement.

2. Basis of Payment: Contractor will be paid a unit price per gallon of sodium aluminate applied, all complete as specified. This unit price shall be payment in full for the costs of all supervision, materials, equipment, labor, supplies, profit and overhead, and perform all operations necessary to transport and apply the chemicals to selected areas, all complete as specified.

1.05 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01010

SECTION 01070

PROJECT MEETINGS
PART 1: GENERAL

1.01 TREATMENT PLANNING CONFERENCE

A. After Owner notifies Contractor of selection to complete the Work, Engineer will schedule a treatment planning meeting that shall be attended by Owner, Contractor, Engineer, and others as appropriate. The meeting will be scheduled as far in advance of the date the Work is to start as is practical.

B. Agenda items may include:

1. Distribution of Contract Documents

2. Designation of responsible personnel for all parties, lines of communication, and lines of authority, including Project Contacts (see Paragraph 1.04 of this Section).

3. Scope of work and the anticipated schedule of operations

4. Critical work sequencing

5. Site access for aluminum distribution to barge or boat

6. Record documents and reporting

7. Site safety and security procedures

8. List of major subcontractors

9. Procedures for processing change orders

10. Use of premises including equipment and material storage

11. Materials deliveries

12. Housekeeping procedures

1.02 PROGRESS PHONE CALLS/EMAILS

A. Progress phone calls or emails may be scheduled by the Engineer as needed at a time mutually agreeable to the Contractor and Engineer. A preferred time for one of these calls or emails is prior to Contractor's submittal of Application for Payment.

B. Following each phone call/email, the Engineer will prepare and distribute to Owner and Contractor copies of the notes of the phone call/email. These will include a brief summary of the progress of the Work since the previous phone call/email.

1.03 UNSCHEDULED MEETINGS

A. The Contractor shall attend other unscheduled meetings which may be reasonably requested by Engineer or Owner to discuss unanticipated changes in the Work, or conditions at the site, or other issues and which must be resolved before progression of work.

1.04 PROJECT CONTACTS

A. Contractor shall submit to Engineer the name of personnel available for ongoing technical support and who are familiar with the Project and are responsible for its completion.

B. The list should include name(s), functional title(s), mailing address(es), phone number(s) and email address(es).

C. At least two phone numbers shall be furnished which will provide 24-hour answering by a competent technical representative of Contractor in the event of an emergency or other unanticipated condition requiring immediate attention. At least one person shall be available at all times for immediate response to the site within 2 hours of being called. The responding person shall be the Contractor's representative at the Site and shall have authority to act on behalf of Contractor.

1.05 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01070

SECTION 01080

SUBMITTALS

PART 1: GENERAL

1.01 GENERAL SUBMITTAL PROCEDURES

A. Contractor shall:

1. Transmit each submittal labeled with the Project name, name of the submittal, and Section and page number of these Contract Documents in which the submittal was required. Indicate the type or purpose of the submittal as more fully described elsewhere in this Section with regard to the Schedule of Submittals. Transmit the correct number of copies as described below for each type of submittal. Each submittal shall be accompanied by a transmittal letter stating the same information.

2. Transmit all submittals to Engineer at the address set forth in the Quote Form and to the attention of the Project Engineer designated by Owner.

3. Apply Contractor's stamp, signed or initialed certifying that review and coordination of information is in accordance with the requirements of the Work and Contract Documents. Unstamped or unsigned submittals will be returned without action.

4. Schedule submittals to expedite Project and in accordance with the Schedule of Submittals to be prepared by Contractor. Coordinate submission of related items.

5. Identify all variations or deviations from the Contract Documents and identify alternative products or system limitations which may be detrimental to successful performance of the completed Work.

6. Provide space for Engineer review stamps and comments on all submittals.

7. Revise and resubmit submittals as required in a timely manner. Identify all changes made since previous submittal.

8. Promptly distribute copies of reviewed submittals to Subcontractors, suppliers, and other concerned parties. Instruct parties to promptly report any inability to comply with provisions.

9. Do not proceed with any Work requiring a submittal, including resubmittal, to Engineer until the submittal has been returned to Contractor without a requirement for resubmittal.

B. All submittals that are made that are not specifically required by the Contract Documents will be returned without action.

C. All submittals shall come from the Contractor and submittals directly from Subcontractors or vendors will be returned without action.

1.02 PROGRESS SCHEDULE

A. Contractor shall submit an estimated progress schedule and a finalized progress schedule.

B. The Contractor shall revise the finalized progress schedule from time to time, as may reasonably be requested and approved by Engineer or Owner, to reflect the current status and progress of the Work and the operations necessary to complete the Work as required.

C. The progress schedule shall clearly illustrate the sequence of the Work (by locations and other factors as may be appropriate) to be followed by Contractor to efficiently progress with the Work.

1.03 REVIEW OF SUBMITTALS

A. The Engineer's review of engineering data will cover only general conformity of the data to the Specifications and Contract Documents, external connections, and interfaces with equipment and materials furnished under separate specifications. The Engineer's review does not indicate a thorough review of all dimensions, quantities, and details of the equipment, material, device, or item indicated or the accuracy of the information or documentation submitted; nor shall review or approval by the Engineer be construed as relieving the Contractor from any and all responsibility for errors or deviations from the requirements of the Contract Documents.

B. All engineering data submitted, after final processing by the Engineer shall become a part of the Contract Documents and the work indicated or described thereby shall be performed in conformity therewith unless otherwise required by the Owner.

1.04 SUBMITTAL FOR INFORMATION OR DOCUMENTATION

A. Submit one copy to Engineer.

B. Submittal shall be made at least 5 days before the subject of the submittal is to be incorporated into the Work.

C. Submittal is for the purpose of formal verification that the subject of the submittal conforms to the requirements of the Specifications, for formal documentation of the Work, or both.

D. No action is required by Owner or Engineer. Engineer will generally notify Contractor if deficiencies are identified; however, Contractor is solely responsible for ensuring that the subject of the submittal conforms to the requirements of the Specifications.

1.05 SUBMITTAL FOR REVIEW

A. Submit two copies to the Engineer.

B. Submittal shall be made at least 10 days before the subject of the submittal is to be incorporated into the Work. Engineer will respond within 5 days from receipt of submittal.

C. Submittal is for the purpose of providing opportunity to Engineer for review and comment on the subject of the submittal.

D. Engineer will respond to the submittal either with a list of comments or indicating no comments.

E. If Engineer's comments indicate a deficiency with respect to the requirement of the Specifications, Contractor shall amend the submittal and resubmit. Engineer will again respond to the resubmittal.

F. If Engineer's comments are in regard to an issue which based upon the Contract Documents is at Contractor's discretion, Contractor shall furnish additional information provide justification, and otherwise cooperate in addressing and resolving Engineer's comments.

G. Contractor shall remain solely responsible for ensuring that the subject of the submittal conforms to the requirements of the Specifications.

1.06 SUBMITTAL FOR APPROVAL

A. Submit two copies to the Engineer.

B. Submittal shall be made at least 7 days before the subject of the submittal is to be incorporated into the Work. Engineer will respond within 5 days from receipt of submittal.

C. Submittals shall be stamped with Contractor's approval. Contractor's stamp shall be a representation that Contractor has assumed full responsibility for determining the submittal requirements and verifying that the subject of the submittal conforms to the requirements of the Specifications. Submittals not bearing Contractor's stamp will be returned without review or action.

D. Engineer will review, make notations as appropriate, stamp, and return submittals to Contractor. Engineer's stamp and Contractor's required action are described below:

1. NO EXCEPTIONS TAKEN. Contractor may proceed without further action.

2. RECOMMENDED REVISIONS NOTED. Contractor shall review Engineer's notations and revise subject of submittal as required to conform to the requirements of the Drawings and Specifications before proceeding with the Work. Resubmittal is not required.

3. RESUBMIT. Contractor shall review Engineer's notations, revise subject of submittal as required to conform to the requirements of Figure 1, Figure 2, and the Specifications, and resubmit to Engineer for additional action.

4. REVIEW COMPLETE, FURNISH THREE FILE COPIES. Contractor shall furnish the requested number of copies and may proceed without further action.

E. Work may proceed when submittals have been returned marked RECOMMENDED REVISIONS NOTED, provided the work is performed in accordance with the Engineer's notations, or NO EXCEPTIONS TAKEN.

1.07 ALTERNATE PRODUCT SUPPORTING DATA

A. If Contractor proposes to use alternate or substitute products, Contractor shall submit written application.

B. Submit two (2) copies of literature, drawings, and any other data necessary to substantiate that proposed substitute is equivalent or equal to the item named, and otherwise meets the conditions established in the Specifications.

C. Do not proceed with product installation or use until written approval by Engineer is received.

1.08 RECORD DOCUMENTS

A. Submit one original copy to Engineer of all record documents (or clearly legible copies) prior to substantial Completion.

B. Record documents consist of all Drawings, Specifications, Addenda, Change Orders, and Shop Drawings legibly annotated to reflect all changes made during construction.

1.9 WARRANTY OR GUARANTEE CERTIFICATES

A. Submit three (3) executed copies prior to Substantial Completion.

B. All warranty or guarantee certificates shall be signed by Contractor and all other parties as requested in specific sections.

1.10 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01080

SECTION 01085

SAFETY

PART 1: GENERAL

1.01 GENERAL

A. In accordance with generally accepted chemical treatment practices, the Contractor shall be solely and completely responsible for job site conditions and safety procedures and programs, including safety and health of all persons and property, on those portions of the site affected by or used by Contractor, Contractor's employees, subcontractors, agents, and others during performance of the Work. This requirement will apply continuously and not be limited to normal working hours. Observation of the Work and Contractor's performance by Owner and Engineer is not intended to include review of the adequacy of the Contractor's safety and health procedures and programs on or near the construction site. The Contractor is solely responsible for the protection of property and the safety and health of its employees, Subcontractors, Suppliers, agents, and others on or near the Site.

1.02 SAFETY

A. In addition to the requirements of the Agreement, the Contractor shall be responsible for:

1. Furnishing Contractor's employees, as well as any subcontractor's and supplier's employees, with all safety equipment and other protection devices needed to comply with Laws and Regulations or accepted safety practices.

2. Any safety violation and/or fine that may occur because of any neglect by Contractor, Contractor's employees, Contractor's subcontractors, or any third party under Contractor's supervision or direction. Contractor shall also be responsible for any safety violation and/or fine Owner may incur due to neglect by Contractor, Contractor's employees, Contractor's subcontractors, and any third party under Contractor's supervision or direction at the Site.

3. Contractor shall be responsible for implementing adequate safety requirements for workers, passers-by, both humans and pets, at all times, during both working and nonworking hours, all days and nights, for the duration of the Work.

1.03 HAZARD COMMUNICATION PROGRAMS

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with applicable laws and regulations.

1.04 EMERGENCIES

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused

thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a change order will be issued.

1.05 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01085

SECTION 01095

CLOSEOUT PROCEDURES

PART 1: GENERAL

1.01 RECORD DOCUMENTS

A. The Contractor shall maintain at the Site (or in Contractor's possession) one set of record documents including all Drawings, Specifications, and Change Orders in good condition and legibly annotated to show changes made during construction. Store record documents separate from documents used for construction, clearly mark, and make accessible to Engineer and Owner at all times.

B. Record information on record documents concurrent with treatment progress. Engineer or Owner may require Contractor to improve its performance with regard to recording information during the treatment process.

C. Submit record documents and other submittals required by other sections of these Specifications.

1.02 CLEANUP

A. The Contractor shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work, and at the completion of the Work, shall remove all waste materials, rubbish, and debris from the premises as well as all tools, treatment equipment, and surplus materials. Contractor shall leave the site clean.

1.03 GUARANTIES AND WARRANTIES

A. The Contractor shall guarantee all work against all defects as specified in the Agreement or as otherwise required for specific items in these Specifications. The Contractor shall repair or replace any such defective Work to conform to the provisions of the Contract and without expense to the Owner, within one (1) day after notification in writing by the Owner or Engineer of such defective Work. If the Contractor does not make said repairs or replacements or have made arrangements for the correction thereof within the period specified above, the Owner may do so and will charge the cost of same to the Contractor. The Contractor shall perform repair work so as to cause the Owner a minimum of inconvenience and interruption of services.

1.04 FINAL SUBMITTALS

A. Contractor shall complete all submittals required by these Contract Documents prior to the payment of Contractor's Final Application for Payment by Owner. Final payment shall not become due and payable until 10 days after all submittals have been made acceptable to Engineer.

B. When the Work has been completed, Engineer will prepare a final statement showing the accepted quantities of every item of work performed by the Contractor. All estimates upon which previous payments have been based are subject to correction in the final statement. The

final voucher, showing the accepted quantity and value of each item of work performed and all amounts to be retained or deducted under the provisions of the Agreement, will be submitted to the Contractor for approval before being passed for payment.

1.05 BASIS FOR COMPENSATION

A. All costs to comply with the requirements of this Section of the Specifications shall be considered to be included in the Contract Price and no additional compensation will be provided.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01095

SECTION 01100

MOBILIZATION AND DEMOBILIZATION

PART 1: GENERAL

1.01 MOBILIZATION/DEMOBILIZATION

A. The Work covered by mobilization/demobilization consists of, but is not limited to furnishing all labor, equipment, and materials, and performing all operations necessary to move personnel, equipment, supplies, and incidentals to the project site to establish and maintain project materials and equipment storage areas, parking areas, and other areas necessary for the Work; provide public convenience and safety, barricades, lights and warning signals; provide water and chemical tracking control; perform all work that must be completed before beginning work on the project for which payment is not provided elsewhere in these Specifications; remove all equipment, materials and labor from the project site after it is no longer necessary and restore the Work area; furnish all bonds and insurance certificates obtained specifically for this project, all in accordance with the Contract Documents, and in compliance with all requirements of Division 1 of these Specifications.

1.02 BASIS FOR COMPENSATION

A. Compensation for all Work covered under this section of these Specifications shall be in accordance with the provisions set forth in Section 01010, Unit Price Measurement and Payment.

PART 2: PRODUCTS [NOT USED]
PART 3: EXECUTION [NOT USED]

END OF SECTION 01100

Division 2 – Technical Specifications

SECTION 02400

CHEMICAL TREATMENT

PART 1: GENERAL

1.01 DESCRIPTION

A. All Work included in this Section shall be performed in accordance with the following paragraphs, the General Requirements set forth in Division 1 of these Specifications, and the provisions of the other Contract Documents.

B. Work covered by this Section includes furnishing all supervision, labor, materials, and equipment required to deliver, store, and apply liquid aluminum sulfate and sodium aluminate to Tamarack Lake, as shown on Figure 2 (Drawings). The Contractor shall:

1. Furnish, deliver, store and apply liquid aluminum sulfate and sodium aluminate to Tamarack Lake to mitigate the internal release of phosphorus from the lake sediment.

2. Treat at appropriate weather and temperature conditions as directed by the Engineer.

3. Furnish, install, and remove all appropriate signage and buoys (if used) in a timely manner.

4. Restore all areas directly or indirectly disturbed by the Work.

5. All other Work required for a completion of the aluminum treatment as a project whole.

1.02 REFERENCES

A. AWWA B403-88 American Water Works Association Standard for Aluminum Sulfate.

B. AWWA B405-06 American Water Works Association Standard for Sodium Aluminate.

1.03 SEQUENCE OF WORK

A. Treatment is to occur once in the fall of 2024.

B. The Contractor shall be responsible for all labor, aluminum sulfate, sodium aluminate, aluminum sulfate and sodium aluminate application equipment and arrangements for the timely delivery of aluminum sulfate and sodium aluminate required to complete the project.

C. Alum application shall be conducted such that the Work is completed by October 23, 2024.

1.04 SUBMITTALS

A. The Contractor shall submit a spill prevention and contingency plan to Engineer for review prior to beginning Work on the Project.

B. The Contractor shall submit certificate(s) indicating all materials meet requirements of these Specifications before treatment occurs. The Contractor shall submit the item, applicable reference specification, class, type, manufacturer, and distributor. The Contractor shall also submit the results of aluminum lot testing of materials delivered to the site, including an analysis of the metals content of the material, before treatment.

C. The Contractor shall submit GPS coordinates and corresponding application rates and amounts of aluminum sulfate and sodium aluminate applied to the lake. This data shall be collected by the Contractor in real-time during the application and submitted to Engineer on a daily basis.

1.04 BASIS FOR COMPENSATION

A. Compensation for all Work covered under this Section of these Specifications shall be in accordance with the provisions set forth in Section 01010, Unit Price Measurement and Payment.

PART 2: PRODUCTS

2.01 CHEMICALS

A. Aluminum Sulfate (Alum)

1. Liquid aluminum sulfate supplied shall meet the requirements of AWWA B403-88. The liquid aluminum sulfate **[$Al_2(SO_4)_3 \bullet 14.3(H_2O)$]** shall be of commercial grade appropriate for the application with an aluminum content of **4.4%** Al^{+3} (Aluminum) by weight.

B Sodium Aluminate

1. Sodium aluminate supplied shall meet the requirements of AWWA B405-06. The sodium aluminate **[$Na_2Al_2O_4$]** shall be of commercial grade appropriate for the application with an aluminum content of **10.4%** Al^{3+} (Aluminum) by weight.

PART 3: EXECUTION

3.01 DELIVERY, STORAGE AND HANDLING

A. The Contractor shall provide the name and location of the proposed chemical supplier with the Quote, and will be responsible for all coordination with the aluminum supplier necessary to insure timely delivery to the project site. The Contractor shall confine all equipment and materials within the public rights-of-way or property access agreement areas as shown on Figure 1 and otherwise in a safe, secure, and environmentally sound manner. Conformance to these requirements shall be determined by the Contractor, subject to disapproval of the Engineer, whose failure to disapprove does not, however, constitute any shift of responsibility

to properly handle equipment and materials from Contractor to Engineer. Tank truck haul routes and site access shall be as directed by Engineer. If gradual off-loading is required, the contractor shall be responsible for all demurrage charges.

B. The Contractor shall provide notice to Owner of delivery of equipment and materials seven days prior to the delivery date.

C. The Contractor shall maintain a copy of the spill prevention and spill contingency plan described on site for the duration of the project.

3.02 UNFAVORABLE TREATMENT CONDITIONS

A. Application of aluminum shall not occur when wind speeds directly above the lake surface exceed 10 miles per hour.

B. Application of aluminum shall not occur if it can be reasonably expected (forecast) that a significant precipitation event (greater than 0.5 inches in 24 hours) shall occur during treatment or begin within 24 hours after treatment completion.

C. Treatment will cease and all personnel will leave the water when thunder and/or lightening are observed. Treatment can resume 30 minutes after the last sound of thunder or lightening flash.

D. Application of alum shall not occur if lake water temperatures drop below 45^{o} F.

E. No portion of the Work shall occur under conditions which would adversely affect the quality of the Work, unless special means or precautions, approved by the Engineer, are taken to perform the Work in a proper and satisfactory manner.

3.03 LOCATION OF WORK

A. Project treatment limits and property access agreement areas are shown on Figures 2 and 1 (Drawings), respectively. Owner has acquired a property access agreement to use portions of the Site outside of the public water area of the lake as described in Attachment 2. Contractor shall apply aluminum within the Treatment Area as shown on Figure 2 (Drawings).

3.04 ALUMINUM APPLICATION

A. The Contractor shall conduct the aluminum application utilizing a barge or similar vessel with an Engineer approved microprocessor injection system that allows for uniform application of liquid aluminum sulfate and sodium aluminate at variable boat speeds. Aluminum sulfate and sodium aluminate application shall be made to the indicated area of Tamarack Lake identified in Figure 2 at the specified doses.

B. The Contractor shall ensure that the aluminum sulfate and sodium aluminate is **evenly distributed throughout the treatment area and that the appropriate dose is applied to the appropriate zone shown in Figure 2.** The Contractor shall maintain records to verify the area of coverage (also see Section 1.04).

C. Engineer will monitor the ambient pH in the lake during the aluminum treatment application. If at any time during treatment, the depth-averaged ambient pH in the lake falls below 6.0 or

increases above 9.0 S.U., Contractor will stop the treatment. Treatment will not resume until authorized by the Engineer.

D. The aluminum treatment shall be made at a sufficient rate to insure long term sediment phosphorus inactivation, as determined by the Engineer. Unless advised otherwise by the Engineer, the Contractor shall apply aluminum sulfate at a dose rate of **745** gallons per acre in the treatment zone with one gallon of sodium aluminate buffer applied for every two gallons of aluminum sulfate applied. It is Contractor's responsibility to ensure that enough material is procured to complete the Work in accordance with the dosing requirements stated herein.

E. The Engineer estimates that this treatment rate will require a total of **7,600** gallons of commercial grade (4.4% Al^{3+} Aluminum) liquid aluminum sulfate [**$Al_2(SO_4)_3 \bullet 14.3(H_2O)$**] and **3,800** gallons of commercial grade (10.4% Al^{3+} Aluminum) sodium aluminate **[$Na_2Al_2O_4$]**. It is Contractor's responsibility to ensure that enough material is available to complete the Work in accordance with the dosing requirements stated herein.

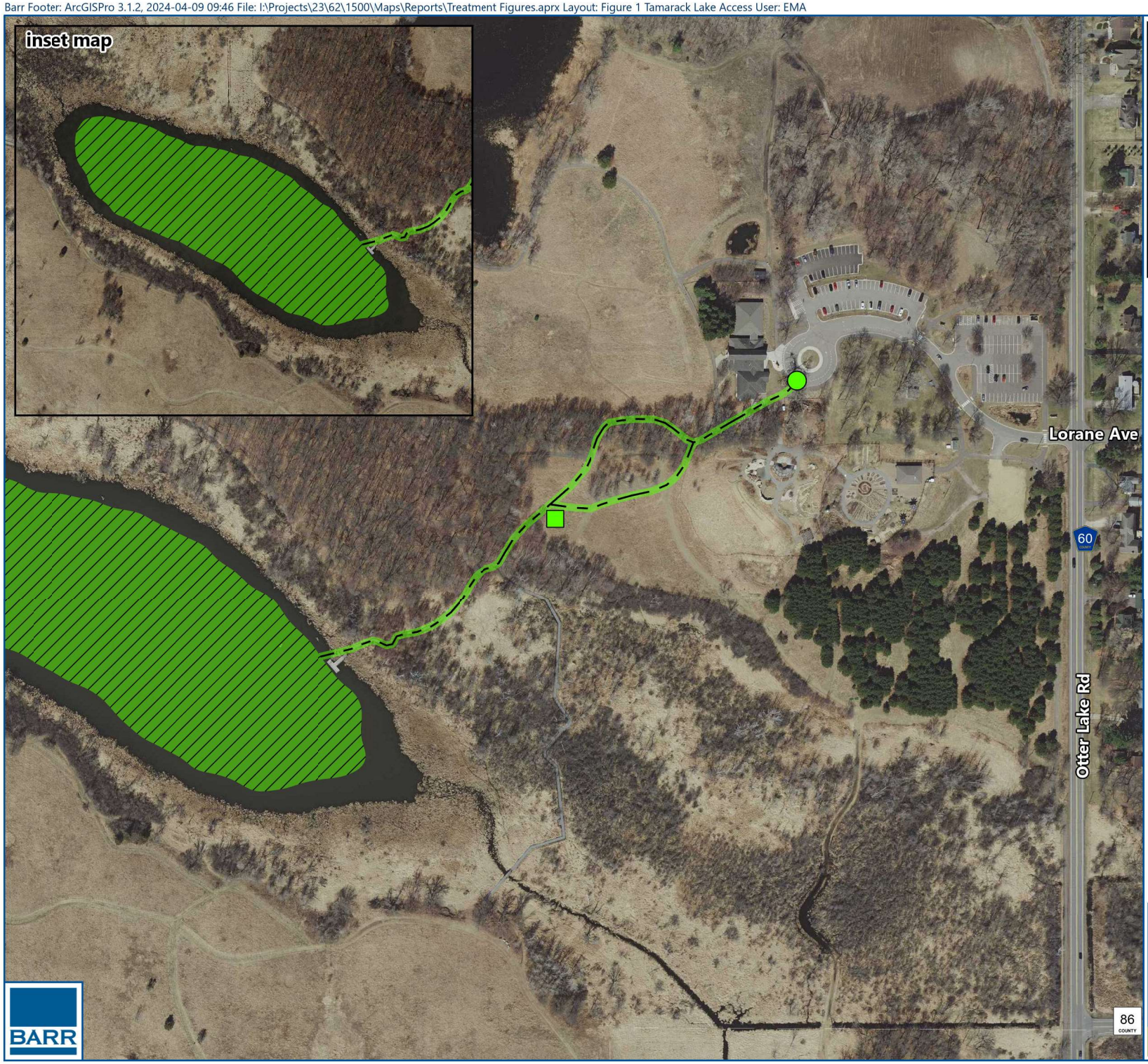
F. The aluminum application must be complete before the surface temperature of Tamarack Lake has fallen below 40º F. Application of aluminum shall not occur if it can be reasonably expected that the surface temperature of Tamarack Lake will drop below 40º F within 24 hours after treatment completion.

G. The Contractor shall keep daily records acceptable to the Engineer and available for review as a basis for and substantiation of payment. Daily logs shall minimally state the following:
   (1) Hours of aluminum application
   (2) The quantity of aluminum applied
   (3) The approximate acreage and volume treated
   (4) Explanation of any downtime
   (5) GIS coordinates of application

END OF SECTION 02400

Drawings

Figures 1 and 2



Access Route

Alum Staging Area

Chemical Offloading Area

Project Limits

Treatment Area

N

0 150 300

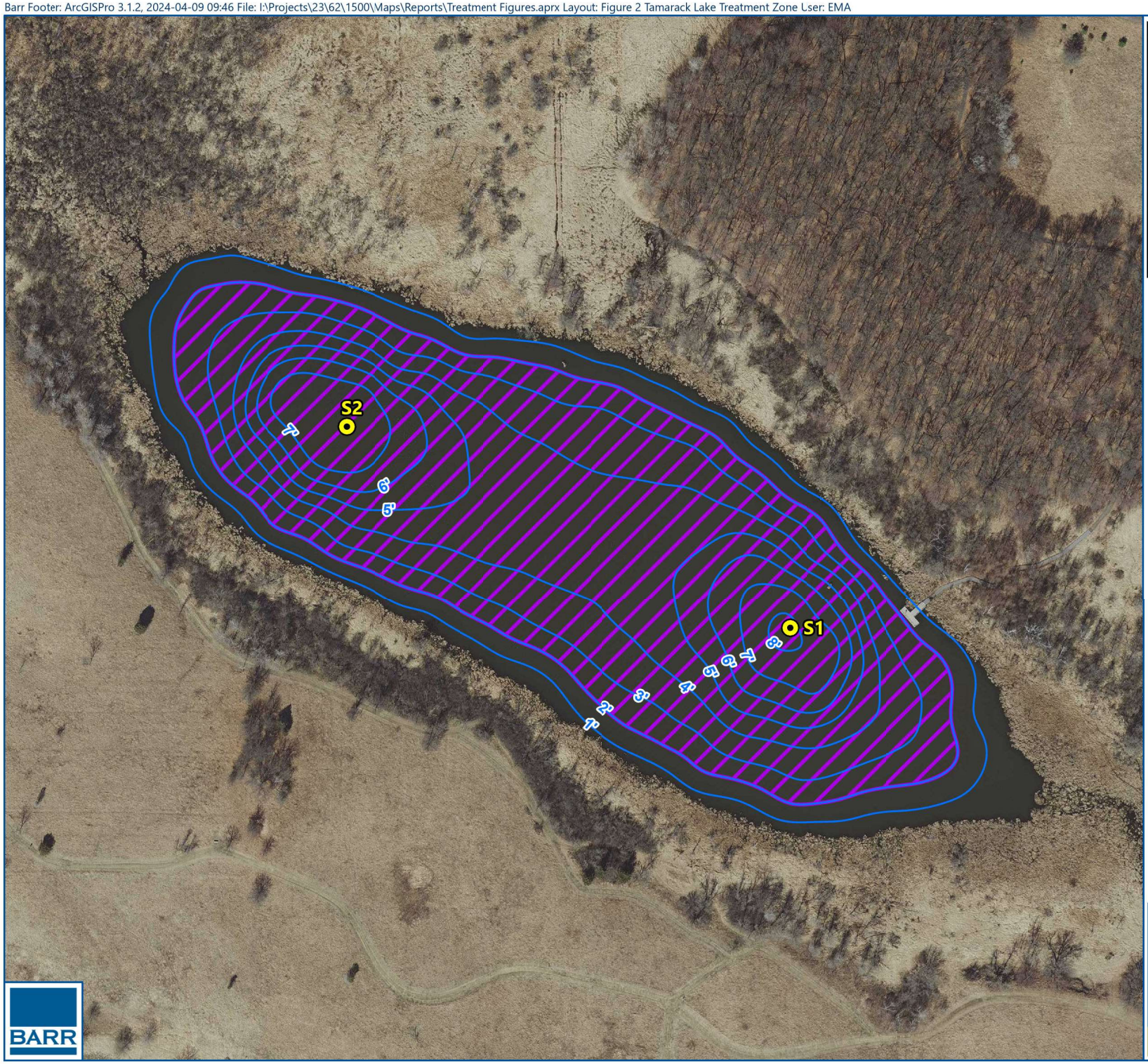
Feet

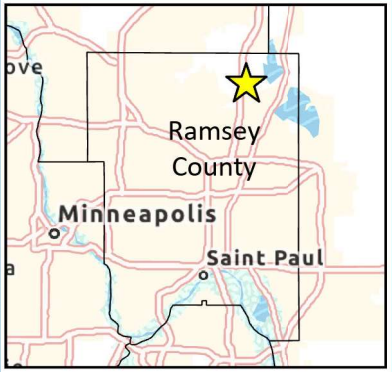
ACCESS MAP

Tamarack Lake

FIGURE 1

BARR





Sediment Sampling Location

Depth Contours (1 ft)

Alum Treatment Zone

Zone 1 (10.2 acres)

depth surveyed on August 2, 2022

Source: Macrophyte, Contour, Biovolume and Bottom Composition Survey, 8/2/22. Data collected and prepared by Ramsey County Parks & Recreation, Soil and Water Conservation Division for Vadnais Lakes Watershed Management Organization.

N

0 100 200

Feet

ALUM TREATMENT ZONE

Tamarack Lake

FIGURE 2

BARR

Attachment 1

Contract Agreement

CONTRACTOR SERVICES AGREEMENT

THIS CONTRACTOR SERVICES AGREEMENT ("**Agreement**") is made and entered into this ___ day of _____ 2024, by and between Vadnais Lake Area Water Management Organization, a Minnesota joint powers entity ("**VLAWMO**"), and _____ ("**Contractor**"). VLAWMO and Contractor may hereinafter be referred to individually as a "party" or collectively as the "parties."

RECITALS

A. VLAWMO desires to undertake the 2024 Alum Treatment for Tamarack Lake in White Bear Township ("**Project**").

B. VLAWMO is working with Barr Engineering as the engineer for this Project ("**Engineer**").

C. The Project involves the Contractor providing all personnel and equipment required to deliver and apply alum within Tamarack Lake ("**Lake**") to mitigate the internal release of phosphorus from Lake sediment as further described in the Request for Quotations attached hereto as Exhibit A (collectively, the "**Contract Documents**").

D. The Contractor will access the Lake through the Tamarack Nature Center property located at 5287 Otter Lake Road ("**Property**"), which is owned by Ramsey County. VLAWMO entered into a property access agreement, which is attached hereto as Exhibit C, ("**Access Agreement**") that sets out the terms and conditions for the use of the Property for the Project.

E. VLAWMO sought written quotes for the Project and selected Contractor to perform the work to complete the Project based on its quote, which is attached hereto as Exhibit B ("**Quote**").

F. Contractor desires to undertake and complete the Project for VLAWMO in accordance with the terms and conditions of this Agreement. VLAWMO and Contractor negotiated some changes to the original draft of this Agreement prior to execution and the parties intend the language in this document to be controlling.

AGREEMENT

In consideration of the mutual promises and agreements contained herein, and intending to be legally bound, VLAWMO and Contractor hereby agree as follows:

1. Scope of Work. Contractor agrees to perform all work and provide all services needed to complete the Project in accordance with the Contract Documents and the terms and conditions of this Agreement (collectively, the "**Work**").

   (a) Contractor agrees to furnish all materials, all necessary tools, and equipment, and to perform all the work and labor necessary to complete the Project. The Project shall be completed in accordance with the terms and conditions of this Agreement, Contractor's Quote, and the Contract Documents.

7. Insurance. Contractor shall maintain workers' compensation insurance (unless exempt under law) and commercial general liability insurance with coverage limits of no less than $1,000,000 per occurrence, $2,000,000 general aggregate, $2,000,000 products/completed operations total limit, $1,000,000 personal injury, and advertising liability. An umbrella or excess liability policy over primary liability insurance coverages is an acceptable method to provide the required commercial general liability and employer's liability insurance amounts. Contractor agrees to also have the following insurance coverages in placed with at least the following minimum amounts of coverage:

   Auto Liability: A minimum of $500,000 combined single limit auto liability, including hired, owned and non-owned.

   Professional Liability: Professional liability of no less than $1,000,000 per claim and $3,000,000 aggregate limit.

   Work Comp: Workers' Compensation as required by Minnesota Law. Employer's liability with limits of $500,000/$500,000/$500,000.

   Additional Insured: Contractor shall name VLAWMO and Ramsey County as additional insureds on all the liability policies and no work can commence until certificates of insurance are delivered to the County.

8. Indemnification. Contractor will indemnify, defend, and hold harmless VLAWMO, Ramsey County, its officers, board members, employees and agents from any and all actions, claims, costs, reasonable attorney's fees, damages and liabilities of any nature arising out of or by reason of any act or omission of Contractor, its officers, agents, Contractors or employees, in the execution, performance, or failure to adequately perform Contractor's obligations pursuant to this Contract. This indemnification, defense, and hold harmless obligation to protect VLAWMO includes, but is not limited to, claims of trespass or damage to private property resulting from Contractor accessing the Lake. Contractor is not required to indemnify, defend, or hold VLAWMO harmless against its negligence. This obligation shall survive the termination of this Contract. Nothing in this Contract shall constitute a waiver by VLAWMO of any statutory limits or immunities from liability whether provided in Minnesota Statutes, Chapter 466 or elsewhere.

9. Independent Contractor. Contractor and its employees are not employees of VLAWMO. Nothing in the Agreement is intended or should be construed in any manner as creating or establishing the relationship as employer/employee, co-partners, or a joint venture between VLAWMO and Contractor. It is agreed that Contractor and its employees will act as an independent Contractor and acquire no rights to tenure, workers' compensation benefits, unemployment compensation benefits, medical and hospital benefits, sick and vacation leave, severance pay, pension benefits or other rights or benefits offered to employees of VLAWMO. The manner in which the Project is to be performed shall be controlled by Contractor; however, the nature of the services and the results to be achieved shall be specified by VLAWMO.

10. Termination.

    (a) VLAWMO may terminate this Agreement upon 30 days' written notice, except that if Contractor is in default and fails to cure the default within ten days following written notice by VLAWMO, VLAWMO has the right to terminate this Agreement immediately upon written notice of termination. Contractor will be paid for the Work properly rendered prior to the effective date of termination.

    (b) VLAWMO may delay or terminate this Agreement prior to the initiation of the Work if it reasonably determines the Project cannot reasonably proceed due to changed Lake conditions, interference with the Access Routes, or other occurrence that interferes with Contractor's ability to reasonably perform the Work.

    (c) The following provisions of this Agreement shall survive expiration, termination, or cancellation of this Agreement: Indemnification; Insurance; Governing Law; Data Practices; and Audit.

11. Amendments. Any amendment to this Agreement must be in writing and signed by both parties.

12. Assignment. No assignment or attempted assignment of this Agreement or of any rights hereunder shall be effective without the prior written consent of VLAWMO.

13. Authority. Each of the undersigned parties warrants it has the full authority to execute this Agreement.

14. No Personal Liability. No officer, agent or employee of VLAWMO shall be personally liable to Contractor, or any successor in interest, in the event of any default or breach by VLAWMO on any obligation or term of this Agreement.

15. Notices. Any notice, demand, or other communication under this Agreement by either party to the other shall be sufficiently given or delivered if it is dispatched by registered or certified mail, postage prepaid, return receipt requested, or delivered personally to the addresses listed in the preamble to this Agreement, or at such other address with respect to either such party as that party may, from time to time, designate in writing and forward to the other as provided in this section.

16. No Agency. Contractor acknowledges that nothing contained in this Agreement nor any act by VLAWMO or Contractor shall be deemed or construed by Contractor or by any third person to create any relationship of third-party beneficiary, principal and agent, limited or general partner, or joint venture between VLAWMO and Contractor.

17. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall constitute one and the same instrument.

18. Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the state of Minnesota. Any disputes, controversies, or claims arising out of this

Agreement shall be heard in the state or federal courts of Minnesota, and all parties to this Agreement waive any objection to the jurisdiction of these courts, whether based on convenience or otherwise.

19. Compliance with Laws. Contractor warrants that all work performed pursuant to this Agreement shall be in compliance with all federal, state and local laws, ordinances, regulations, rules, and standards.

20. Entire Agreement. This Agreement, any attached exhibits and any addenda or amendments signed by the parties shall constitute the entire Agreement between VLAWMO and Contractor, and supersedes any other written or oral agreements between and VLAWMO and Contractor.

21. Severability. In the event that any one or more of the provisions of this Agreement, or any application thereof, shall be found to be invalid, illegal or otherwise unenforceable, the validity, legality, and enforceability of the remaining provisions in any application thereof shall not in any way be affected or impaired thereby.

22. Waivers. No failure by any party to insist upon the strict performance of any covenant, duty, agreement, or condition of this Agreement or to exercise any right or remedy consequent upon a breach thereof, shall constitute a waiver of any such breach of any other covenant, agreement, term, or condition, nor does it imply that such covenant, agreement, term or condition may be waived again.

23. Third Party Rights. The parties to this Agreement do not intend to confer on any third party any rights or benefits under this Agreement.

24. Data Practices. Any and all data created, collected, received, stored, used, maintained, or disseminated by the parties pursuant to this Agreement shall be administered in accordance with, and is subject to the requirements of the Minnesota Government Data Practices Act, Minnesota Statutes, Chapter 13.

25. Audit. Contractor agrees that VLAWMO, the Minnesota State Auditor, and Minnesota Legislative Auditor, or any of their duly authorized representatives, at any time during normal business hours and as often as they may reasonably deem necessary, shall have access to and the right to examine, audit, excerpt and transcribe any books, documents, papers, and records that are relevant and involve transactions relating to this Agreement for six years following termination of this Agreement.

IN WITNESS THEREOF, the parties hereto have executed this Agreement as of the day and year written above.

VLAWMO: **Contractor:**

By: _____ By: _____

(b) Contractor agrees to diligently perform all Work required to complete the Project and to comply in all respects with the Contract Documents. VLAWMO may conduct such inspections of the Work as it may determine is needed. VLAWMO has the right to reject any Work or materials it reasonably determines is defective or unsuitable, or that otherwise does not comply with the Contract Documents or the terms of this Agreement. If VLAWMO rejects any Work or materials, Contractor is responsible for, at its own cost, promptly removing and replacing such defective Work or materials with approved work or materials as needed to comply with the Contract Documents.

(c) Contractor shall only access the Lake via the routes identified by VLAWMO ("**Access Routes**") and then only in accordance with the terms and conditions of the Access Agreement.

(d) Contractor shall take all reasonable steps to avoid damaging the Access Routes. If any damages do occur, Contractor is solely responsible at its own cost for repairing all such damages to restore the property to at least the same condition as prior to Contractor utilizing the property as part of the Access Routes.

(e) Contractor shall be responsible for any damage to or loss of its equipment caused by its performance of this Agreement. Contractor shall also be responsible, if necessary, for placing and maintaining such traffic control devices as may be required to warn the travelling public of the Work being performed. The selection and placement of traffic control devices if required to provide the Work shall be consistent with the standards established in the Minnesota Manual on Uniform Traffic Control Devices.

(f) Contractor will select the means, methods, and manner for performing the Work.

2. Performance and Payments Bonds. The parties agree performance and payment bonds are not required for this Project.

3. Schedule. Contractor agrees to promptly commence the Work on the Project after VLAWMO has received all required documents and authorizes the start of the Work. Contractor agrees to prosecute the Work diligently and to have the work entirely completed in every respect to the satisfaction and approval of VLAWMO on or before October 23, 2024 ("**Completion Deadline**"). Contractor agrees to notify VLAWMO in writing of any and all causes of delay of Work, or any part thereof, within 24 hours after such cause of delay shall arise. If the reason for the delay is reasonably determined by VLAWMO to be outside Contractor's control, such as fire, flood, epidemic, pandemic, strikes, wars, acts of God, acts of public authorities, or delays or defaults caused by public carriers, VLAWMO shall reasonably extend the Completion Deadline and in such case Contractor shall only become liable for liquidated damages provided for herein for failure to perform during any delay after the time is so extended.

4. Liquidated Damages. Time is of the essence for this Agreement. If Contractor fails for any reason, except upon written consent of VLAWMO, to complete the Project on or before the Completion Deadline, VLAWMO shall have the right to deduct from any money due or which

may become due to Contractor, the amount of two hundred dollars ($200.00) per day for each and every day elapsing between the time stipulated for the completion and the actual date of completion, in accordance with the terms thereof; or if no moneys shall be due Contractor, VLAWMO shall have the right to recover such sum; such deduction to be made or such sum to be recovered not as a penalty, but as liquidated damages. Contractor agrees that it will be difficult for VLAWMO to determine the amount of all damages that VLAWMO would incur as a result of delay and that the liquidated damages set forth in this paragraph are reasonable. Liquidated damages shall not apply to delays directly resulting from the Engineer indicating the application of the materials is not allowed.

5. Compensation.

(a) This is a unit price, not to exceed amount, contract. VLAWMO agrees to pay Contractor the unit price for each unit identified in Contractor's Quote, which is attached hereto as Exhibit B, to complete the Project. VLAWMO will only pay Contractor for the actual units utilized to complete the Project.

(b) If Contractor properly performs the work, VLAWMO shall, from month to month before completion of the Work, and pursuant to invoices from Contractor, pay Contractor up to 95 percent of the amount already earned under the Agreement. When the work is 95 percent or more completed, upon the sole determination of VLAWMO staff, such portions of the retained price shall be released only as VLAWMO determines it need not be retained to protect the interest of VLAWMO in the satisfactory completion of the Agreement. The balance shall be retained by VLAWMO until the final performance and completion of this Agreement by Contractor to the satisfaction, approval, and acceptance of VLAWMO including provision by Contractor of Minnesota Department of Revenue Form IC-134 or other authorized proof of Contractor's compliance with applicable state laws.

(c) No claim for extra work done or materials furnished by Contractor will be made by Contractor or allowed by VLAWMO, nor shall Contractor do any work or furnish any materials not covered by the Contract Documents, unless such work or materials is ordered in writing by VLAWMO. Any such work or materials which may be done or furnished by Contractor without such written order first being given, shall be at Contractor's own risk and expense.

6. Non-Discrimination. Contractor agrees that in the hiring of common or skilled labor for the performance of any work under this Agreement or any subcontract hereunder, no Contractor, material supplier, or vendor, shall, by reason of race, color, sex, creed, national origin, disability, age, sexual orientation, status with regard to public assistance, or religion, discriminate against any person or persons who are qualified and available to perform the work to which such employment relates; that neither Contractor nor any subcontractor, material supplier, or vendor, shall in any manner discriminate against, or intimidate, or prevent the employment of any such person or persons from the performance of work under this Agreement or any subcontract hereunder on account of race, color, sex, creed, national origin, disability, age, sexual orientation, status with regard to public assistance, or religion.

VLAWMO:

By: _____

Its:

By: _____

Its:

Contractor:

By: _____

Its: _____

EXHIBIT A
Request for Quotations

[attached hereto]

EXHIBIT B
Contractor's Quote

[attached hereto]

EXHIBIT C
Access Agreement

[attached hereto]

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

PROPERTY OWNER NAME(S): County of Ramsey, a political subdivision of the State of Minnesota, through Ramsey County Parks and Recreation and Ramsey County Soil and Water Conservation Division ("**Owner**")

PROPERTY ADDRESS: Tamarack Nature Center, 5287 Otter Lake Rd, White Bear Township, MN 55110 ("**Property**")

PROPERTY ID NUMBER (PID): Parcel ID: 103022330003
SECTION 10 TOWN 30 RANGE 22 SUBJ TO RDS THE FOL; EX W 697 FT OF E ...OF W 1/2 OF SEC 10 TN 30 RN 22

EFFECTIVE DATE: March 31, 2024 TERMINATION DATE: December 31, 2024

By executing this Property Access Agreement ("Agreement"), Owner understands that the Vadnais Lake Area Water Management Organization ("VLAWMO") desires to enter onto the above-listed Property to carry out certain work, as described generally below. The work consists of an alum treatment, divided into two phases, to treat internal phosphorus loading in Tamarack Lake, which is an impaired water as designated by the Minnesota Pollution Control Agency (MPCA) for nutrients. The work is the result of a preceding feasibility study in the attached **Exhibit A**. Phase 1 of the alum treatment is anticipated to occur during fall 2024. Phase 2 of the alum treatment is anticipated to occur 2-3 years after the first phase has been completed. The decision for timing of the phase 2 application will be a result of monitoring conducted by VLAWMO and upon recommendation by the project engineer. The Owner is willing to grant access to the Property on the terms and conditions provided by this Agreement and with ongoing collaboration between both parties. As more information becomes available in the request for quote documents and contract documents, those will be shared by VLAWMO with the Owner. A focus of ongoing communication, especially regarding site access and staging specifics, will be regular updates and accommodation of potential nature center activities. An important and sensitive activity window will happen October 24-November 1 because Tamarack Nature Center has a high-attendance activity. VLAWMO and the Owner will coordinate around this window of time with additional sensitivity to ensure that the project activities are not interfering with the event. The right of entry granted herein shall apply to VLAWMO, its employees, agents, and contractors, collectively referred to herein as VLAWMO. Owner and VLAWMO agree as follows:

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1. Right of Entry. Owner hereby grants to VLAWMO, its employees, agents, and contractors a temporary and non-exclusive license to enter upon the Property for the purpose of performing the following work (collectively, the "**Work**"):

   The work consists of staging and conducting an alum treatment in Tamarack Lake in two phases. Phase 1 is anticipated to be completed during fall 2024. **Exhibit B** shows the anticipated use area for project delivery, staging, and the possible location for temporary storage tanks. The final use area will be defined by the contractor as part of the quote/bid received and will be shared with the Owner by VLAWMO once a contractor has been selected and approved by the VLAWMO Board to complete the work. Staging may include setting up and maintaining storage tanks with double containment for alum (aluminum sulfate) and a buffer (sodium aluminate), delivering the chemicals to the site, and filling the tanks onsite. Chemical delivery and maintenance will be conducted consistent with bid or quote documents that will include a management/safety response plan. Conducting the alum treatment will include a contractor using the parking lot area and vehicle access trails to bring a small boat (e.g., pontoon or other similar watercraft) near the application location. Once supplies are close to the application area, they will be transported along the boardwalk using wheeled carts or hand-carried. The small watercraft will be launched at or near the observation platform. Chemicals will be loaded onto the watercraft and applied to the lake in accordance with the description that will be provided by the contractor in the quote/bid documents and successful quote/bid. Staging will begin prior to each phase of the alum treatment, with communication and coordination between VLAWMO and the Owner. The application of alum is anticipated to take a few days over the course of 1-2 weeks, dependent upon weather and pH response in the lake. Monitoring will be conducted by the project engineer during the alum application as per MPCA requirements, and VLAWMO will be conducting ongoing monitoring once the application has been completed. Phase 2 will be conducted in the same manner as phase 1 and will be timed according to recommendations made by the project engineer.

   Owner authorizes VLAWMO, at VLAWMO's reasonable discretion, to enter upon and temporarily bring onto the Property such equipment and materials as may be reasonably needed to perform the Work. Owner represents and warrants that it is the fee owner of the Property and has the authority and right to enter into this Agreement on behalf of all owners of the Property.

2. Term. This Agreement shall commence as of the Effective Date and terminate on the Termination Date as indicated above unless extended by mutual written agreement of the parties. Following completion of the Work, VLAWMO agrees to reasonably restore the Property to its prior condition in the event that it is damaged as a result of the work. All such restoration work shall be completed before the indicated termination date.

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

3. Fees and Costs. VLAWMO shall be solely responsible for the costs of all labor, services, equipment, and materials used in conducting the Work at the Property and shall not permit any lien or encumbrance upon the Property resulting from its activities thereon. VLAWMO is also responsible for all costs associated with restoring the Property.

4. Property Damage. If VLAWMO causes damage to the Property or Owner's personal property while performing the Work, VLAWMO shall repair the Property or replace the damaged item at its own cost.

5. Insurance. VLAWMO shall require the contractor completing the work to maintain workers' compensation insurance (unless exempt under law) and commercial general liability insurance with coverage limits of no less than $1,000,000 per occurrence, $2,000,000 general aggregate, $2,000,000 products/completed operations total limit, $1,000,000 personal injury, and advertising liability. An umbrella or excess liability policy over primary liability insurance coverages is an acceptable method to provide the required commercial general liability and employer's liability insurance amounts.

   Additional insurance requirements include:

   Auto Liability: If the contractor is driving on behalf of the county but not transporting clients as part of the contractor's services under this contract, a minimum of $500,000 combined single limit auto liability, including hired, owned and non-owned.

   Professional Liability: Professional liability of no less than $1,000,000 per claim and $3,000,000 aggregate limit.

   Work Comp: Workers' Compensation as required by Minnesota Law. Employer's liability with limits of $500,000/$500,000/$500,000.

   Additional Insured: The County must be named as an additional insured on all policies and no work can commence until certificates of insurance are delivered to the County.

   If requested, the Contractor shall provide the VLAWMO and the Owner a certificate of insurance showing all insurance coverages it has in effect. The Contractor shall have the Owner named as an additional insured on its commercial general liability policy.

6. Indemnify. VLAWMO will, and will cause its contractors to, indemnify, hold harmless, and defend Owner and its respective officials, agents, and employees against any and all liability, losses, costs, damages, expenses, claims, or actions, including attorney's and expert witness's fees, which Owner or its officials, agents, or employees may sustain, incur, or be required to pay, arising out of or by reason of any act or omission of VLAWMO, its contractors, officials, agents, or employees, arising directly or indirectly from VLAWMO's or its contractor's or contractors' presence on the Property, activities on the Property, acts and/or omissions with respect to the Property and/or Work, and/or from the performance, or failure to adequately or safely perform the Work.

7. Binding Effect. This Agreement shall be binding upon, and inure to the benefit of, the parties' respective successors and assigns.

8. Governing Law. This Agreement shall be interpreted in accordance with and be governed by the laws of the state of Minnesota.

9. Entire Agreement. This Agreement is the full, complete, and entire agreement of the parties with respect to the subjects hereof, and any and all prior writings, representations, and negotiations with respect to those subjects are superseded by this Agreement. This Agreement may only be amended by the parties hereto by a written and signed instrument.

IN WITNESS WHEREOF, the undersigned parties have executed this Agreement as of the dates indicated below.

OWNER:

Signature

Mark McCabe, Director Ramsey County Parks
Printed Name

March 3, 2024
Date

Approved as to form:

Kathleen Ritter 3/11/2024
Assistant County Attorney Date

VLAWMO:

Signature

James Linder
Printed Name

4-24-24
Date

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit A: Feasibility study

Attached, beginning on following page

Tamarack and Wilkinson Lakes In-Lake Treatment Feasibility Study

Prepared for
Vadnais Lake Area Water Management Organization (VLAWMO)
and Ramsey County Soil and Water Conservation Division

November, 2023

With Funding from

CLEAN WATER LAND & LEGACY AMENDMENT

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

Tamarack and Wilkinson Lakes In-Lake Treatment Feasibility Study

November, 2023

Contents

List of Tables

List of Figures

1.0 Project Background and Purpose

Barr Engineering Company (Barr) was retained by Vadnais Lake Area Water Management Organization (VLAWMO) in 2023 to provide engineering services to build on past efforts by completing sediment monitoring (collected during spring 2023) and aluminum sulfate (alum) dosing for Tamarack and Wilkinson Lakes to improve lake water quality. This feasibility study includes sediment core collection/analysis, determination of an alum dosage plan, and compilation/consolidation of supporting information to implement in-lake management practices.

Figure 1-1 shows the watershed divides and drainage patterns for Tamarack and Wilkinson Lakes, including subcatchments and monitoring stations. Table 1-1 shows the lake morphology/depth and other watershed/water body characteristics for each basin (as determined in GIS or published by VLAWMO).

Table 1-1 Lake Morphology and Watershed Characteristics

Parameter	Tamarack Lake	Wilkinson Lake
Open Water Surface Area (acres)	13	100
Average Depth (feet)	5	3
Maximum Depth (feet)	10	5
Residence Time (years)	not estimated	0.2
Direct, Overall Drainage Area (acres)	130, 130	2973[1], 4555[2]

[1]Based on Subwatershed ID#2007904 in TMDL Report (excludes lake surface area)

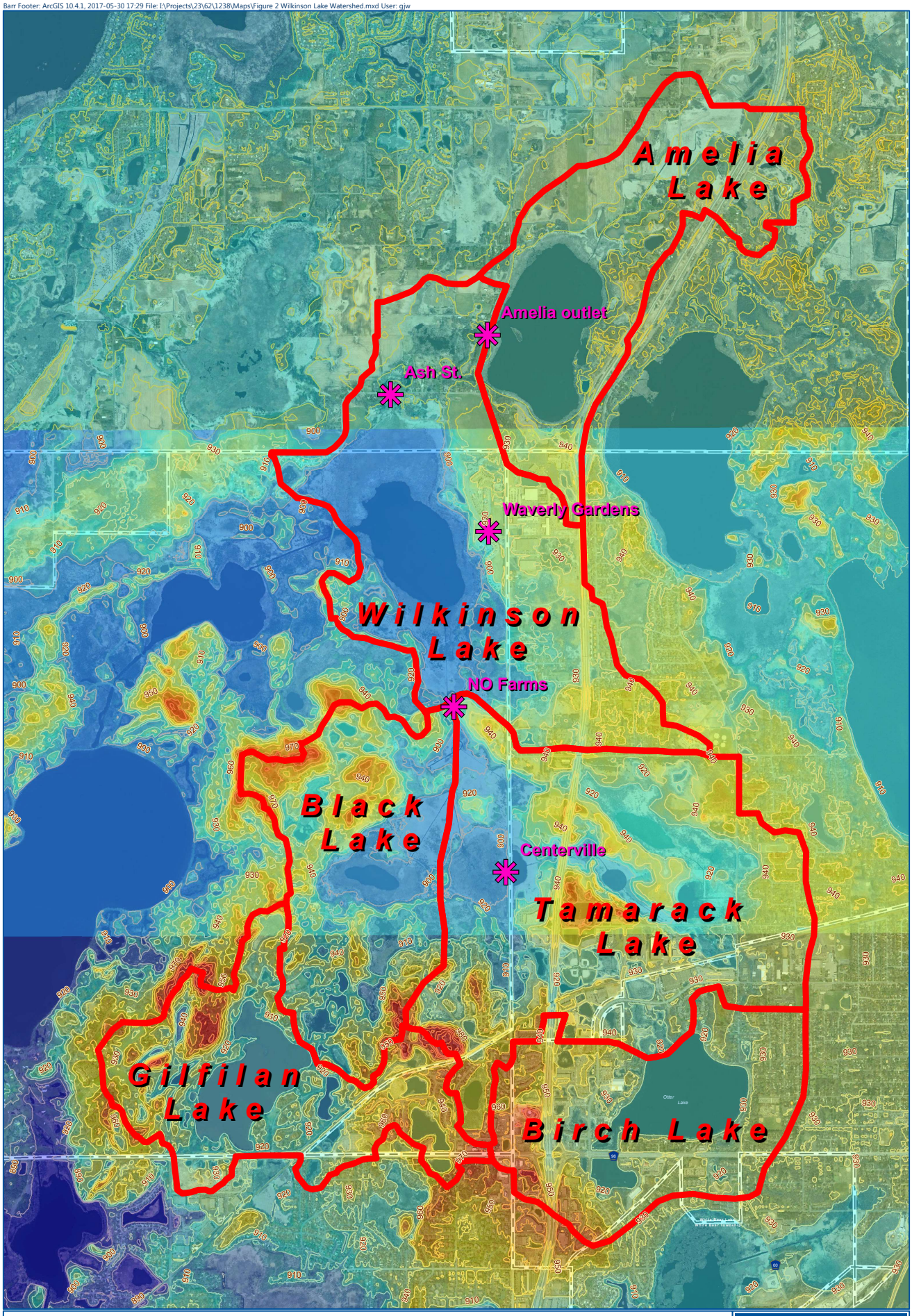
[2]Based on Subwatershed ID#s 2007901, 2007903, and 2007904 in TMDL Report

1.1 Summary of Lake TMDL Report and Past Studies

Barr systematically reviewed reports and data collected on Tamarack Lake and Wilkinson Lake, including the total maximum daily load (TMDL) report and implementation plan (2013 & 2014), sustainable lake management plans/reports (2011, and 2017 and 2023 updates), storm sewer and treatment practice plans, proposed redevelopment plans and retrofit report (2012), BMP feasibility studies (2017 & 2020), fish (2012 & 2017) and aquatic plant survey reports (2010 & 2014), sediment (2008) and bathymetric/macrophyte/ vegetation biovolume/bottom composition surveys (2017 & 2022).

While Tamarack Lake has been listed as impaired for excess nutrients, it was not previously addressed in the TMDL report.

Barr Footer: ArcGIS 10.4.1, 2017-05-30 17:29 File: I:\Projects\23\62\1238\Maps\Figure 2 Wilkinson Lake Watershed.mxd User: gjw



BARR

Wilkinson Watershed Sampling Sites
Wilkinson Lake Subcatchments
10-Foot Elevation Contour
Municipal Boundary

0 1,000 2,000
Feet

WILKINSON LAKE WATERSHED
Vadnais Lake Area
Watershed Management
Organization

FIGURE 1-1

The TMDL report (Wenck, 2014a) and implementation plan (VLAWMO, 2014) estimated internal and watershed loading and called for 63% total phosphorus load reductions for Wilkinson Lake, which corresponded with a 76% reduction of stormwater runoff, after accounting for an explicit margin of safety.

The high percentage of watershed loading on Wilkinson Lake focused the direction on additional studies since the publishing of the TMDL report. This included increased monitoring and several feasibility studies, along with updated fish and vegetation studies. VLAWMO recently bid and initiated construction on a deep-water wetland restoration project that is expected to remove approximately 33 pounds of total phosphorus per year from the south tributary to Wilkinson Lake.

Lake and watershed modeling, along with the associated GIS mapping, from the TMDL study were obtained by Barr and reviewed for use in a recent feasibility analysis (Barr, 2017). Additional concerns with the TMDL modeling are discussed in Section 2.1, in which it was determined that the following data gaps and limitations of the past analyses would also need to be addressed to better evaluate the sources of phosphorus during the critical condition and potential improvement options for Wilkinson Lake:

- The P8 watershed modeling from the TMDL study did not simulate the existing watershed Best Management Practices (BMPs) and phosphorus assimilation by upstream lakes. As discussed in Section 2, this may have led to overestimated phosphorus loadings for each lake watershed in the TMDL study.
- The GIS mapping (and associated P8 watershed modeling) from the TMDL study included a significant landlocked area from Gilfillan Lake, as well as an area from Lake Amelia that is only connected infrequently (during wet years), in the Wilkinson Lake watershed. This may have also led to overestimated phosphorus loading for this watershed in the TMDL study.

Stormwater monitoring data collected in the Wilkinson Lake watershed since 2011 was obtained and evaluated to better distinguish priority phosphorus source areas that would not otherwise have been determined from the P8 modeling developed for the TMDL study.

1.2 Summary of Recent Water Quality Monitoring

Table 1-2 shows the ten-year summer average total phosphorus and chlorophyll-a concentrations observed for each lake, along with the average Secchi disc transparency, compared to MPCA's shallow lake water quality criteria. Table 1-2 shows that, despite recent water quality improvements in Wilkinson Lake, both lakes do not currently meet MPCA's shallow lakes criteria.

Table 1-2 Average Summer Water Quality (2013-22) and Shallow Lake Criteria Comparison

Water Body	Total Phosphorus Concentration (µg/L)	Chlorophyll-a Concentration (µg/L)	Secchi Disc Transparency (meters)
Tamarack Lake	167	121	0.38
Wilkinson Lake	134	32	0.97
MPCA Shallow Lakes Criteria	**60**	**20**	**1.0**

Both water bodies will experience low dissolved oxygen in the bottom waters, periodically, during the summer months, and are subject to internal phosphorus loading.

Figures 1-2, 1-3 and 1-4 show how the last ten years of average summer total phosphorus, chlorophyll-a and Secchi disc transparency, respectively, have varied for each lake. The first four years of the records shown in each figure represent the data used for the TMDL analyses of Wilkinson Lake. The monitoring data shows that both lakes have not been meeting any of the three shallow lake criteria during the period of record.

Figure 1-2 shows that average summer total phosphorus concentrations were generally better for the lakes in 2011, significantly worse in 2015 and 2016, followed by a return to improved water quality in Wilkinson Lake between 2017 and 2021. As a result, 2011 became the focus of the updated lake and watershed modeling discussed in Section 2.

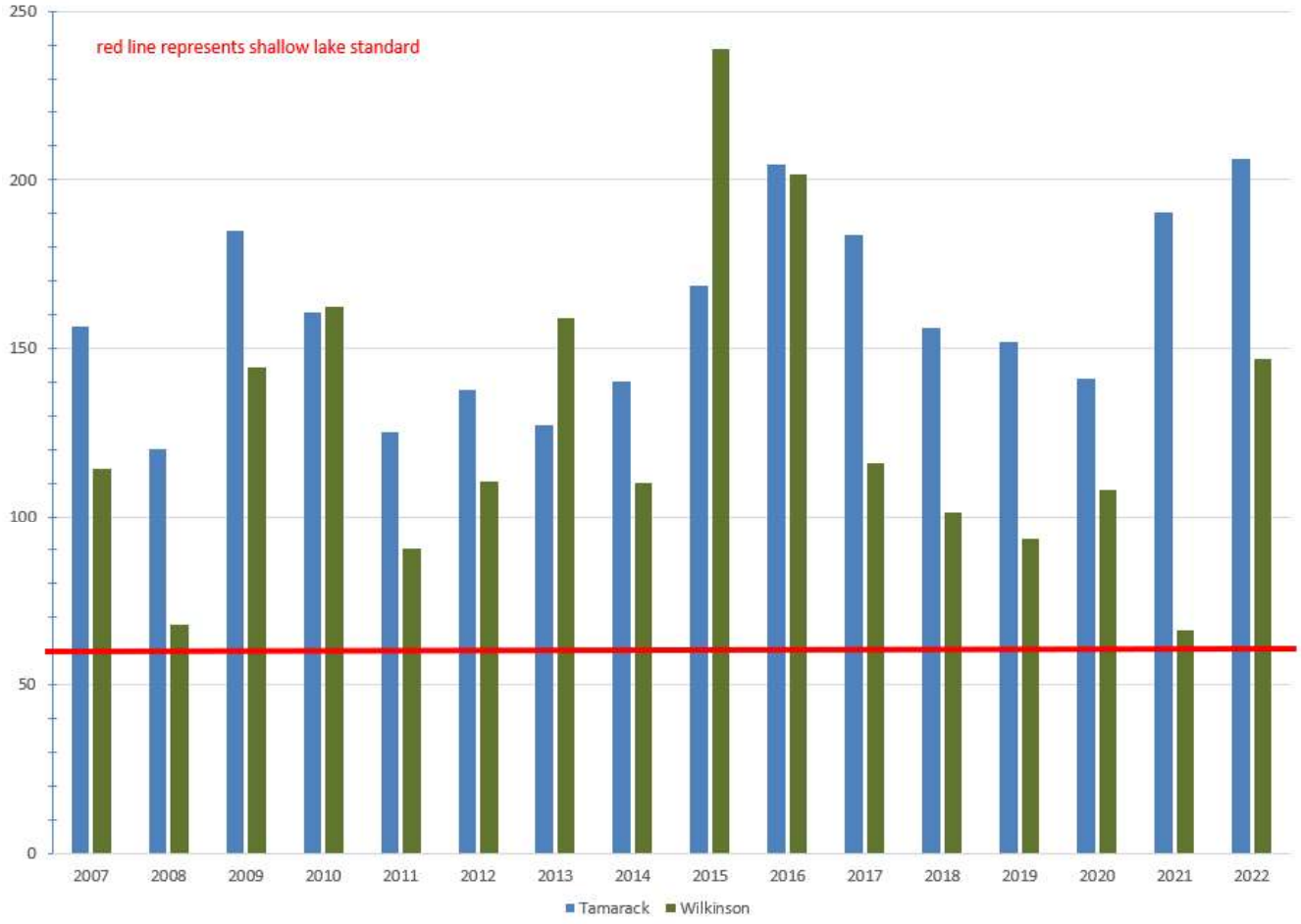


Figure 1-2 Summer Average (June-Sept.) Total Phosphorus Concentrations (µg/L) since 2007

Figure 1-3 shows that average summer chlorophyll-a concentrations were generally better for the lakes in 2011, significantly worse in 2015, followed by a return to improved water quality in Wilkinson Lake between 2016 and 2022. Chlorophyll-a concentrations in Wilkinson Lake met the MPCA criteria every year between 2017 and 2022.

Figure 1-3 shows that algae growth has remained high in Tamarack Lake since 2015. The highest chlorophyll-a concentrations on record in Tamarack Lake occurred during 2021 and 2022.

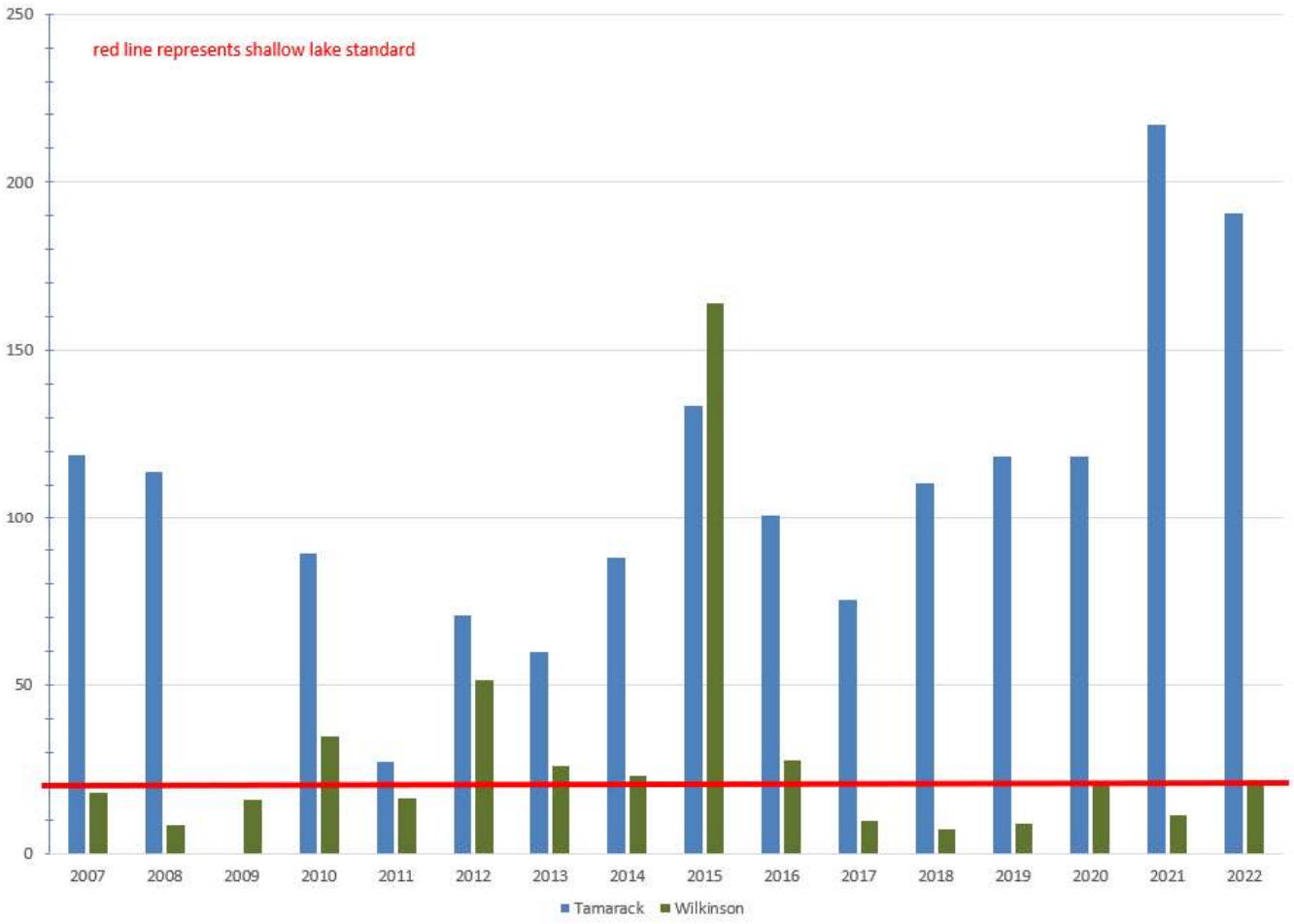


Figure 1-3 Summer Average (June-Sept.) Chlorophyll-a Concentrations (µg/L) since 2007

Figure 1-4 shows that average summer Secchi disc transparency measurements were significantly worse in 2015, followed by a return to improved water quality in Wilkinson Lake between 2016 and 2021. Secchi disc transparency in Wilkinson Lake met the MPCA criteria every year between 2017 and 2021, which explains why the long-term average shown in Table 1-2 very nearly met the MPCA threshold.

While Tamarack Lake experienced its highest transparency in 2022, it remains 0.4 meters lower than MPCA threshold (see Figure 1-4) due to high algae growth and high phosphorus concentrations.

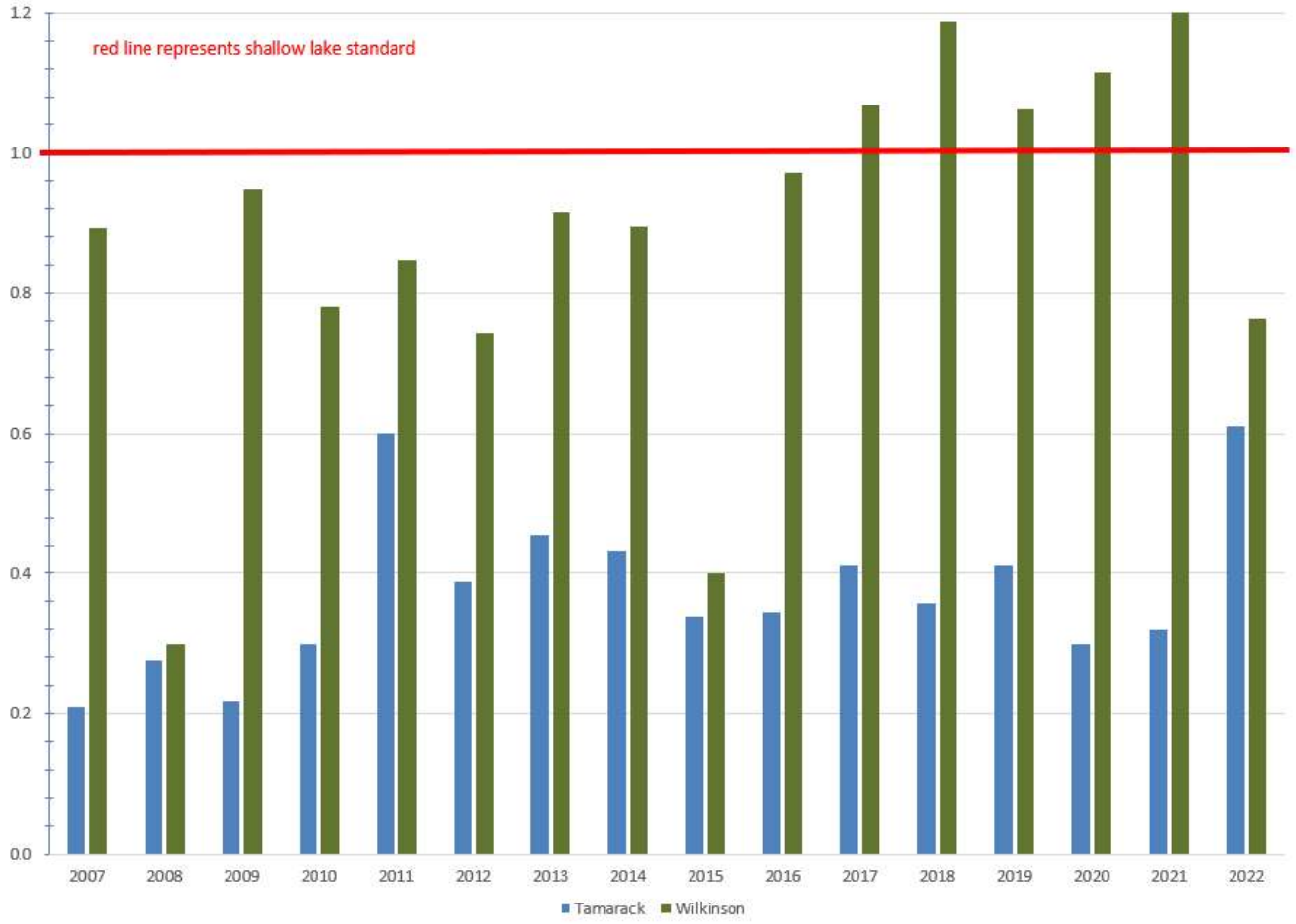


Figure 1-4 Summer Average (June-Sept.) Secchi Disc Transparency (meters) since 2007

1.3 Current Analysis of Lake Sediment Cores

Phosphorus from stormwater over time accumulates in the bottom sediments of lakes and ponds. During the spring and fall, this phosphorus is largely tied-up in the sediments, but during the warm summer months the phosphorus can be released from bottom sediments and move upward into the water column. This can lead to summer and sometimes early fall algal blooms. During the winter, lake stratification can also lead to phosphorus release from anoxic bottom sediments. Not all the phosphorus

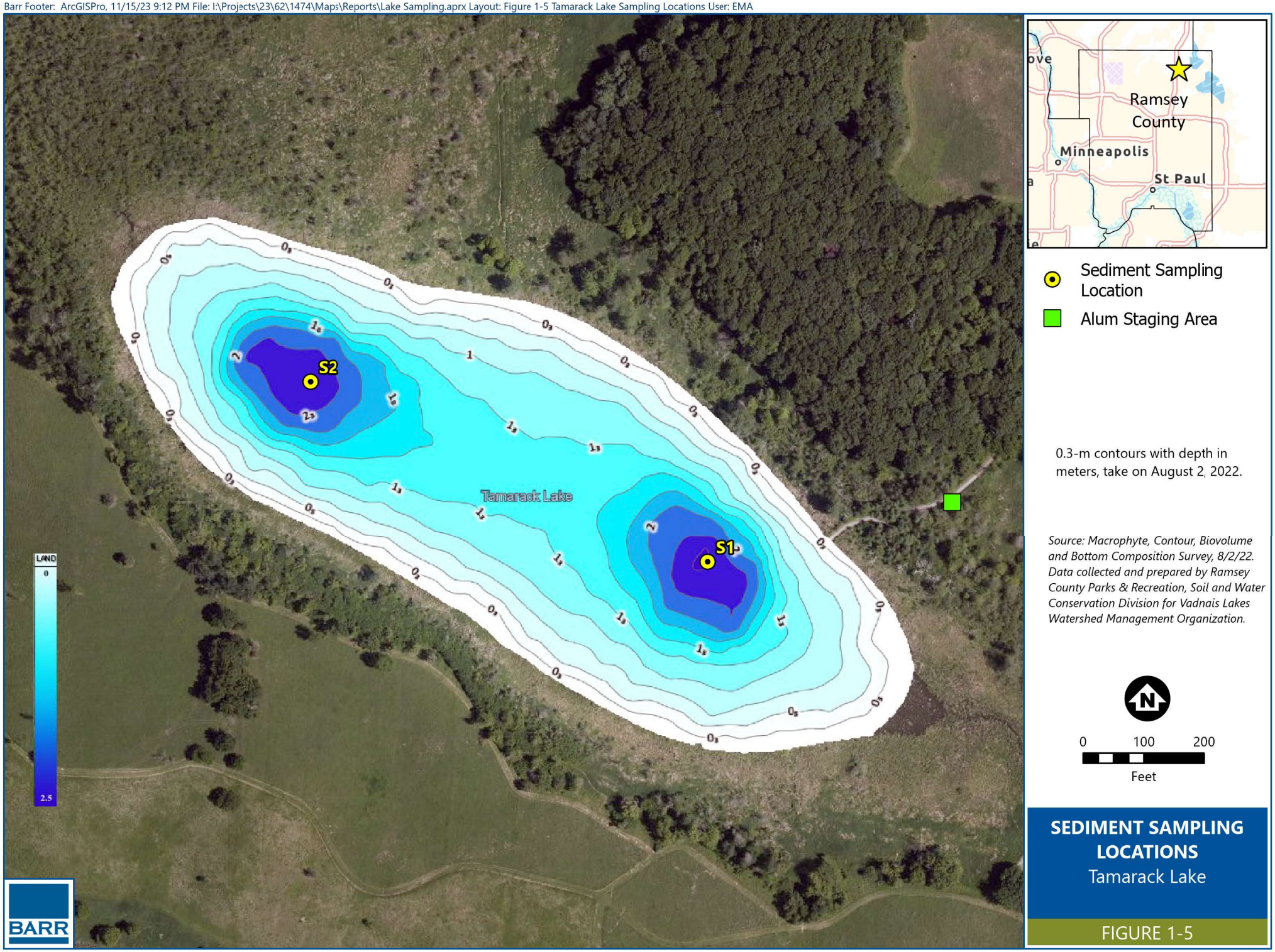
that is incorporated into bottom sediments releases into the water column. Phosphorus in sediment is typically attached to something and can be found in the following forms (often referred to as "fractions"): calcium bound phosphorus (Ca-P), aluminum bound phosphorus (Al-P), iron bound phosphorus (Fe-P), and organically bound P (Org-P). Ca-P and Al-P are largely inert and are immobilized in the bottom sediment. Org-P decays over time and release phosphorus into the water column over the course of several years. Fe-P is the mobile phosphorus form that readily releases into the water column during warm summer months as oxygen is depleted in the sediment.

The primary purposes of collecting sediment cores are to quantify the amount of Fe-P (mobile phosphorus) and Org-P in sediment. The more Fe-P and Org-P in sediment the more alum will need to be applied to immobilize these phosphorus fractions. In general, aluminum treatment (either as alum or sodium aluminate, for example), forces the Fe-P to bind to aluminum and form Al-P (the inert form of aluminum). In most cases, alum treatments are designed to also provide excess aluminum in sediment which can then bind phosphorus years after the treatment. When aluminum in the form of alum or other solutions is added to a lake, it forms an aluminum hydroxide floc that settles to the lake bottom. The aluminum floc will mix into the top few to several inches of sediment over time and becomes diluted. The sediment phosphorus data collected at different depths was used to help determine the expected sediment mixing depth for each lake.

The total mass of mobile and Org-P in the actively mixed layers of sediment were determined for each lake. Alum doses were then calculated for each lake by determining an appropriate Al:Al-P ratio to immobilize the phosphorus that contributes to the internal load.

Sediment cores were collected between June 2 and June 6, 2023, in Tamarack Lake (2 cores) and Wilkinson Lake (4 cores) (see Figures 1-5 and 1-6, respectively). Each sediment core was sliced into 2-cm sediment samples down to a depth of 10 cm, and 5 cm intervals were collected down to 20 cm or deeper. Sediment samples were returned to the Barr Engineering laboratory and analyzed for the phosphorus fractions identified previously.

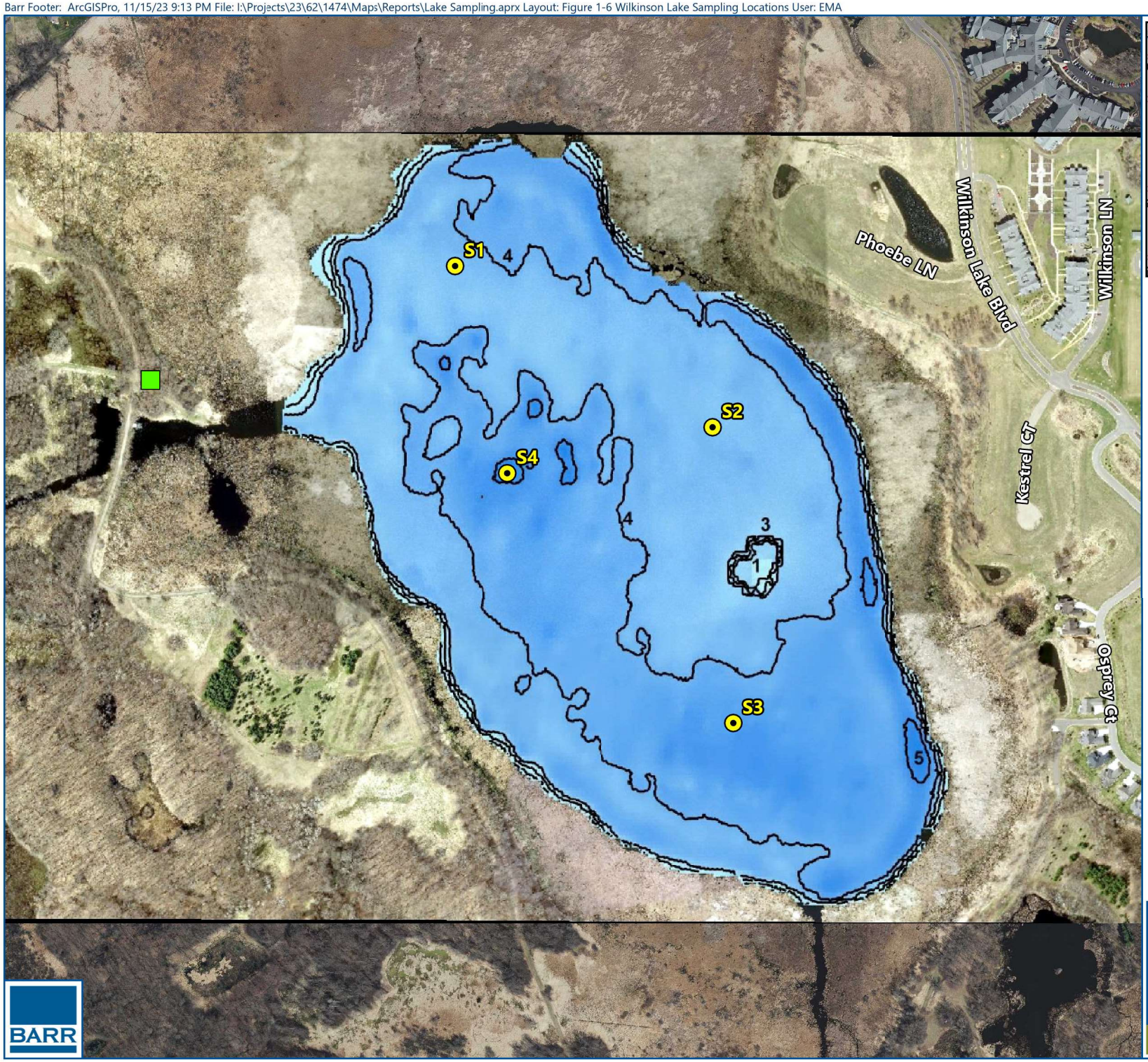
In general, mobile phosphorus concentrations in the sediment of Tamarack and Wilkinson Lakes were slightly lower than the organic-P fraction, as shown in Figure 1-7, but sediment phosphorus levels were generally higher in the core section at the sediment-water interface. Phosphorus concentrations and physical characteristics were relatively similar among both cores taken from Tamarack Lake, which were elevated above the mobile phosphorus concentrations measured in the Wilkinson Lake cores. Sediment cores S1 and S2 in Wilkinson Lake were like one another, with lower mobile phosphorus concentrations (see Figure 1-7), while sediment cores S3 and S4 in Wilkinson Lake had significantly higher mobile phosphorus concentrations. Figure 1-6 shows that the locations of sediment cores S3 and S4 correspond with the slightly deeper water in Wilkinson Lake and the flow path from the south tributary to the lake outlet.



SEDIMENT SAMPLING LOCATIONS

Tamarack Lake

FIGURE 1-5



Sediment Sampling Location

Alum Staging Area

Source: Contour Survey 4/05/17. Data collected and prepared by Ramsey County Conservation District for Vadnais Lakes Watershed Management Organization.

N

0 250 500

Feet

SEDIMENT SAMPLING LOCATIONS

Wilkinson Lake

FIGURE 1-6

BARR

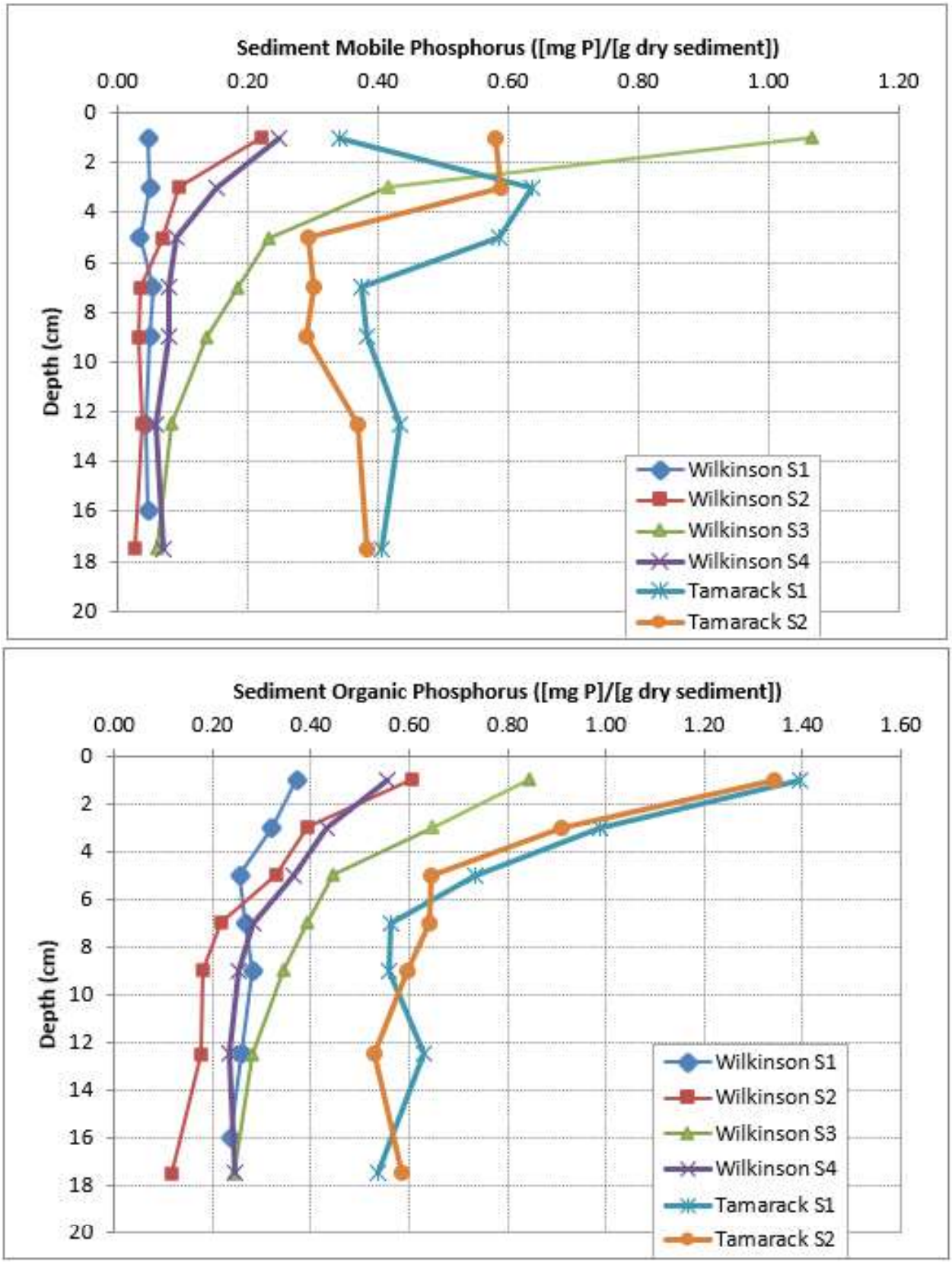


Figure 1-7 Results of Sediment Phosphorus Fractionations

2.0 Water Quality Modeling and Analysis

A key component to performing diagnoses is selecting a rigorous approach to evaluating potential water quality benefits. The simplified lake and watershed modeling approach used in the 2014 TMDL project did not account for intra-annual variations in lake water quality, so it was not considered for use in the previous feasibility analysis (Barr, 2017) as it lumps parameters at an annual time scale, treats lakes as fully mixed in a steady-state with uniform residence time, and does not adequately distinguish internal phosphorus loading sources from watershed sources during the critical conditions for water quality impairment. Based on our review of the available monitoring data and understanding of the purpose of the feasibility study, an approach was developed for evaluating the primary drivers of water quality impairment in each lake that adds further clarity, because it is based on updated monitoring data and accounts for intra-annual variations and recent management actions. Differentiating the individual drivers of lake water quality is based on the observed dynamics of each lake to set realistic expectations for future management actions.

The approach for this analysis used existing monitoring data, professional judgment, and past modeling to identify the best approach to cost-effectively improve lake water quality. Relevant subtasks included:

- Review current and historic water chemistry and biological data. Evaluate long- and short-term water quality trends.
- Review sediment phosphorus and dissolved oxygen data and use those data to estimate the internal phosphorus loading potential.
- Using existing watershed modeling, develop an updated lake phosphorus balance that includes phosphorus loads from watershed and in-lake sources and evaluate results to better understand the effect of varying climatic and sensitivity to management changes.
- Analyze fish data to evaluate potential impacts of rough fish on lake water quality and to determine the impact of water quality dynamics on the fish community.
- Integrate data analyses from above to diagnose causes of lake water quality problems, including feedback loops and dynamics between biological measurements and lake water quality observations.
- Evaluate existing and proposed water quality improvement options to identify feasible and cost-effective water quality improvement options for each lake basin.
- Complete an evaluation of feasible water quality improvement options to estimate expected lake water quality changes that could be attained.

2.1 Existing Management Practices

2.1.1 Watershed Best Management Practices (BMPs)

Since watershed mapping did not delineate the direct drainage areas tributary to existing BMPs and the BMP characteristics were not available, the updated P8 watershed modeling did not account for treatment for these BMPs in the feasibility study (Barr, 2017). Management actions were evaluated for the 2011

conditions in Wilkinson Lake, as the lake water quality modeling indicated that it represented a typical summer season that experienced both internal and external phosphorus loading impacts (see Section 2.2).

2.1.2 Past In-Lake Treatment Measures and Aquatic Invasive Species Control

An updated fish survey (Blue Water Science, 2017) indicates that natural winterkill conditions and an outlet carp barrier have successfully minimized rough fish populations and no other fish management is currently needed.

VLAWMO staff identified coontail and water lilies as the only two plant species in Wilkinson Lake when it was surveyed for the TMDL study (Wenck, 2014a). None of the plants were present in nuisance proportions and the vegetation in the surrounding wetland area consisted mostly of cattail and arrowhead. An updated vegetation survey was completed in 2017 by Ramsey County SWCD (then named RCD), which indicated the following:

> Aquatic macrophytes were found at all 60 points surveyed. Canada Waterweed (*Elodea canadensis)* and White Water Lily *(Nymphaea odorata)* were the most prominent species present, found at most of the survey points. Flat-stem pondweed (*Potamogeton zosteriformis*), Filamentous Algae *(Spirogyra/Cladophora sp.)*, and Coontail *(Ceratophyllum demersum)* were the next most common species. Found in fewer than 15% of the survey points were the following species: Curly Leaf Pondweed (*Potamogeton crispus*); Greater Duckweed (*Spirodela polyriza);* Sago Pondweed *(Potamogeton pectinatus)*; Yellow Water Lily (*Nuphar lutea*), Slender Waternymph (*Najas gracillima*); Muskgrass (*Chara spp.)* and Stonewort (*Nitella sp.*). Although the specific species of stonewort was not determined, there was no indication that the plant detected was the invasive starry stonewort – no white bulbils were seen. The secchi disk reading was 0.9m (2.95 ft).

2.2 Wilkinson Lake

Updated lake and watershed modeling was developed for this study and optimized to reproduce the observed water quality for each lake during the summer periods of interest. Figure 2-1 shows how the predicted and measured total phosphorus concentrations compare during the summer of 2011 for Wilkinson Lake without BMP implementation. Approximately 200 pounds of the overall phosphorus load was attributed to sediment phosphorus release during this time. The in-lake water quality modeling was used to show how implementation of the deep-water wetland restoration project (that is expected to remove 32.5 pounds of total phosphorus per year from the south tributary to Wilkinson Lake) and in-lake alum treatment would improve water quality during 2011. Figure 2-1 shows that the predicted phosphorus concentration in Wilkinson Lake would respond well to the implementation of the watershed BMP and an 80 percent reduction in internal load (like what would be expected following an in-lake alum treatment), or approximately 160 pounds per year of phosphorus.

The modeled summer average TP following BMP implementation shown in Figure 2-1 is 67 ug/L, but it should be noted that the results of these analyses are based on the same starting phosphorus concentration at the beginning of the summer. Over time, following full-scale BMP implementation or in-lake alum treatment, it is expected that the starting concentrations would be lower than what is shown at

the beginning of each summer season. Based on the results shown in Figure 2-1, this in turn, should ensure that an in-lake alum treatment combined with implementation of the deep-water wetland restoration project would maintain lake water quality at levels that are very close to the shallow lake standards.

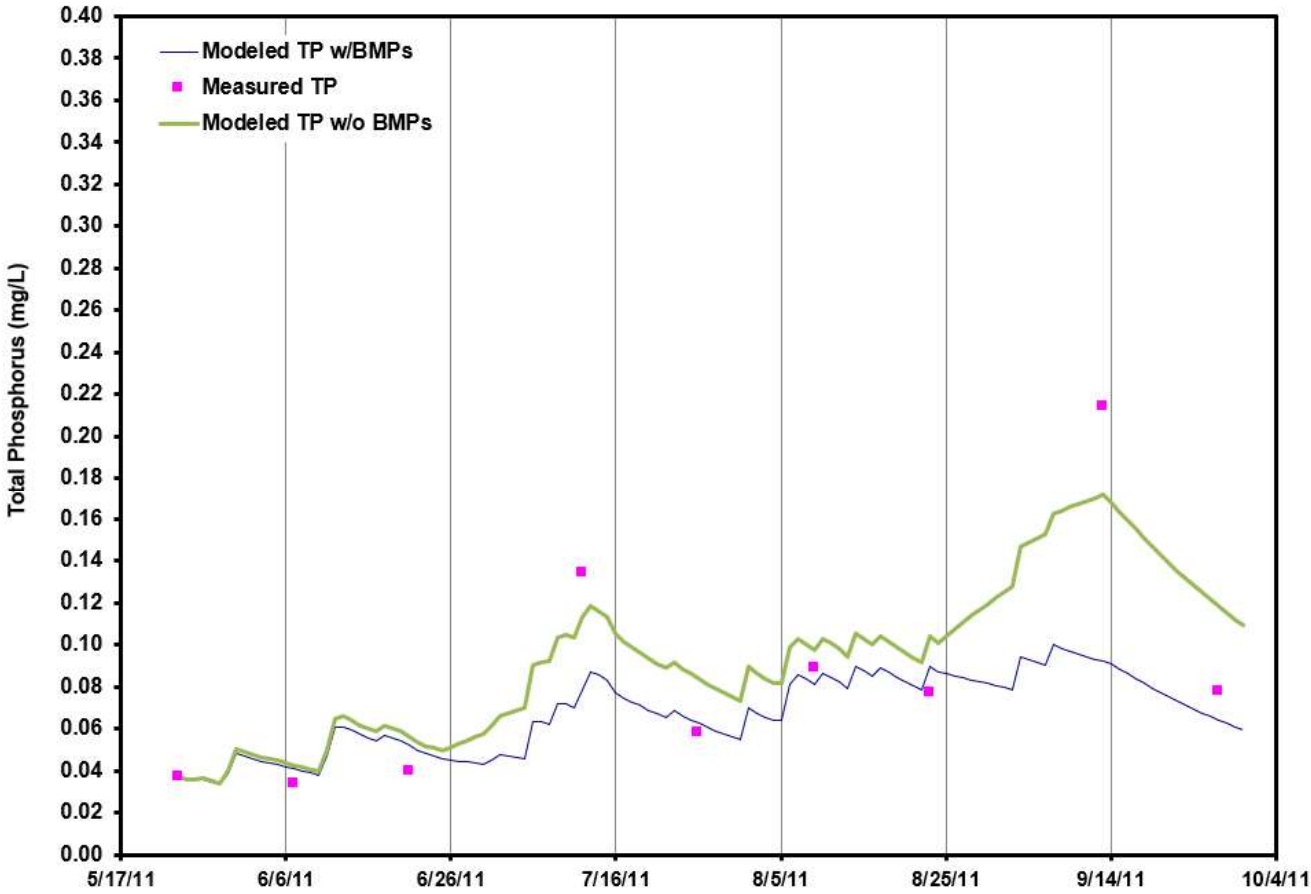


Figure 2-1 2011 Water Quality Modeling Results for Wilkinson Lake

2.3 Tamarack Lake

Since watershed and in-lake water quality modeling was not specifically available for Tamarack Lake, Barr reviewed the 2021 and 2022 lake water quality monitoring data to develop a mass balance estimate of how much the increasing summer total phosphorus concentrations could be associated with internal load. Measured total phosphorus concentrations increased by 166 and 200 µg/L during the respective summers of 2021 and 2022 for Tamarack Lake. On average, approximately 32 pounds of internal phosphorus load can be attributed to sediment phosphorus release during these two years. As a result, an in-lake alum treatment is also recommended for Tamarack Lake as the monitoring results indicate that it would be needed to ensure that the water quality goals/standards are met on a consistent basis. Over time, following an estimated 26 pounds per year of phosphorus load reduced (80 percent) from an in-lake alum treatment (and to a lesser extent, small-scale watershed BMP implementation), it is expected that the concentrations would be maintained closer to the shallow lake standard throughout the summer season.

3.0 Social Implications of In-Lake Management

Understanding the inner working and prescribing management strategies of lake systems requires use of complex mathematical watershed and lake models. However, the resultant management strategies, although technically supported, are often difficult to convey to the public. To address the issue, a stakeholder engagement process was incorporated into the 2017 feasibility study (Barr, 2017). The goal of the stakeholder engagement process was to involve the public, regulatory agencies and VLAWMO staff in the process of identifying and vetting management solutions for each lake. This stakeholder process was completed previously for Wilkinson Lake, and it's recommended for VLAWMO to convey some of the same output with key stakeholders to implement future projects for both lakes, and assist with getting alum treatment permitting from MPCA.

The 2016 Stakeholder Charrette was attended by members of the public, non-governmental organizations (including the North Oaks Homeowners Association), municipal agencies (Cities of North Oaks and White Bear Lake and Ramsey Conservation District), state government (Minnesota Department of Natural Resources and Minnesota Pollution Control Agency) and VLAWMO staff. The attendees convened for a state of the lake presentation for each lake followed by collaborative group discussions.

When group attendees were asked about what role fish and aquatic plants play, they were interested in discerning the difference between invasive and non-invasive plants. Also, there was concern about the lack of species diversity and how that would affect the ecological functions of the lakes. They were also interested in conducting a fish study in Wilkinson Lake (which was subsequently conducted in 2017).

In addition, group attendees wondered why Wilkinson Lake is considered a shallow lake and not a wetland. The group discussions generated questions for regulatory agencies to address and VLAWMO staff to consider. The MPCA detailed their role as the agency responsible for assessing a lake's quality and its ability to meet designated standards. Modifying the classification to assign a shallow lake or wetland designation to the public water/wetland through the MPCA is a relatively straightforward process requiring data (maximum depth, littoral area, shoreline vegetation, uses, etc.) supporting the change. After considerable discussion and a qualitative review of the available data on Wilkinson Lake, it was concluded that maintaining the shallow lake classification is best for this system. Wilkinson Lake is in the upper watershed and discharge from it must be relatively clean so as not to adversely affect the water quality of downstream lakes that ultimately feed the water supply.

Vegetation changes may need to be considered for an alum treatment. Both lakes do not have recreational use and native vegetation would be expected to experience increased growth. Curlyleaf pondweed is not currently present in Tamarack Lake, although ongoing monitoring is recommended. In Wilkinson Lake, curlyleaf pondweed monitoring and consideration for management is also recommended following an alum treatment.

4.0 Recommendations

4.1 Alum Treatment for Tamarack and Wilkinson Lakes

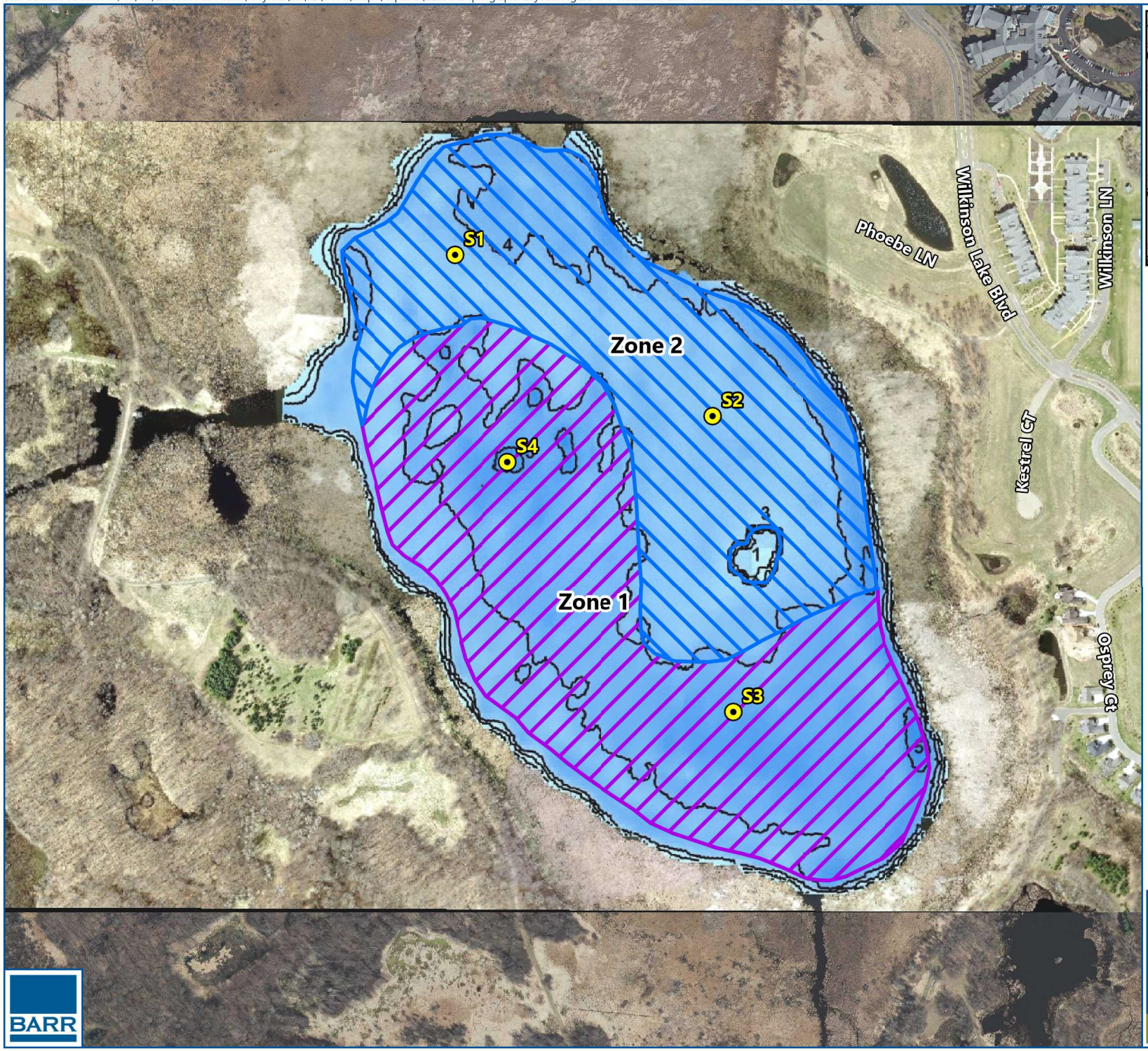
Alum treatment is recommended for both Tamarack and Wilkinson Lakes to reset the sediment phosphorus release rates to levels that are consistent with natural background conditions. The application of aluminum has two expected mechanisms: (1) aluminum binds with iron-bound phosphorus in the sediment, thereby forming Al-P, and (2) a residual amount of unbound aluminum remains in the sediment and is available to bind phosphorus that is released from the decay of Org-P. For most lake systems alum dosing is designed to provide some amount of "excess" aluminum to bind phosphorus released from decayed Org-P. However, the aluminum added to the sediment will age over time and be less effective at capturing more phosphorus. Due to the high amount of Org-P in Tamarack and Wilkinson Lake sediment, it is recommended that the alum treatments of Tamarack and Wilkinson Lakes be split into two applications. By splitting the alum treatment into two applications separated by two or more years, more of the decomposing Org-P can be captured by the alum. The second application would occur two or more years after the first application and could be completed as soon as lake monitoring data indicates that internal phosphorus loading is beginning to reoccur.

Two forms of aluminum are typically applied to lakes: alum and sodium aluminate. When alum is added to a lake, it will lower the pH (make it more acidic), while sodium aluminate will raise the pH (more basic). Therefore, these two chemicals are often added in combination to neutralize the pH effects during treatment. At lower doses, alum-only applications can be conducted without adversely affecting the pH (i.e. pH stays above 6). Alum is typically less expensive and easier to work with than sodium aluminate, and an alum-only treatment may be preferable when it will not cause an unacceptable change in pH.

Since Wilkinson Lake sediment cores S1 and S2 had lower mobile phosphorus concentrations than sediment cores S3 and S4, and since the locations of sediment cores S3 and S4 correspond with the slightly deeper water and the flow path from the south tributary to the lake outlet, the Wilkinson Lake dosages were split into two treatment zones as shown in Figure 4-1. Table 4-1 shows the recommended alum and sodium aluminate dosages prescribed for each lake with split applications, including a breakdown of the treatment zone dosages for Wilkinson Lake.

Table 4-1 Recommended Alum Dosing for Split Applications

Lake	First Application		Second Application		Lake Total	
	gallons alum	gallons sodium aluminate	gallons alum	gallons sodium aluminate	gallons alum	gallons sodium aluminate
Tamarack	3,770	1,885	3,770	1,885	7,540	3,770
Wilkinson Zone 1	19,070	9,535	19,070	9,535	60,830	30,415
Wilkinson Zone 2	11,345	5,673	11,345	5,672		
				Treatment Total	**68,370**	**34,185**



Sediment Sampling Location

Alum Treatment Zones

Zone 1 (47.2 acres)

Zone 2 (38.1 acres)

Source: Contour Survey 4/05/17. Data collected and prepared by Ramsey County Conservation District for Vadnais Lakes Watershed Management Organization.

N

0 250 500

Feet

ALUM TREATMENT ZONES

Wilkinson Lake

FIGURE 4-1

BARR

The pH in the waterbody must be closely monitored during alum applications, and if the pH reaches the critical value of 6.0, the treatment should be stopped until the pH can recover. If pH and alkalinity conditions are different at the time of treatment and show a greater potential to lower pH below 6.0 during treatment, the treatment plan could be altered to replace a portion of the alum with a higher quantity of sodium aluminate to buffer the pH.

Typically, in-lake alum treatments are effective for 15 to 20 years, with shallow lakes experiencing shorter durations of effectiveness, depending on the extent of watershed treatment. However, it is expected that the split applications of alum, combined with the extent of stormwater treatment in each lake watershed, will ensure that the effective life of the alum treatment is greater than ten years and that alum would not need to be reapplied for 15 years. VLAWMO will be responsible for any future maintenance that will be needed to achieve the effective life of the project.

4.2 Estimated Implementation Costs

As discussed in Section 2.1, and shown in Figure 1-1, there are several existing/planned BMPs and upstream lakes and wetlands in the Wilkinson Lake watershed and the Tamarack Lake watershed that do not contribute excess phosphorus loading.

Splitting the alum treatment into multiple applications would also allow for adjustments to the final alum dose, based on observations of water quality and/or sediment chemistry following the first application. the total estimated costs (including engineering, treatment oversight and a 25% contingency is recommended) for the recommended split treatment for each lake are shown in Table 4-2. Phase 1 is recommended for the fall of 2024. The treatment costs are based on the prescribed dosages of alum and sodium aluminate shown in Table 4-1 and assumed unit costs of $3 per gallon for alum and $7.50 per gallon for sodium aluminate.

Table 4-2 Summary of Alum Treatment Costs

Description	Tamarack Lake		Wilkinson Lake	
	Phase 1	Phase 2	Phase 1	Phase 2
Chemical treatment contract	$26,000	$26,000	$205,000	$205,000
Engineering and treatment contracting support	$4,000	$4,000	$10,000	$10,000
Contingency (25%)	$7,500	$7,500	$53,750	$53,750
Totals	**$37,500**	**$37,500**	**$268,750**	**$268,750**
	$75,000		**$537,500**	

The alum treatment costs shown in Table 4-2 assume that both basins are treated at the same time to minimize mobilization costs for the treatment contractor. Treatment support includes pH monitoring of each lake each time that chemicals are applied to assure that the project's permit requirements are met. Figures 1-5 and 1-6 show the recommended locations for a contractor's alum staging area, including path access and locations for temporary tanks adjacent to Tamarack Lake and Wilkinson Lake, respectively.

It is expected that wider-scale implementation of additional site-scale BMPs throughout the watershed would also be cost-effective as the watershed experiences development and redevelopment but may not always be feasible and would likely need to be implemented as a part of street reconstruction projects to realize significant cost savings. Other than winterkill, which along with the outlet carp barrier, has controlled the rough fish densities (Blue Water Science, 2017), no other in-lake treatment alternatives were considered cost-effective and/or adequate to meet the water quality goals for the lakes. Herbicide treatments may be warranted in Wilkinson Lake after alum treatment to ensure that curlyleaf pondweed and/or other invasives do not supplant native plants. Curlyleaf pondweed has not been documented in Tamarack Lake, so herbicide treatment should not be needed.

5.0 References

Barr Engineering Company. 2017. East Goose, West Goose and Wilkinson Lakes Feasibility Study. Prepared for Vadnais Lake Area Water Management Organization (VLAWMO) in partnership with Young Environmental Consulting Group.

Blue Water Science. 2017. Fish Survey of Wilkinson Lake (ID #62-0043) Ramsey County, Minnesota in 2017. Prepared for VLAWMO and MnDNR.

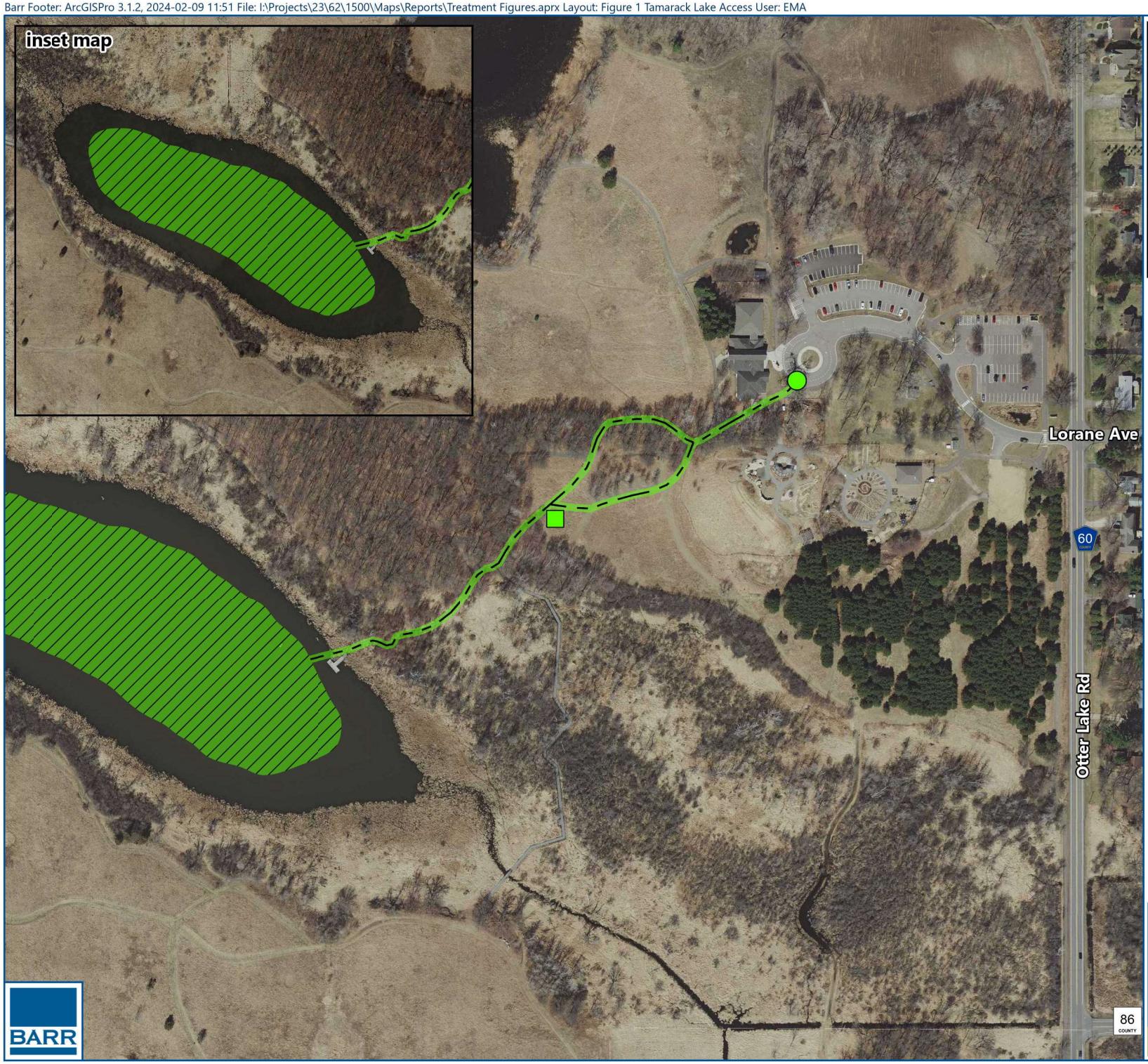
VLAWMO. 2014. Vadnais Lake Area WMO Total Maximum Daily Load (TMDL) Implementation Plan.

Wenck. 2013. Vadnais Lake Area WMO Total Maximum Daily Load (TMDL) and Protection Study. Prepared for VLAWMO.

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit B: Map of anticipated use area

Attached, beginning on following page



Access Route

Alum Staging Area

Chemical Offloading Area

Project Limits

Treatment Area

N

0 150 300

Feet

ACCESS MAP

Tamarack Lake

FIGURE 1

BARR

EXHIBIT B
Contractor's Quote

[attached hereto]

LAKE RESTORATION, INC.

YOUR LOCAL AQUATIC EXPERTS SINCE 1977

08/26/2024

Lake: Tamarack County: Ramsey

Barr Engineering Company
Attn: Greg Wilson
4300 MarketPointe Drive, Suite 200
Bloomington, MN 55435

Lake Restoration Past Relevant Experience:

Lake	Year	Contracting entity	Gallons Applied
Cedar	1996	Minneapolis Park & Rec.	100,000
Lake of the Isles	1997	Minneapolis Park & Rec.	40,000
Langdon Lake	1998	Wenck Eng.	100,000
St. Clair	1998	Pelican River Watershed	72,000
Bryant	2008	Nine Mile Creek Watershed	124,000
Sunfish	2008		14500
Long Lake, Pine Springs	2009		59,000
Lake Rebecca, Hennepin	2010	Three Rivers Park District	168,000
Bryant	2013	Nine Mile Creek Watershed	122,000

Lake Restoration Alum Supplier Information:

Hawkins Chemical

PO BOX 860263

Minneapolis, MN 55486-0263

Lake Restoration Clarification on Quote / Contractor Services Agreement:

Lake Restoration intends that the owner/engineer may use this submitted quote and its prices in preparation of Contractor Services Agreements between the owner and Lake Restoration, Inc.

LAKE RESTORATION, INC.

YOUR LOCAL AQUATIC EXPERTS SINCE 1977

Lake Restoration, Inc. and the owner will have to agree on the scope of each contractor services agreement, including number of mobilizations, amount of aluminum sulfate, deadlines, etc. prior to treatment.

Signed,

Paul Kretsch, VP of Sales and Marketing

12425 Ironwood Circle, Rogers MN 55374

763-428-9777

www.LakeRestoration.com

quote and within the times indicated, in accordance with the terms and conditions of the Contract Documents. Contractor accepts all terms and conditions of the request for quotes. A submitted quote will remain subject to acceptance for 45 days after the date for submission of quotes stated above.

2. In submitting this quote, the Contractor represents that it has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents, and hereby acknowledges receipt of the following addenda:

Addendum No.	Addendum Date

3. The price quote form may be completed in ink, by typewriter, or by computer program.
4. The address and telephone number for communications regarding the price quote must be shown on the price quote form.

Item	Description	Unit	Estimated Quantity	Unit Price	Extension
1.1	Mobilization/Demobilization to Tamarack Lake	EA	4	$11,580	$46,320
1.2	Aluminum Sulfate Application to Tamarack Lake	Pounds	78,580	$0.70	$55,006
				Total Quote	$101,326

GRAND TOTAL OF BASE PRICE QUOTE EXTENSIONS

(in words) One-Hundred one thousand, three-hundred twenty-six Dollars

($ 101,326.00)

F. Submission of Price Quotes

1. All price quotes shall be submitted on the unaltered forms included with the quotation. The blank spaces on the form shall be filled in correctly in ink, typewritten or printed where indicated for each and every item for which a quantity is given, and the respondent shall clearly indicate the prices for which he/she proposes to do each item of the Work.
2. All costs to complete the Work will be considered to be included in the quoted price and no additional compensation will be provided.
3. The price quote submittal must include documentation of past relevant experience, in a format of choice, including documentation of past relevant experience with at least three examples of application of aluminum sulfate to lakes of 10 acres or larger in size.

j. **Permit**—written permission from the Minnesota Pollution Control Agency for aluminum treatment of Tamarack Lake

Communications concerning this price quote shall be addressed to the address of respondent at the address indicated below.

This quotation is submitted by:

Firm Name:	Lake Restoration, Inc.
By (Typed or Printed):	Paul Kretsch
Signature:	Paul Kretsch
Title:	VP Sales & Marketing
Official Address:	12425 Ironwood Circle Rogers, MN 55374
Phone:	(763) 428 9777
Federal Tax I.D. No.	411410549
Date:	08/26/2024
Experience With Alum Applications to Lakes (Yes or No):	Yes
Contact Information for Project Reference(s):	If needed

EXHIBIT C
Access Agreement

[attached hereto]

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

PROPERTY OWNER NAME(S): County of Ramsey, a political subdivision of the State of Minnesota, through Ramsey County Parks and Recreation and Ramsey County Soil and Water Conservation Division ("**Owner**")

PROPERTY ADDRESS: Tamarack Nature Center, 5287 Otter Lake Rd, White Bear Township, MN 55110 ("**Property**")

PROPERTY ID NUMBER (PID): Parcel ID: 103022330003
SECTION 10 TOWN 30 RANGE 22 SUBJ TO RDS THE FOL; EX W 697 FT OF E ...OF W 1/2 OF SEC 10 TN 30 RN 22

EFFECTIVE DATE: March 31, 2024 TERMINATION DATE: December 31, 2024

By executing this Property Access Agreement ("Agreement"), Owner understands that the Vadnais Lake Area Water Management Organization ("VLAWMO") desires to enter onto the above-listed Property to carry out certain work, as described generally below. The work consists of an alum treatment, divided into two phases, to treat internal phosphorus loading in Tamarack Lake, which is an impaired water as designated by the Minnesota Pollution Control Agency (MPCA) for nutrients. The work is the result of a preceding feasibility study in the attached **Exhibit A**. Phase 1 of the alum treatment is anticipated to occur during fall 2024. Phase 2 of the alum treatment is anticipated to occur 2-3 years after the first phase has been completed. The decision for timing of the phase 2 application will be a result of monitoring conducted by VLAWMO and upon recommendation by the project engineer. The Owner is willing to grant access to the Property on the terms and conditions provided by this Agreement and with ongoing collaboration between both parties. As more information becomes available in the request for quote documents and contract documents, those will be shared by VLAWMO with the Owner. A focus of ongoing communication, especially regarding site access and staging specifics, will be regular updates and accommodation of potential nature center activities. An important and sensitive activity window will happen October 24-November 1 because Tamarack Nature Center has a high-attendance activity. VLAWMO and the Owner will coordinate around this window of time with additional sensitivity to ensure that the project activities are not interfering with the event. The right of entry granted herein shall apply to VLAWMO, its employees, agents, and contractors, collectively referred to herein as VLAWMO. Owner and VLAWMO agree as follows:

---

1. Right of Entry. Owner hereby grants to VLAWMO, its employees, agents, and contractors a temporary and non-exclusive license to enter upon the Property for the purpose of performing the following work (collectively, the "**Work**"):

   The work consists of staging and conducting an alum treatment in Tamarack Lake in two phases. Phase 1 is anticipated to be completed during fall 2024. **Exhibit B** shows the anticipated use area for project delivery, staging, and the possible location for temporary storage tanks. The final use area will be defined by the contractor as part of the quote/bid received and will be shared with the Owner by VLAWMO once a contractor has been selected and approved by the VLAWMO Board to complete the work. Staging may include setting up and maintaining storage tanks with double containment for alum (aluminum sulfate) and a buffer (sodium aluminate), delivering the chemicals to the site, and filling the tanks onsite. Chemical delivery and maintenance will be conducted consistent with bid or quote documents that will include a management/safety response plan. Conducting the alum treatment will include a contractor using the parking lot area and vehicle access trails to bring a small boat (e.g., pontoon or other similar watercraft) near the application location. Once supplies are close to the application area, they will be transported along the boardwalk using wheeled carts or hand-carried. The small watercraft will be launched at or near the observation platform. Chemicals will be loaded onto the watercraft and applied to the lake in accordance with the description that will be provided by the contractor in the quote/bid documents and successful quote/bid. Staging will begin prior to each phase of the alum treatment, with communication and coordination between VLAWMO and the Owner. The application of alum is anticipated to take a few days over the course of 1-2 weeks, dependent upon weather and pH response in the lake. Monitoring will be conducted by the project engineer during the alum application as per MPCA requirements, and VLAWMO will be conducting ongoing monitoring once the application has been completed. Phase 2 will be conducted in the same manner as phase 1 and will be timed according to recommendations made by the project engineer.

   Owner authorizes VLAWMO, at VLAWMO's reasonable discretion, to enter upon and temporarily bring onto the Property such equipment and materials as may be reasonably needed to perform the Work. Owner represents and warrants that it is the fee owner of the Property and has the authority and right to enter into this Agreement on behalf of all owners of the Property.

2. Term. This Agreement shall commence as of the Effective Date and terminate on the Termination Date as indicated above unless extended by mutual written agreement of the parties. Following completion of the Work, VLAWMO agrees to reasonably restore the Property to its prior condition in the event that it is damaged as a result of the work. All such restoration work shall be completed before the indicated termination date.

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

3. Fees and Costs. VLAWMO shall be solely responsible for the costs of all labor, services, equipment, and materials used in conducting the Work at the Property and shall not permit any lien or encumbrance upon the Property resulting from its activities thereon. VLAWMO is also responsible for all costs associated with restoring the Property.

4. Property Damage. If VLAWMO causes damage to the Property or Owner's personal property while performing the Work, VLAWMO shall repair the Property or replace the damaged item at its own cost.

5. Insurance. VLAWMO shall require the contractor completing the work to maintain workers' compensation insurance (unless exempt under law) and commercial general liability insurance with coverage limits of no less than $1,000,000 per occurrence, $2,000,000 general aggregate, $2,000,000 products/completed operations total limit, $1,000,000 personal injury, and advertising liability. An umbrella or excess liability policy over primary liability insurance coverages is an acceptable method to provide the required commercial general liability and employer's liability insurance amounts.

   Additional insurance requirements include:

   Auto Liability: If the contractor is driving on behalf of the county but not transporting clients as part of the contractor's services under this contract, a minimum of $500,000 combined single limit auto liability, including hired, owned and non-owned.

   Professional Liability: Professional liability of no less than $1,000,000 per claim and $3,000,000 aggregate limit.

   Work Comp: Workers' Compensation as required by Minnesota Law. Employer's liability with limits of $500,000/$500,000/$500,000.

   Additional Insured: The County must be named as an additional insured on all policies and no work can commence until certificates of insurance are delivered to the County.

   If requested, the Contractor shall provide the VLAWMO and the Owner a certificate of insurance showing all insurance coverages it has in effect. The Contractor shall have the Owner named as an additional insured on its commercial general liability policy.

6. Indemnify. VLAWMO will, and will cause its contractors to, indemnify, hold harmless, and defend Owner and its respective officials, agents, and employees against any and all liability, losses, costs, damages, expenses, claims, or actions, including attorney's and expert witness's fees, which Owner or its officials, agents, or employees may sustain, incur, or be required to pay, arising out of or by reason of any act or omission of VLAWMO, its contractors, officials, agents, or employees, arising directly or indirectly from VLAWMO's or its contractor's or contractors' presence on the Property, activities on the Property, acts and/or omissions with respect to the Property and/or Work, and/or from the performance, or failure to adequately or safely perform the Work.

7. Binding Effect. This Agreement shall be binding upon, and inure to the benefit of, the parties' respective successors and assigns.

8. Governing Law. This Agreement shall be interpreted in accordance with and be governed by the laws of the state of Minnesota.

9. Entire Agreement. This Agreement is the full, complete, and entire agreement of the parties with respect to the subjects hereof, and any and all prior writings, representations, and negotiations with respect to those subjects are superseded by this Agreement. This Agreement may only be amended by the parties hereto by a written and signed instrument.

IN WITNESS WHEREOF, the undersigned parties have executed this Agreement as of the dates indicated below.

OWNER:

Signature

Mark McCabe, Director Ramsey County Parks
Printed Name

March 3, 2024
Date

Approved as to form:

Kathleen Ritter 3/11/2024
Assistant County Attorney Date

VLAWMO:

Signature

James Linder
Printed Name

4-24-24
Date

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit A: Feasibility study

Attached, beginning on following page

Tamarack and Wilkinson Lakes In-Lake Treatment Feasibility Study

Prepared for
Vadnais Lake Area Water Management Organization (VLAWMO)
and Ramsey County Soil and Water Conservation Division

November, 2023

With Funding from

CLEAN WATER LAND & LEGACY AMENDMENT

4300 MarketPointe Drive, Suite 200
Minneapolis, MN 55435
952.832.2600
www.barr.com

Tamarack and Wilkinson Lakes In-Lake Treatment Feasibility Study

November, 2023

Contents

List of Tables

List of Figures

1.0 Project Background and Purpose

Barr Engineering Company (Barr) was retained by Vadnais Lake Area Water Management Organization (VLAWMO) in 2023 to provide engineering services to build on past efforts by completing sediment monitoring (collected during spring 2023) and aluminum sulfate (alum) dosing for Tamarack and Wilkinson Lakes to improve lake water quality. This feasibility study includes sediment core collection/analysis, determination of an alum dosage plan, and compilation/consolidation of supporting information to implement in-lake management practices.

Figure 1-1 shows the watershed divides and drainage patterns for Tamarack and Wilkinson Lakes, including subcatchments and monitoring stations. Table 1-1 shows the lake morphology/depth and other watershed/water body characteristics for each basin (as determined in GIS or published by VLAWMO).

Table 1-1 Lake Morphology and Watershed Characteristics

Parameter	Tamarack Lake	Wilkinson Lake
Open Water Surface Area (acres)	13	100
Average Depth (feet)	5	3
Maximum Depth (feet)	10	5
Residence Time (years)	not estimated	0.2
Direct, Overall Drainage Area (acres)	130, 130	2973[1], 4555[2]

[1]Based on Subwatershed ID#2007904 in TMDL Report (excludes lake surface area)

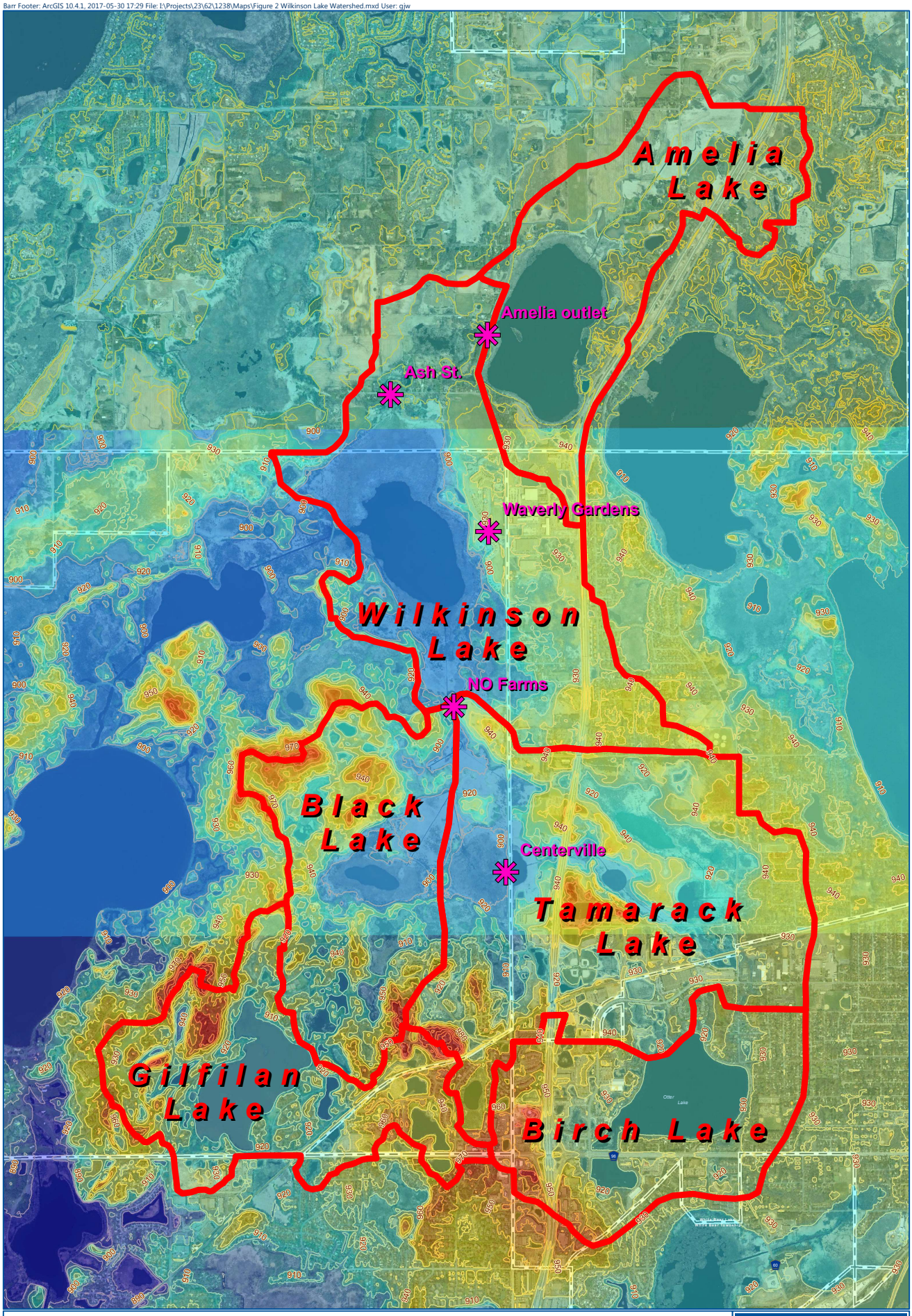
[2]Based on Subwatershed ID#s 2007901, 2007903, and 2007904 in TMDL Report

1.1 Summary of Lake TMDL Report and Past Studies

Barr systematically reviewed reports and data collected on Tamarack Lake and Wilkinson Lake, including the total maximum daily load (TMDL) report and implementation plan (2013 & 2014), sustainable lake management plans/reports (2011, and 2017 and 2023 updates), storm sewer and treatment practice plans, proposed redevelopment plans and retrofit report (2012), BMP feasibility studies (2017 & 2020), fish (2012 & 2017) and aquatic plant survey reports (2010 & 2014), sediment (2008) and bathymetric/macrophyte/ vegetation biovolume/bottom composition surveys (2017 & 2022).

While Tamarack Lake has been listed as impaired for excess nutrients, it was not previously addressed in the TMDL report.

Barr Footer: ArcGIS 10.4.1, 2017-05-30 17:29 File: I:\Projects\23\62\1238\Maps\Figure 2 Wilkinson Lake Watershed.mxd User: gjw



BARR

Wilkinson Watershed Sampling Sites
Wilkinson Lake Subcatchments
10-Foot Elevation Contour
Municipal Boundary

0 1,000 2,000
Feet

WILKINSON LAKE WATERSHED
Vadnais Lake Area
Watershed Management
Organization

FIGURE 1-1

The TMDL report (Wenck, 2014a) and implementation plan (VLAWMO, 2014) estimated internal and watershed loading and called for 63% total phosphorus load reductions for Wilkinson Lake, which corresponded with a 76% reduction of stormwater runoff, after accounting for an explicit margin of safety.

The high percentage of watershed loading on Wilkinson Lake focused the direction on additional studies since the publishing of the TMDL report. This included increased monitoring and several feasibility studies, along with updated fish and vegetation studies. VLAWMO recently bid and initiated construction on a deep-water wetland restoration project that is expected to remove approximately 33 pounds of total phosphorus per year from the south tributary to Wilkinson Lake.

Lake and watershed modeling, along with the associated GIS mapping, from the TMDL study were obtained by Barr and reviewed for use in a recent feasibility analysis (Barr, 2017). Additional concerns with the TMDL modeling are discussed in Section 2.1, in which it was determined that the following data gaps and limitations of the past analyses would also need to be addressed to better evaluate the sources of phosphorus during the critical condition and potential improvement options for Wilkinson Lake:

- The P8 watershed modeling from the TMDL study did not simulate the existing watershed Best Management Practices (BMPs) and phosphorus assimilation by upstream lakes. As discussed in Section 2, this may have led to overestimated phosphorus loadings for each lake watershed in the TMDL study.
- The GIS mapping (and associated P8 watershed modeling) from the TMDL study included a significant landlocked area from Gilfillan Lake, as well as an area from Lake Amelia that is only connected infrequently (during wet years), in the Wilkinson Lake watershed. This may have also led to overestimated phosphorus loading for this watershed in the TMDL study.

Stormwater monitoring data collected in the Wilkinson Lake watershed since 2011 was obtained and evaluated to better distinguish priority phosphorus source areas that would not otherwise have been determined from the P8 modeling developed for the TMDL study.

1.2 Summary of Recent Water Quality Monitoring

Table 1-2 shows the ten-year summer average total phosphorus and chlorophyll-a concentrations observed for each lake, along with the average Secchi disc transparency, compared to MPCA's shallow lake water quality criteria. Table 1-2 shows that, despite recent water quality improvements in Wilkinson Lake, both lakes do not currently meet MPCA's shallow lakes criteria.

Table 1-2 Average Summer Water Quality (2013-22) and Shallow Lake Criteria Comparison

Water Body	Total Phosphorus Concentration (µg/L)	Chlorophyll-a Concentration (µg/L)	Secchi Disc Transparency (meters)
Tamarack Lake	167	121	0.38
Wilkinson Lake	134	32	0.97
MPCA Shallow Lakes Criteria	**60**	**20**	**1.0**

Both water bodies will experience low dissolved oxygen in the bottom waters, periodically, during the summer months, and are subject to internal phosphorus loading.

Figures 1-2, 1-3 and 1-4 show how the last ten years of average summer total phosphorus, chlorophyll-a and Secchi disc transparency, respectively, have varied for each lake. The first four years of the records shown in each figure represent the data used for the TMDL analyses of Wilkinson Lake. The monitoring data shows that both lakes have not been meeting any of the three shallow lake criteria during the period of record.

Figure 1-2 shows that average summer total phosphorus concentrations were generally better for the lakes in 2011, significantly worse in 2015 and 2016, followed by a return to improved water quality in Wilkinson Lake between 2017 and 2021. As a result, 2011 became the focus of the updated lake and watershed modeling discussed in Section 2.

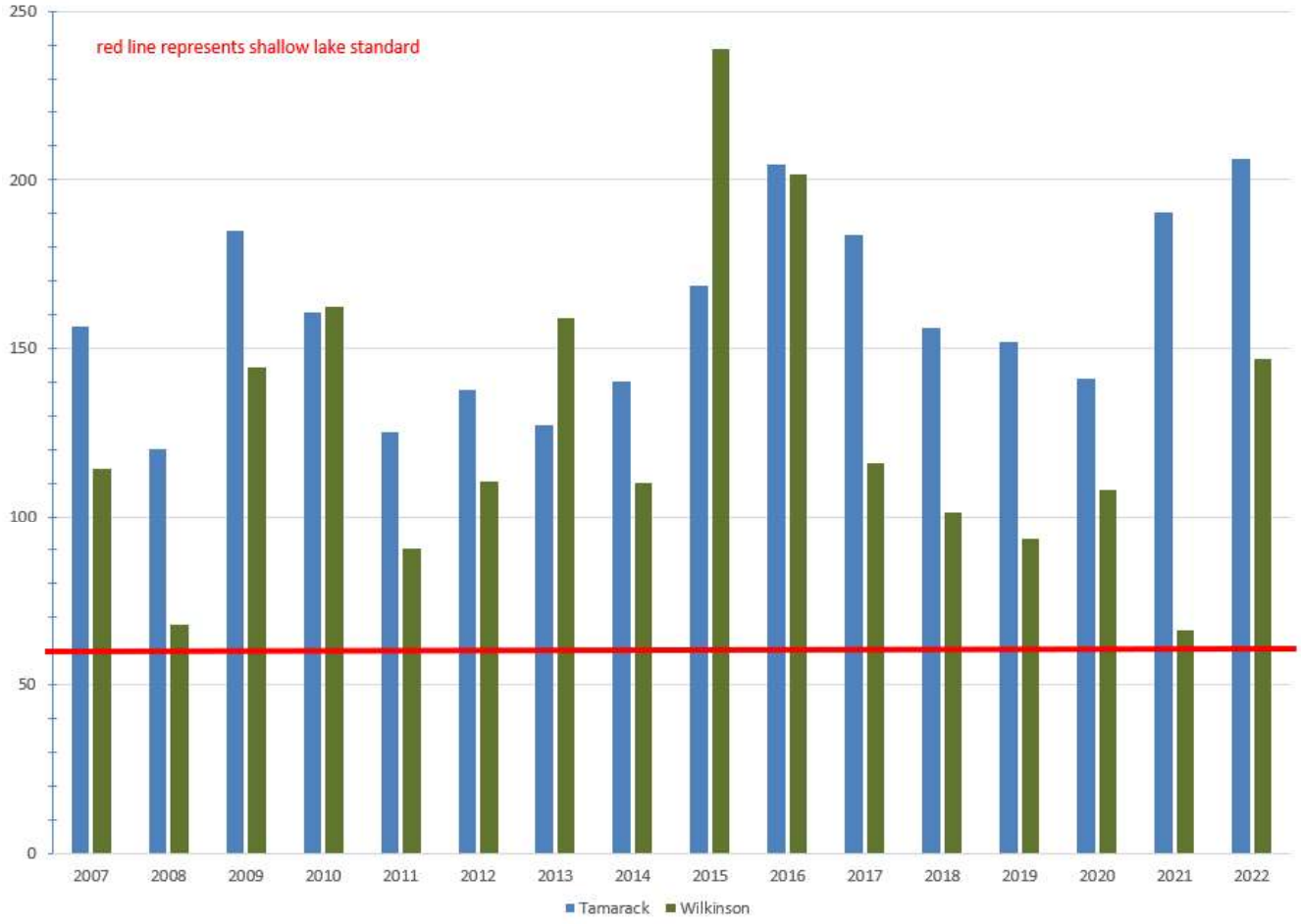


Figure 1-2 Summer Average (June-Sept.) Total Phosphorus Concentrations (µg/L) since 2007

Figure 1-3 shows that average summer chlorophyll-a concentrations were generally better for the lakes in 2011, significantly worse in 2015, followed by a return to improved water quality in Wilkinson Lake between 2016 and 2022. Chlorophyll-a concentrations in Wilkinson Lake met the MPCA criteria every year between 2017 and 2022.

Figure 1-3 shows that algae growth has remained high in Tamarack Lake since 2015. The highest chlorophyll-a concentrations on record in Tamarack Lake occurred during 2021 and 2022.

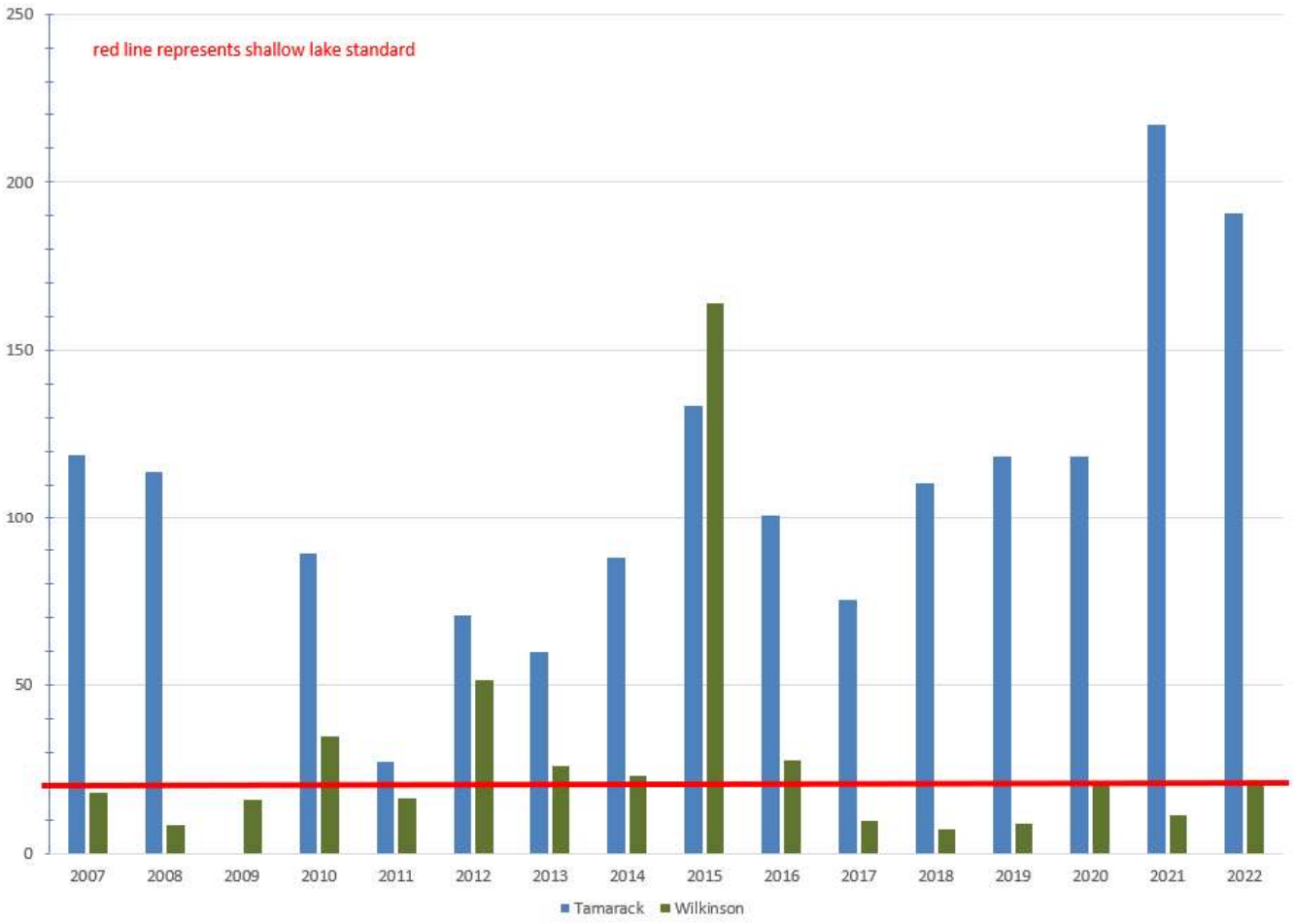


Figure 1-3 Summer Average (June-Sept.) Chlorophyll-a Concentrations (µg/L) since 2007

Figure 1-4 shows that average summer Secchi disc transparency measurements were significantly worse in 2015, followed by a return to improved water quality in Wilkinson Lake between 2016 and 2021. Secchi disc transparency in Wilkinson Lake met the MPCA criteria every year between 2017 and 2021, which explains why the long-term average shown in Table 1-2 very nearly met the MPCA threshold.

While Tamarack Lake experienced its highest transparency in 2022, it remains 0.4 meters lower than MPCA threshold (see Figure 1-4) due to high algae growth and high phosphorus concentrations.

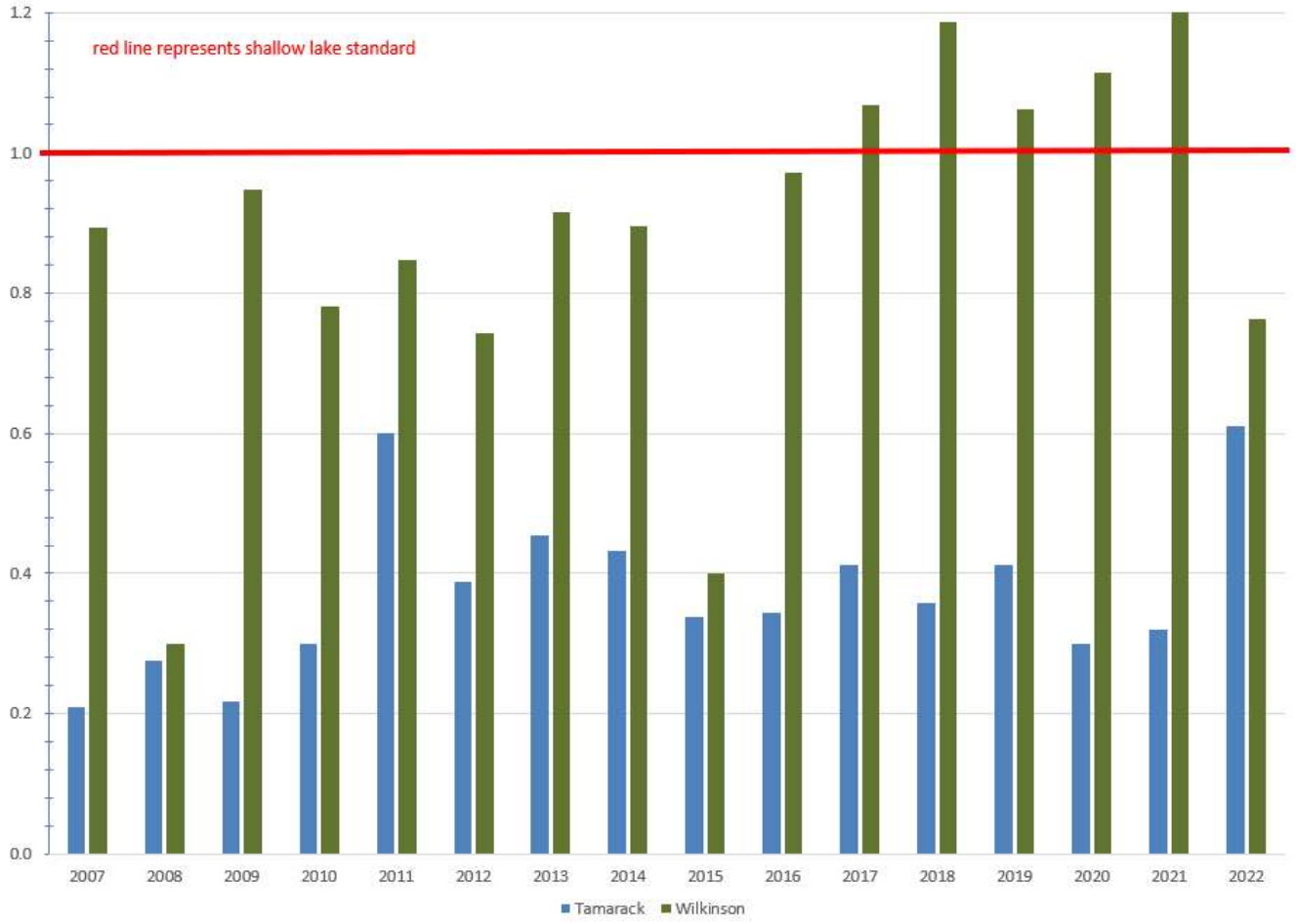


Figure 1-4 Summer Average (June-Sept.) Secchi Disc Transparency (meters) since 2007

1.3 Current Analysis of Lake Sediment Cores

Phosphorus from stormwater over time accumulates in the bottom sediments of lakes and ponds. During the spring and fall, this phosphorus is largely tied-up in the sediments, but during the warm summer months the phosphorus can be released from bottom sediments and move upward into the water column. This can lead to summer and sometimes early fall algal blooms. During the winter, lake stratification can also lead to phosphorus release from anoxic bottom sediments. Not all the phosphorus

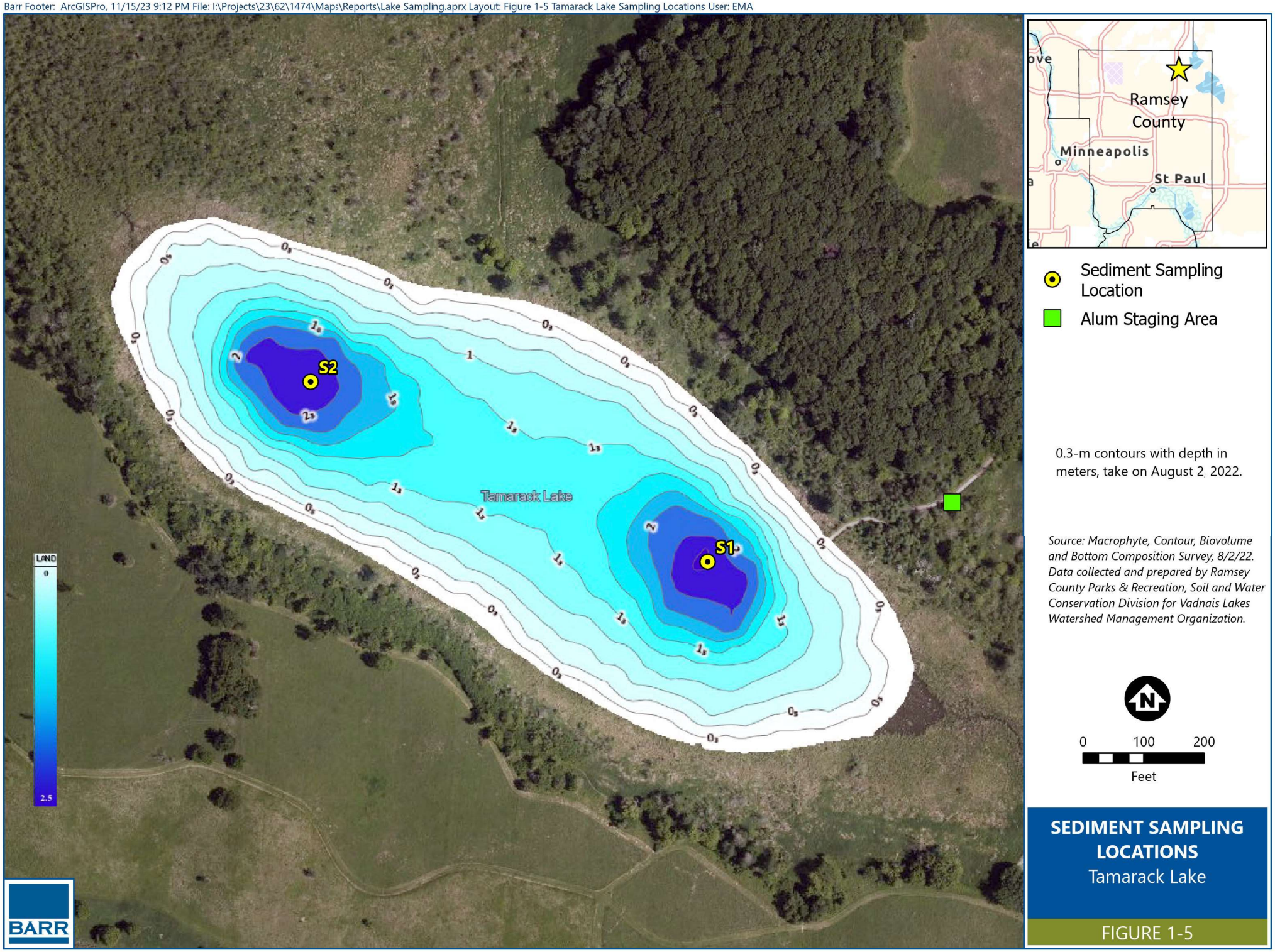
that is incorporated into bottom sediments releases into the water column. Phosphorus in sediment is typically attached to something and can be found in the following forms (often referred to as "fractions"): calcium bound phosphorus (Ca-P), aluminum bound phosphorus (Al-P), iron bound phosphorus (Fe-P), and organically bound P (Org-P). Ca-P and Al-P are largely inert and are immobilized in the bottom sediment. Org-P decays over time and release phosphorus into the water column over the course of several years. Fe-P is the mobile phosphorus form that readily releases into the water column during warm summer months as oxygen is depleted in the sediment.

The primary purposes of collecting sediment cores are to quantify the amount of Fe-P (mobile phosphorus) and Org-P in sediment. The more Fe-P and Org-P in sediment the more alum will need to be applied to immobilize these phosphorus fractions. In general, aluminum treatment (either as alum or sodium aluminate, for example), forces the Fe-P to bind to aluminum and form Al-P (the inert form of aluminum). In most cases, alum treatments are designed to also provide excess aluminum in sediment which can then bind phosphorus years after the treatment. When aluminum in the form of alum or other solutions is added to a lake, it forms an aluminum hydroxide floc that settles to the lake bottom. The aluminum floc will mix into the top few to several inches of sediment over time and becomes diluted. The sediment phosphorus data collected at different depths was used to help determine the expected sediment mixing depth for each lake.

The total mass of mobile and Org-P in the actively mixed layers of sediment were determined for each lake. Alum doses were then calculated for each lake by determining an appropriate Al:Al-P ratio to immobilize the phosphorus that contributes to the internal load.

Sediment cores were collected between June 2 and June 6, 2023, in Tamarack Lake (2 cores) and Wilkinson Lake (4 cores) (see Figures 1-5 and 1-6, respectively). Each sediment core was sliced into 2-cm sediment samples down to a depth of 10 cm, and 5 cm intervals were collected down to 20 cm or deeper. Sediment samples were returned to the Barr Engineering laboratory and analyzed for the phosphorus fractions identified previously.

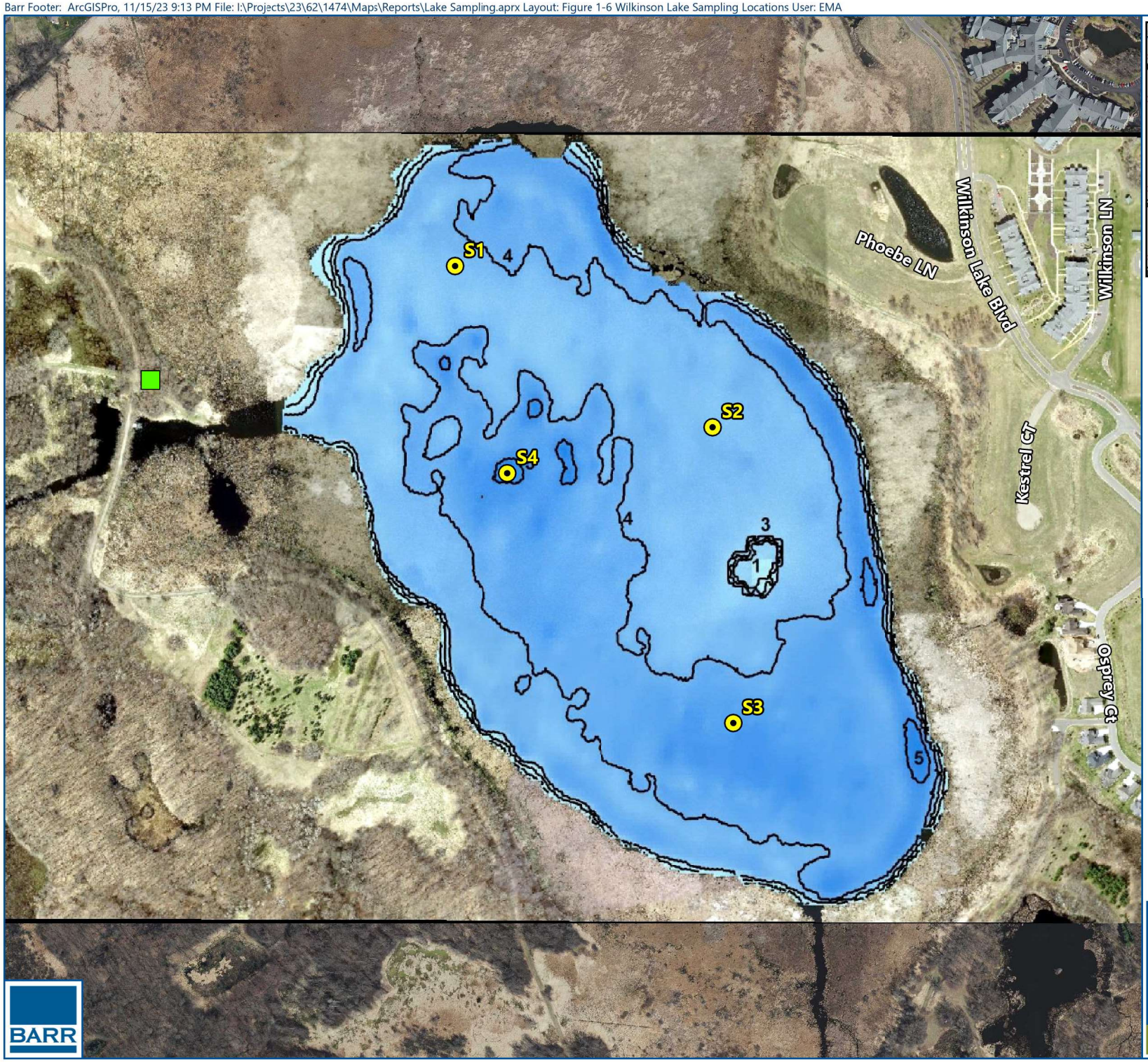
In general, mobile phosphorus concentrations in the sediment of Tamarack and Wilkinson Lakes were slightly lower than the organic-P fraction, as shown in Figure 1-7, but sediment phosphorus levels were generally higher in the core section at the sediment-water interface. Phosphorus concentrations and physical characteristics were relatively similar among both cores taken from Tamarack Lake, which were elevated above the mobile phosphorus concentrations measured in the Wilkinson Lake cores. Sediment cores S1 and S2 in Wilkinson Lake were like one another, with lower mobile phosphorus concentrations (see Figure 1-7), while sediment cores S3 and S4 in Wilkinson Lake had significantly higher mobile phosphorus concentrations. Figure 1-6 shows that the locations of sediment cores S3 and S4 correspond with the slightly deeper water in Wilkinson Lake and the flow path from the south tributary to the lake outlet.



SEDIMENT SAMPLING LOCATIONS

Tamarack Lake

FIGURE 1-5



Sediment Sampling Location

Alum Staging Area

Source: Contour Survey 4/05/17. Data collected and prepared by Ramsey County Conservation District for Vadnais Lakes Watershed Management Organization.

N

0 250 500

Feet

SEDIMENT SAMPLING LOCATIONS

Wilkinson Lake

FIGURE 1-6

BARR

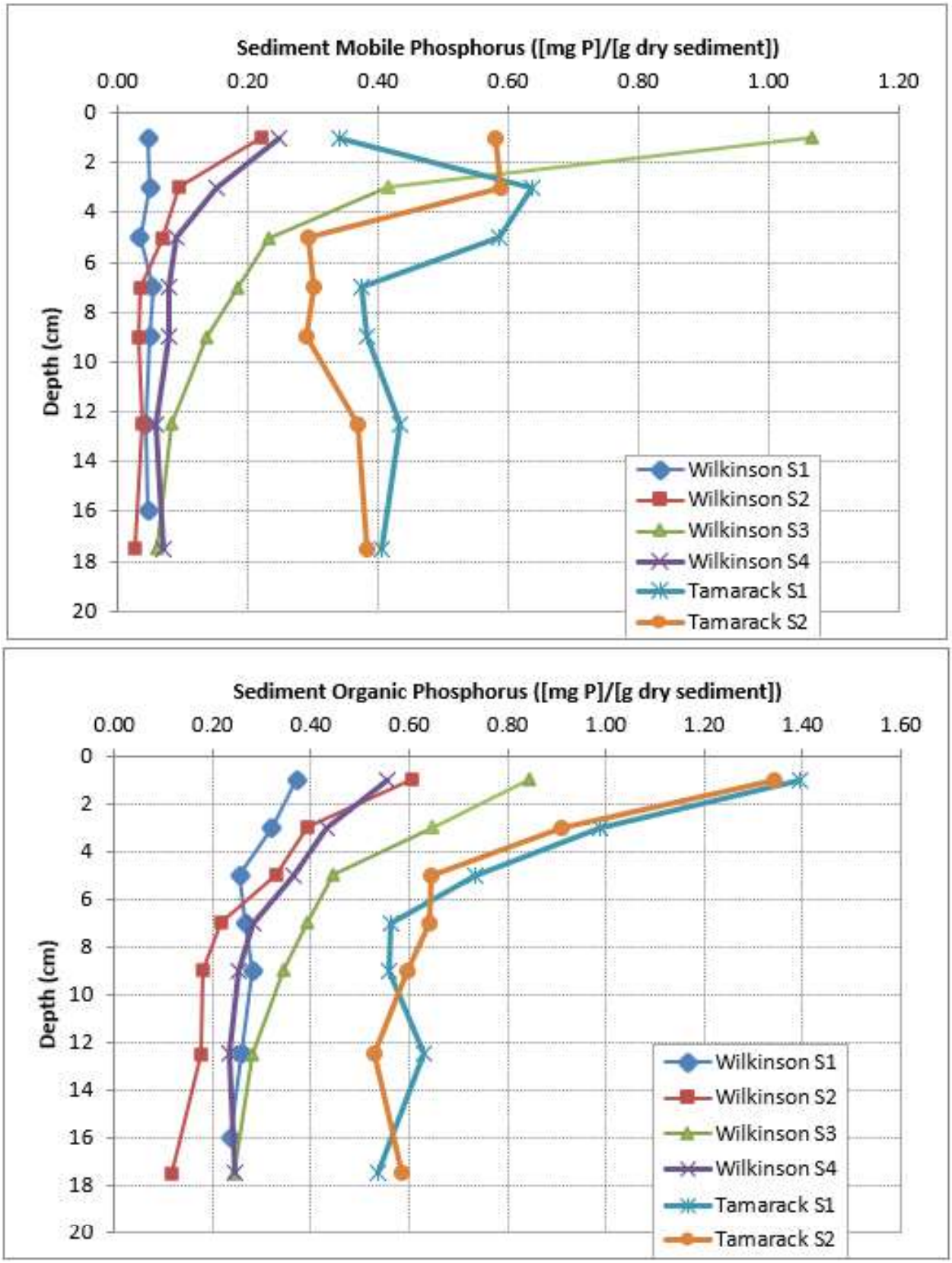


Figure 1-7 Results of Sediment Phosphorus Fractionations

2.0 Water Quality Modeling and Analysis

A key component to performing diagnoses is selecting a rigorous approach to evaluating potential water quality benefits. The simplified lake and watershed modeling approach used in the 2014 TMDL project did not account for intra-annual variations in lake water quality, so it was not considered for use in the previous feasibility analysis (Barr, 2017) as it lumps parameters at an annual time scale, treats lakes as fully mixed in a steady-state with uniform residence time, and does not adequately distinguish internal phosphorus loading sources from watershed sources during the critical conditions for water quality impairment. Based on our review of the available monitoring data and understanding of the purpose of the feasibility study, an approach was developed for evaluating the primary drivers of water quality impairment in each lake that adds further clarity, because it is based on updated monitoring data and accounts for intra-annual variations and recent management actions. Differentiating the individual drivers of lake water quality is based on the observed dynamics of each lake to set realistic expectations for future management actions.

The approach for this analysis used existing monitoring data, professional judgment, and past modeling to identify the best approach to cost-effectively improve lake water quality. Relevant subtasks included:

- Review current and historic water chemistry and biological data. Evaluate long- and short-term water quality trends.
- Review sediment phosphorus and dissolved oxygen data and use those data to estimate the internal phosphorus loading potential.
- Using existing watershed modeling, develop an updated lake phosphorus balance that includes phosphorus loads from watershed and in-lake sources and evaluate results to better understand the effect of varying climatic and sensitivity to management changes.
- Analyze fish data to evaluate potential impacts of rough fish on lake water quality and to determine the impact of water quality dynamics on the fish community.
- Integrate data analyses from above to diagnose causes of lake water quality problems, including feedback loops and dynamics between biological measurements and lake water quality observations.
- Evaluate existing and proposed water quality improvement options to identify feasible and cost-effective water quality improvement options for each lake basin.
- Complete an evaluation of feasible water quality improvement options to estimate expected lake water quality changes that could be attained.

2.1 Existing Management Practices

2.1.1 Watershed Best Management Practices (BMPs)

Since watershed mapping did not delineate the direct drainage areas tributary to existing BMPs and the BMP characteristics were not available, the updated P8 watershed modeling did not account for treatment for these BMPs in the feasibility study (Barr, 2017). Management actions were evaluated for the 2011

conditions in Wilkinson Lake, as the lake water quality modeling indicated that it represented a typical summer season that experienced both internal and external phosphorus loading impacts (see Section 2.2).

2.1.2 Past In-Lake Treatment Measures and Aquatic Invasive Species Control

An updated fish survey (Blue Water Science, 2017) indicates that natural winterkill conditions and an outlet carp barrier have successfully minimized rough fish populations and no other fish management is currently needed.

VLAWMO staff identified coontail and water lilies as the only two plant species in Wilkinson Lake when it was surveyed for the TMDL study (Wenck, 2014a). None of the plants were present in nuisance proportions and the vegetation in the surrounding wetland area consisted mostly of cattail and arrowhead. An updated vegetation survey was completed in 2017 by Ramsey County SWCD (then named RCD), which indicated the following:

> Aquatic macrophytes were found at all 60 points surveyed. Canada Waterweed (*Elodea canadensis)* and White Water Lily *(Nymphaea odorata)* were the most prominent species present, found at most of the survey points. Flat-stem pondweed (*Potamogeton zosteriformis*), Filamentous Algae *(Spirogyra/Cladophora sp.)*, and Coontail *(Ceratophyllum demersum)* were the next most common species. Found in fewer than 15% of the survey points were the following species: Curly Leaf Pondweed (*Potamogeton crispus*); Greater Duckweed (*Spirodela polyriza);* Sago Pondweed *(Potamogeton pectinatus)*; Yellow Water Lily (*Nuphar lutea*), Slender Waternymph (*Najas gracillima*); Muskgrass (*Chara spp.)* and Stonewort (*Nitella sp.*). Although the specific species of stonewort was not determined, there was no indication that the plant detected was the invasive starry stonewort – no white bulbils were seen. The secchi disk reading was 0.9m (2.95 ft).

2.2 Wilkinson Lake

Updated lake and watershed modeling was developed for this study and optimized to reproduce the observed water quality for each lake during the summer periods of interest. Figure 2-1 shows how the predicted and measured total phosphorus concentrations compare during the summer of 2011 for Wilkinson Lake without BMP implementation. Approximately 200 pounds of the overall phosphorus load was attributed to sediment phosphorus release during this time. The in-lake water quality modeling was used to show how implementation of the deep-water wetland restoration project (that is expected to remove 32.5 pounds of total phosphorus per year from the south tributary to Wilkinson Lake) and in-lake alum treatment would improve water quality during 2011. Figure 2-1 shows that the predicted phosphorus concentration in Wilkinson Lake would respond well to the implementation of the watershed BMP and an 80 percent reduction in internal load (like what would be expected following an in-lake alum treatment), or approximately 160 pounds per year of phosphorus.

The modeled summer average TP following BMP implementation shown in Figure 2-1 is 67 ug/L, but it should be noted that the results of these analyses are based on the same starting phosphorus concentration at the beginning of the summer. Over time, following full-scale BMP implementation or in-lake alum treatment, it is expected that the starting concentrations would be lower than what is shown at

the beginning of each summer season. Based on the results shown in Figure 2-1, this in turn, should ensure that an in-lake alum treatment combined with implementation of the deep-water wetland restoration project would maintain lake water quality at levels that are very close to the shallow lake standards.

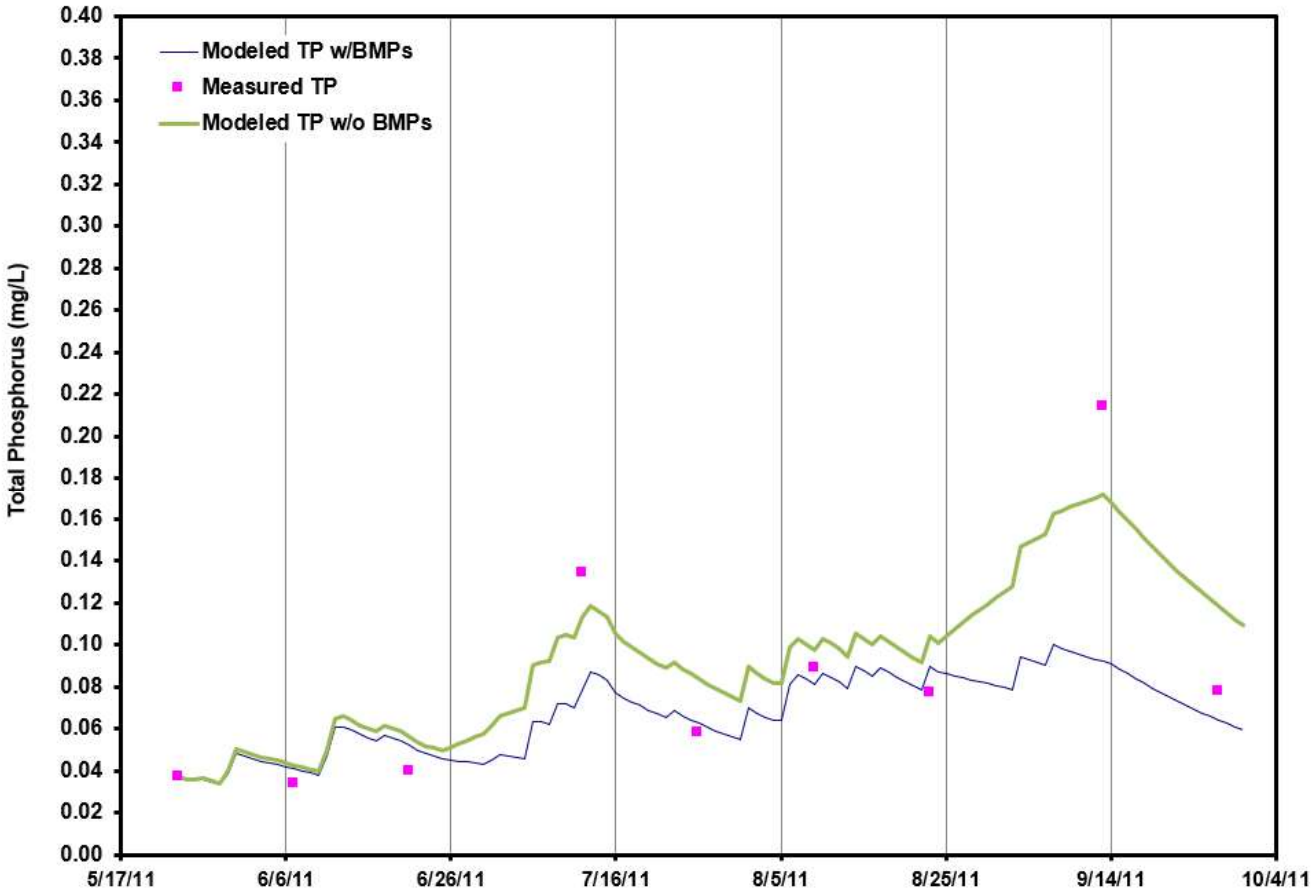


Figure 2-1 2011 Water Quality Modeling Results for Wilkinson Lake

2.3 Tamarack Lake

Since watershed and in-lake water quality modeling was not specifically available for Tamarack Lake, Barr reviewed the 2021 and 2022 lake water quality monitoring data to develop a mass balance estimate of how much the increasing summer total phosphorus concentrations could be associated with internal load. Measured total phosphorus concentrations increased by 166 and 200 µg/L during the respective summers of 2021 and 2022 for Tamarack Lake. On average, approximately 32 pounds of internal phosphorus load can be attributed to sediment phosphorus release during these two years. As a result, an in-lake alum treatment is also recommended for Tamarack Lake as the monitoring results indicate that it would be needed to ensure that the water quality goals/standards are met on a consistent basis. Over time, following an estimated 26 pounds per year of phosphorus load reduced (80 percent) from an in-lake alum treatment (and to a lesser extent, small-scale watershed BMP implementation), it is expected that the concentrations would be maintained closer to the shallow lake standard throughout the summer season.

3.0 Social Implications of In-Lake Management

Understanding the inner working and prescribing management strategies of lake systems requires use of complex mathematical watershed and lake models. However, the resultant management strategies, although technically supported, are often difficult to convey to the public. To address the issue, a stakeholder engagement process was incorporated into the 2017 feasibility study (Barr, 2017). The goal of the stakeholder engagement process was to involve the public, regulatory agencies and VLAWMO staff in the process of identifying and vetting management solutions for each lake. This stakeholder process was completed previously for Wilkinson Lake, and it's recommended for VLAWMO to convey some of the same output with key stakeholders to implement future projects for both lakes, and assist with getting alum treatment permitting from MPCA.

The 2016 Stakeholder Charrette was attended by members of the public, non-governmental organizations (including the North Oaks Homeowners Association), municipal agencies (Cities of North Oaks and White Bear Lake and Ramsey Conservation District), state government (Minnesota Department of Natural Resources and Minnesota Pollution Control Agency) and VLAWMO staff. The attendees convened for a state of the lake presentation for each lake followed by collaborative group discussions.

When group attendees were asked about what role fish and aquatic plants play, they were interested in discerning the difference between invasive and non-invasive plants. Also, there was concern about the lack of species diversity and how that would affect the ecological functions of the lakes. They were also interested in conducting a fish study in Wilkinson Lake (which was subsequently conducted in 2017).

In addition, group attendees wondered why Wilkinson Lake is considered a shallow lake and not a wetland. The group discussions generated questions for regulatory agencies to address and VLAWMO staff to consider. The MPCA detailed their role as the agency responsible for assessing a lake's quality and its ability to meet designated standards. Modifying the classification to assign a shallow lake or wetland designation to the public water/wetland through the MPCA is a relatively straightforward process requiring data (maximum depth, littoral area, shoreline vegetation, uses, etc.) supporting the change. After considerable discussion and a qualitative review of the available data on Wilkinson Lake, it was concluded that maintaining the shallow lake classification is best for this system. Wilkinson Lake is in the upper watershed and discharge from it must be relatively clean so as not to adversely affect the water quality of downstream lakes that ultimately feed the water supply.

Vegetation changes may need to be considered for an alum treatment. Both lakes do not have recreational use and native vegetation would be expected to experience increased growth. Curlyleaf pondweed is not currently present in Tamarack Lake, although ongoing monitoring is recommended. In Wilkinson Lake, curlyleaf pondweed monitoring and consideration for management is also recommended following an alum treatment.

4.0 Recommendations

4.1 Alum Treatment for Tamarack and Wilkinson Lakes

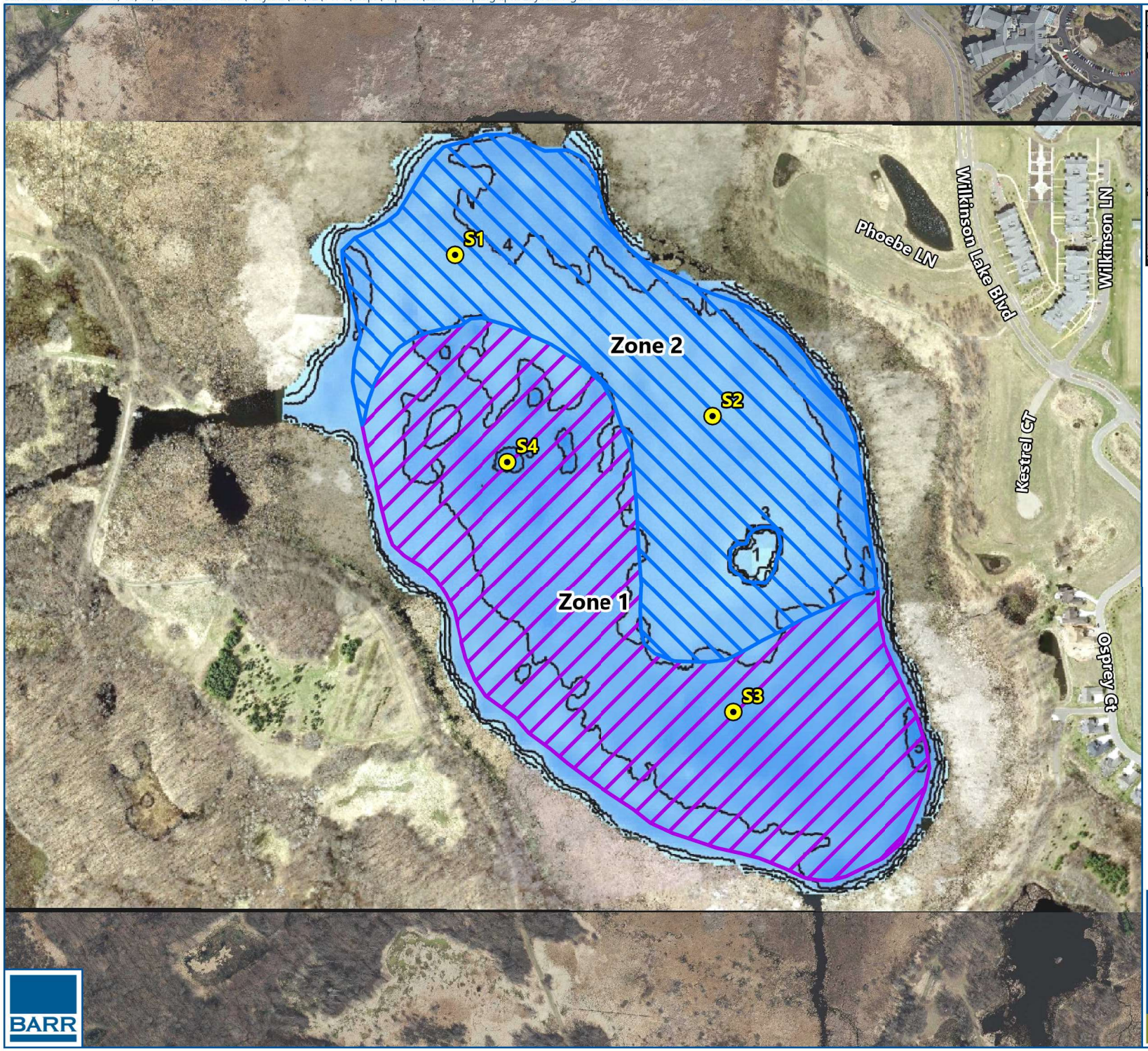
Alum treatment is recommended for both Tamarack and Wilkinson Lakes to reset the sediment phosphorus release rates to levels that are consistent with natural background conditions. The application of aluminum has two expected mechanisms: (1) aluminum binds with iron-bound phosphorus in the sediment, thereby forming Al-P, and (2) a residual amount of unbound aluminum remains in the sediment and is available to bind phosphorus that is released from the decay of Org-P. For most lake systems alum dosing is designed to provide some amount of "excess" aluminum to bind phosphorus released from decayed Org-P. However, the aluminum added to the sediment will age over time and be less effective at capturing more phosphorus. Due to the high amount of Org-P in Tamarack and Wilkinson Lake sediment, it is recommended that the alum treatments of Tamarack and Wilkinson Lakes be split into two applications. By splitting the alum treatment into two applications separated by two or more years, more of the decomposing Org-P can be captured by the alum. The second application would occur two or more years after the first application and could be completed as soon as lake monitoring data indicates that internal phosphorus loading is beginning to reoccur.

Two forms of aluminum are typically applied to lakes: alum and sodium aluminate. When alum is added to a lake, it will lower the pH (make it more acidic), while sodium aluminate will raise the pH (more basic). Therefore, these two chemicals are often added in combination to neutralize the pH effects during treatment. At lower doses, alum-only applications can be conducted without adversely affecting the pH (i.e. pH stays above 6). Alum is typically less expensive and easier to work with than sodium aluminate, and an alum-only treatment may be preferable when it will not cause an unacceptable change in pH.

Since Wilkinson Lake sediment cores S1 and S2 had lower mobile phosphorus concentrations than sediment cores S3 and S4, and since the locations of sediment cores S3 and S4 correspond with the slightly deeper water and the flow path from the south tributary to the lake outlet, the Wilkinson Lake dosages were split into two treatment zones as shown in Figure 4-1. Table 4-1 shows the recommended alum and sodium aluminate dosages prescribed for each lake with split applications, including a breakdown of the treatment zone dosages for Wilkinson Lake.

Table 4-1 Recommended Alum Dosing for Split Applications

Lake	First Application		Second Application		Lake Total	
	gallons alum	gallons sodium aluminate	gallons alum	gallons sodium aluminate	gallons alum	gallons sodium aluminate
Tamarack	3,770	1,885	3,770	1,885	7,540	3,770
Wilkinson Zone 1	19,070	9,535	19,070	9,535	60,830	30,415
Wilkinson Zone 2	11,345	5,673	11,345	5,672		
				Treatment Total	**68,370**	**34,185**



Sediment Sampling Location

Alum Treatment Zones

Zone 1 (47.2 acres)

Zone 2 (38.1 acres)

Source: Contour Survey 4/05/17. Data collected and prepared by Ramsey County Conservation District for Vadnais Lakes Watershed Management Organization.

N

0 250 500

Feet

ALUM TREATMENT ZONES

Wilkinson Lake

FIGURE 4-1

BARR

The pH in the waterbody must be closely monitored during alum applications, and if the pH reaches the critical value of 6.0, the treatment should be stopped until the pH can recover. If pH and alkalinity conditions are different at the time of treatment and show a greater potential to lower pH below 6.0 during treatment, the treatment plan could be altered to replace a portion of the alum with a higher quantity of sodium aluminate to buffer the pH.

Typically, in-lake alum treatments are effective for 15 to 20 years, with shallow lakes experiencing shorter durations of effectiveness, depending on the extent of watershed treatment. However, it is expected that the split applications of alum, combined with the extent of stormwater treatment in each lake watershed, will ensure that the effective life of the alum treatment is greater than ten years and that alum would not need to be reapplied for 15 years. VLAWMO will be responsible for any future maintenance that will be needed to achieve the effective life of the project.

4.2 Estimated Implementation Costs

As discussed in Section 2.1, and shown in Figure 1-1, there are several existing/planned BMPs and upstream lakes and wetlands in the Wilkinson Lake watershed and the Tamarack Lake watershed that do not contribute excess phosphorus loading.

Splitting the alum treatment into multiple applications would also allow for adjustments to the final alum dose, based on observations of water quality and/or sediment chemistry following the first application. the total estimated costs (including engineering, treatment oversight and a 25% contingency is recommended) for the recommended split treatment for each lake are shown in Table 4-2. Phase 1 is recommended for the fall of 2024. The treatment costs are based on the prescribed dosages of alum and sodium aluminate shown in Table 4-1 and assumed unit costs of $3 per gallon for alum and $7.50 per gallon for sodium aluminate.

Table 4-2 Summary of Alum Treatment Costs

Description	Tamarack Lake		Wilkinson Lake	
	Phase 1	Phase 2	Phase 1	Phase 2
Chemical treatment contract	$26,000	$26,000	$205,000	$205,000
Engineering and treatment contracting support	$4,000	$4,000	$10,000	$10,000
Contingency (25%)	$7,500	$7,500	$53,750	$53,750
Totals	**$37,500**	**$37,500**	**$268,750**	**$268,750**
	$75,000		**$537,500**	

The alum treatment costs shown in Table 4-2 assume that both basins are treated at the same time to minimize mobilization costs for the treatment contractor. Treatment support includes pH monitoring of each lake each time that chemicals are applied to assure that the project's permit requirements are met. Figures 1-5 and 1-6 show the recommended locations for a contractor's alum staging area, including path access and locations for temporary tanks adjacent to Tamarack Lake and Wilkinson Lake, respectively.

It is expected that wider-scale implementation of additional site-scale BMPs throughout the watershed would also be cost-effective as the watershed experiences development and redevelopment but may not always be feasible and would likely need to be implemented as a part of street reconstruction projects to realize significant cost savings. Other than winterkill, which along with the outlet carp barrier, has controlled the rough fish densities (Blue Water Science, 2017), no other in-lake treatment alternatives were considered cost-effective and/or adequate to meet the water quality goals for the lakes. Herbicide treatments may be warranted in Wilkinson Lake after alum treatment to ensure that curlyleaf pondweed and/or other invasives do not supplant native plants. Curlyleaf pondweed has not been documented in Tamarack Lake, so herbicide treatment should not be needed.

5.0 References

Barr Engineering Company. 2017. East Goose, West Goose and Wilkinson Lakes Feasibility Study. Prepared for Vadnais Lake Area Water Management Organization (VLAWMO) in partnership with Young Environmental Consulting Group.

Blue Water Science. 2017. Fish Survey of Wilkinson Lake (ID #62-0043) Ramsey County, Minnesota in 2017. Prepared for VLAWMO and MnDNR.

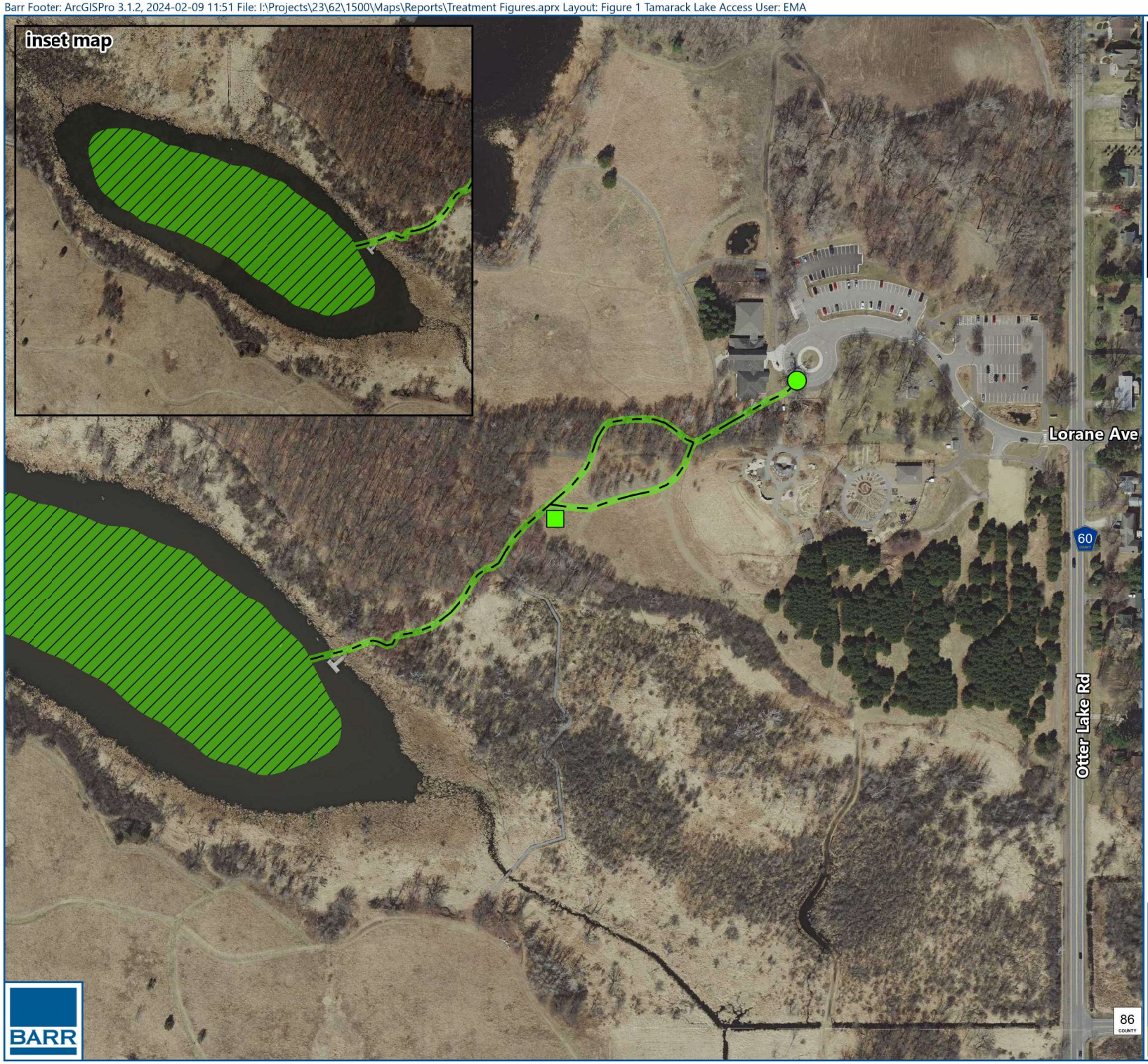
VLAWMO. 2014. Vadnais Lake Area WMO Total Maximum Daily Load (TMDL) Implementation Plan.

Wenck. 2013. Vadnais Lake Area WMO Total Maximum Daily Load (TMDL) and Protection Study. Prepared for VLAWMO.

PROPERTY ACCESS AGREEMENT
VADNAIS LAKE AREA WATER MANAGEMENT ORGANIZATION

Exhibit B: Map of anticipated use area

Attached, beginning on following page



Access Route

Alum Staging Area

Chemical Offloading Area

Project Limits

Treatment Area

N

0 150 300

Feet

ACCESS MAP

Tamarack Lake

FIGURE 1

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