MINNEHAHA CREEK
WATERSHED DISTRICT
QUALITY OF WATER, QUALITY OF LIFE

Meeting: Board of Managers
Meeting date: 7/28/2022
Agenda Item #: 11.1
Request for Board Action

Title:	Approval of Specifications for Wassermann Alum Treatment and Authorization to Solicit Quotes
Resolution number:	22-045
Prepared by:	Name: Anna Brown Phone: 952-641-4522 abrown@minnehahacreek.org
Reviewed by:	Name/Title: Kailey Cermak, Hydrologist; Brian Beck, Research and Monitoring Program Manager
Recommended action:	Authorize staff to release a request for quotes to perform an alum treatment on Wassermann Lake
Schedule:	July 29, 2022: Release request for quotes August 12, 2022: Deadline to submit quotes August 22, 2022: Contract award approval by Board of Managers October 2022: Alum application
Budget considerations:	Fund name: Wassermann Lake Internal Load Management 3-3156 Fund budget: $360,900 (includes $270,675 BWSR Clean Water Fund grant) Expenditures to date: $147,000 (May 2021 Treatment) Requested amount of funding: n/a

Past Board action:

Resolution 19-072	Authorization to apply for BWSR Clean Water Funds
Resolution 20-050	Ordering of the Wassermann internal load management project
Resolution 20-051	Approval of Wassermann internal load project agreement
Resolution 21-012	Authorization to solicit quotes for the first Wassermann treatment
Resolution 21-025	Contract award for the first alum treatment
Resolution 22-021	Approval of design and construction oversight contract for second alum treatment

Summary:
Since adoption of the 2017 Water Management Plan, MCWD has been working to implement high impact capital projects within the SMCHB subwatershed, with particular focus in the city of Victoria and Laketown Township, where current land use pressure presents a unique opportunity to implement projects concurrent with development. Under this plan, MCWD has invested substantially in both watershed and in-lake management activities in the restoration of Wassermann Lake, an impaired waterbody within the city of Victoria. Internal loading is the last remaining significant source of nutrient pollution to address in Wassermann Lake, with the 2013 SMCHB Diagnostic Study estimates an annual internal release rate of 374 pounds per year. MCWD is planning to conduct its second alum treatment of Wassermann Lake in October 2022, concluding this phase of focused restoration work in and around Wassermann Lake.

Wassermann Lake Alum Treatment

In January 2020, MCWD was awarded a Clean Water Fund grant from BWSR positioning Wassermann Lake for an initial alum treatment in spring 2021 and a subsequent treatment in fall 2022. The total budget for this project is $355,900, including $284,720 in grant funds and $71,180 in match. MCWD's match funds are allocated to feasibility, pre- and mid-project sediment analysis, and a portion of the treatment cost. The grant dollars are allocated exclusively to alum application.

In October 2020, MCWD contracted with Wenck (now Stantec) to conduct an engineering feasibility of the alum treatment and develop an alum dose design and cost estimates for the treatment. The feasibility study recommends the treatment be split into two doses, with monitoring and sediment core analysis between the first and second dose to evaluate effectiveness and make any adjustments to the dosing recommendation needed to optimize the treatment. The recommendation considers a greater internal load rate in the deeper areas of the lake, and therefore divides the treatment area in two zones, with the deeper zone receiving a greater application rate.

The first treatment was conducted in spring 2021. In April 2022, MCWD contracted with Stantec to develop the specifications and dosing recommendations for the second alum treatment and provide oversight of the treatment. One element of the scope of work was to use sediment core analysis, along with the District's water quality data, to evaluate the effectiveness of the first alum treatment and make recommendations for the second dose accordingly (Attachment 2). The data indicate that the first treatment is effectively suppressing phosphorus release in the deepest areas of the lake and that it is less effective in the shallower areas. Despite the mixed results from effectiveness monitoring, the analysis did not provide strong lines of evidence to change the dose for the second treatment. Rather, the report recommends keeping the treatment at the same level as the first, and any additional available grant funds after the quote solicitation would be used to increase the application across the shallower zone.

The engineer's estimate for the alum treatment is $169,000. MCWD has approximately $175,000 remaining in grant funds for the project. Following the quote solicitation and award, any grant funding remaining will be incorporated into the contract through change order.

Staff requests authorization to release a request for quotes for the Wassermann Lake alum treatments.

Supporting documents:

Attachment 1: Wassermann Lake Alum Treatment Request for Qualifications
Attachment 2: Wassermann Lake 2nd Dose Alum Treatment Recommendations

MINNEHAHA CREEK
WATERSHED DISTRICT
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RESOLUTION

Resolution number: 22-045

Title: Approval of Specifications for Wassermann Alum Treatment and Authorization to Solicit Quotes

WHEREAS pursuant to Resolution 14-047 the MCWD Board of Managers has identified the Six Mile Creek-Halsted Bay (SMCHB) Subwatershed as a priority area for focusing District planning activities and coordination efforts with subwatershed partners;

WHEREAS in January 2018 the Board of Managers adopted the MCWD Watershed Management Plan (WMP), which incorporated a comprehensive restoration strategy developed in 2016 for the SMCHB subwatershed to achieve MCWD's goals of protecting and improving water quality, water quantity, ecological integrity, and thriving communities through land use and water integration. The WMP includes a capital improvement plan, which lists the Wassermann West External Load Reduction as an implementation project;

WHEREAS in March 2020, the Board of Managers accepted a grant award of $284,720 through the BWSR Clean Water Fund grant program for the implementation of the Wassermann Internal Load Management project;

WHEREAS on June 23, 2020, the Board of Managers ordered the Wassermann Internal Load Management Project in fulfillment of the MCWD WMP's identification of the project as a planned capital investment to reduce internal nutrient loading, improve water clarity, and create a more abundant and diverse aquatic vegetation community with alum treatments;

WHEREAS on September 24, 2020, the Board of Managers approved a contract with Wenck Associates, now Stantec, to analyze collected water chemistry and sediment data to develop specifications for alum treatment of Wassermann Lake and the Wassermann West Pond and to provide construction oversight of the alum applications;

WHEREAS on January 28, 2021, the Board of Managers authorized the release of a request for quotes for the Wassermann Lake and Wassermann West Pond Alum Treatments;

WHEREAS on March 25, 2021, the Board of Managers awarded the contract for the Wassermann Lake and Wassermann West Pond Alum Treatments to Clark Aquatic Services, and the alum treatments were completed in May 2021;

WHEREAS on April 14, 2022, the Board of Managers approved a contract with Stantec to develop specifications and provide application oversight for the second planned alum treatment of Wassermann Lake; and the scope of work included strengthening the qualifications section of the quote package and completing sediment core analysis to inform alum treatment specifications;

WHEREAS the sediment core analysis concludes that there should be no initial change between the completed first dose and the second planned dose, but does recommend that any additional treatment capacity allowed by budget be applied in the shallow zone of the lake;

NOW, THEREFORE, BE IT RESOLVED, that the Minnehaha Creek Watershed District Board of Managers hereby approves the specifications for the Wassermann Lake Alum Treatment and authorizes the release of a request for quotes.

Resolution Number 22-045 was moved by Manager _____, seconded by Manager _____. Motion to adopt the resolution ___ ayes, ___ nays, ___abstentions. Date: July 28, 2022

_____ Date: _____
Secretary

MINNEHAHA CREEK WATERSHED DISTRICT

QUALITY OF WATER QUALITY OF LIFE

Scope of Work Report

July 25, 2022

Wassermann Lake Alum Treatment

1. PURPOSE**:** Apply Buffered alum solution to Wassermann Lakes at the locations identified in Victoria, MN.

2. GENERAL BACKGROUND**:** The Minnehaha Creek Watershed District (MCWD) is planning to apply aluminum sulfate and sodium aluminate to reduce phosphorous release from Wassermann Lake, which will improve water quality conditions in Wassermann Lake.

3. SITE DESCRIPTION:

   Subject Property Address:

   Wassermann Lake Site

   8725 County Road 43
   Victoria, MN 55318

   This address has been provided as a general location and is not the legal description. Refer to Figures 1 & 2 for more detail.

4. WASSERMANN LAKE ALUM TREATMENT PROJECT DELIVERABLES (CONTRACT SERVICES):

   MCWD will contract the services of a CONTRACTOR to furnish and apply liquid aluminum sulfate and sodium aluminate as detailed in the specifications.

5. ASSUMPTIONS:

   a) Notice should be given to the MCWD 3 business days in advance of mobilization. Staging areas are shown in Figure 2. If additional parking or staging area is needed, the Contractor shall make arrangements offsite as necessary to complete the work

   b) The work will not begin until Minnehaha Creek Watershed District issues notice to proceed.

   c) Where it appears, “bid” means “quote”.

   d) The bid will be for the Wasserman Lake application.

6. SPECIFICATIONS: Specifications for the contract services are attached in Appendix A.

7. APPENDIX:
   - APPENDIX A: Specifications
   - APPENDIX B: Quote Sheet
   - APPENDIX C: Contract Template

8. QUESTIONS:

Any questions about the request for quotes should be sent to Kailey Cermak, kcermak@minnehahacreek.org before Friday, August 5 at 10:00 AM CST.

9. SUBMITTING QUOTE:

Quote Due Date: Friday, August 12, 2022 at 12:00 pm. Please submit a completed Quote Sheet (Appendix C) to Anna Brown at abrown@minnehahacreek.org, and Chris Meehan at christopher.meehan@stantec.com. Emailed quotes are acceptable. All quotes will be binding for 60 days or until released by MCWD, whichever is sooner.

10. PROJECT TIMELINE

The application should take place between September 15, 2022 – October 31, 2022, pending water temperature, outlined in Section 02 73 00 1.03 C. The application must be complete before October 31, 2022.

12. SELECTION REQUIREMENTS

In selecting a contractor, the District will consider the quoted price as well as the submitter's experience and capacity, in the District's judgment, to perform the work in a timely and correct fashion.

Those submitting quotes are encouraged to submit information as to similar applications completed within the past five years, which should include the date, location, waterbody and client; the contract amount; and client reference contact information.

In addition, submitters are requested to state the following in their quote transmittal:

a) Number of lake flocculation projects the company has performed in the past five years.
b) Vessel(s) to be used in this project.
c) Equipment to be used in this project to monitor and record field conditions and to hold, mix, dispense, measure and document flocculent and buffer application.
d) Individuals who would perform the work, their roles, and their experience.
e) Suppliers of flocculent and buffer.

13. AWARD OF CONTRACT:

The OWNER's acceptance of the quote will be in the form of a written "Notice of Award" letter, which will specify that the CONTRACTOR execute the Contract and submit the required endorsements and certificates of insurance coverage within ten (10) days from the date of Notice of Award. The OWNER will not execute the Contract until these required items are submitted and have been approved.

The CONTRACTOR will have no authority to perform work under this Contract until it receives a signed Notice to Proceed, and OWNER and CONTRACTOR have held a pre-construction conference. OWNER will deliver a Notice to Proceed to the CONTRACTOR upon satisfaction of the above-indicated requirements.

APPENDIX A

Specifications

Section 00 01 05 – Professional Certifications
Section 00 52 00 – Notice to Proceed
Section 00 82 00 – Funding Agency Requirements
Section 01 20 00 – Price and Payment Procedures
Section 01 70 00 – Execution and Closeout Requirements
Section 02 73 00 – Water Alum Treatment

SECTION 00 01 05

PROFESSIONAL CERTIFICATIONS

PROJECT MANUAL

WASSERMANN LAKE ALUM TREATMENT

Prepared For: **MINNEHAHA CREEK WATERSHED DISTRICT**

15320 Minnetonka Blvd
Minnetonka, MN 55345
Telephone: (952) 471-0682

Prepared By: **STANTEC CONSULTING SERVICES INC.**

7500 Olson Memorial Highway
Suite 300
Golden Valley, Minnesota 55427
Telephone: (763) 252-6800

May 2022

I hereby certify that this specification was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Chris Meehan, P.E. Minn. Reg. No. 43066 Date
Stantec, Inc

SECTION 00 52 00

NOTICE TO PROCEED

To: _____ Date: _____

Owner: Minnehaha Creek Watershed District
Project: Wassermann Lake Alum Treatments Project
Project Location: Victoria, Minnesota

You are hereby notified to commence WORK in accordance with the Agreement dated _____, 20__, on or before _____, 20__, and you are to complete the WORK by no later than the scheduled completion dates as set forth in the Contract Documents.

_____
(OWNER)

By_____

Title_____

ACCEPTANCE OF NOTICE

Receipt of this above Notice to Proceed is hereby acknowledged by _____ this the _____ day of _____, 20__.

By:_____

Title:_____

END OF SECTION

SECTION 00 82 00

FUNDING AGENCY REQUIREMENTS

PART 1 – GENERAL

1.01 SUMMARY

A. Basic requirements set by funding agency.

1.02 REQUIREMENTS

A. Comply with the attached requirements set by the Funding Agency.

B. No laborer or mechanic employed directly on the project work site by CONTRACTOR or any sub-contractor, agent, or other person doing or contracting to do all or a part of the work of the project, is permitted or required to work more hours than the prevailing hours of labor unless paid for all hours in excess of the prevailing hours at a rate of at least 1-1/2 times the hourly basic rate of pay. A laborer or mechanic may not be paid a lesser rate of wages than the prevailing wage rate in the same or most similar trade or occupation in the area.

C. These requirements do not apply to wage rates and hours of employment of laborers or mechanics who process or manufacture materials or products or to the delivery of materials or products by or for commercial establishments which have a fixed place of business from which they regularly supply processed or manufactured materials or products. This section applies to laborers or mechanics who deliver mineral aggregate such as sand, gravel, or stone which is incorporated into the work under the contract by depositing the material substantially in place, directly or through spreaders, from the transporting vehicle.

D. Prevailing wage rates, prevailing hours of labor, and hourly basic rates of pay are set forth at Attachment A to this section.

E. CONTRACTOR and subcontractors shall furnish to OWNER copies of all payrolls not more than 14 days after the end of each pay period. The payrolls must contain all the data required by Minnesota Statutes §177.30. OWNER may examine all records relating to wages paid laborers or mechanics on work to which prevailing wage requirements apply.

F. CONTRACTOR shall keep prevailing wage information posted in at least one conspicuous place for the information of the employees working on the project.

G. It is a misdemeanor for CONTRACTOR, a subcontractor, or an agent to pay any laborer, worker or mechanic employed directly on the project site a lesser wage for work done under the contract than the prevailing wage rate. This misdemeanor is punishable by a fine of not more than $700, or imprisonment for not more than 90 days, or both. Each day a violation continues is a separate offense.

H. The Minnesota Department of Labor and Industry may demand, and CONTRACTOR and any subcontractor shall furnish, copies of any or all payrolls. The Department may examine all records relating to wages paid laborers or mechanics on work to which prevailing wages applies.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.01 LIST OF ATTACHMENTS

A. Special Provisions Division A – Labor

B. Exhibit A

    a. Prevailing Wages for State Funded Construction Projects (Region 9)

    b. Truck Rental Rates (Region 9)

END OF SECTION

MINNESOTA DEPARTMENT OF LABOR AND INDUSTRY PREVAILING WAGES FOR STATE FUNDED CONSTRUCTION PROJECTS

THIS NOTICE MUST BE POSTED ON THE JOBSITE IN A CONSPICUOUS PLACE

Construction Type: Highway and Heavy

Region Number: 09

Counties within region:

- ANOKA-02
- CARVER-10
- CHISAGO-13
- DAKOTA-19
- HENNEPIN-27
- RAMSEY-62
- SCOTT-70
- WASHINGTON-82

Effective: 2021-11-01 Revised: 2021-11-15

This project is covered by Minnesota prevailing wage statutes. Wage rates listed below are the minimum hourly rates to be paid on this project.

All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at a rate of one and one half (1 1/2) times the basic hourly rate. *Note: Overtime pay after eight (8) hours on the project must be paid even if the worker does not exceed forty (40) hours in the work week.*

Violations on MnDOT highways and road projects should be reported to:

Department of Transportation
Office of Construction
Transportation Building MS650
John Ireland Blvd
St. Paul, MN 55155
(651) 366-4209

All other prevailing wage violations and questions should be sent to:

Department of Labor and Industry
Prevailing Wage Section
443 Lafayette Road N
St Paul, MN 55155
(651) 284-5091
DLI.PrevWage@state.mn.us

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
LABORERS (101 - 112) (SPECIAL CRAFTS 701 - 730)					
101	LABORER, COMMON (GENERAL LABOR WORK)	2021-11-01	35.50	21.84	57.34
		2022-05-01	37.00	22.39	59.39
102	LABORER, SKILLED (ASSISTING SKILLED CRAFT JOURNEYMAN)	2021-11-01	35.50	21.84	57.34
		2022-05-01	37.00	22.39	59.39

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
103	LABORER, LANDSCAPING (GARDENER, SOD LAYER AND NURSERY OPERATOR)	2021-11-01	25.75	18.70	44.45
		2022-05-01	26.89	19.31	46.20
104	FLAG PERSON	2021-11-01	35.50	21.84	57.34
		2022-05-01	37.00	22.39	59.39
105	WATCH PERSON	2021-11-01	32.10	21.29	53.39
		2022-05-01	33.60	21.84	55.44
106	BLASTER	2021-11-01	22.08	6.87	28.95
107	PIPELAYER (WATER, SEWER AND GAS)	2021-11-01	39.00	21.84	60.84
		2022-05-01	40.50	22.39	62.89
108	TUNNEL MINER	2021-11-01	37.00	21.84	58.84
		2022-05-01	38.50	22.39	60.89
109	UNDERGROUND AND OPEN DITCH LABORER (EIGHT FEET BELOW STARTING GRADE LEVEL)	2021-11-01	37.00	21.84	58.84
		2022-05-01	38.50	22.39	60.89
110	SURVEY FIELD TECHNICIAN (OPERATE TOTAL STATION, GPS RECEIVER, LEVEL, ROD OR RANGE POLES, STEEL TAPE MEASUREMENT; MARK AND DRIVE STAKES; HAND OR POWER DIGGING FOR AND IDENTIFICATION OF MARKERS OR MONUMENTS; PERFORM AND CHECK CALCULATIONS; REVIEW AND UNDERSTAND CONSTRUCTION PLANS AND LAND SURVEY MATERIALS). THIS CLASSIFICATION DOES NOT APPLY TO THE WORK PERFORMED ON A PREVAILING WAGE PROJECT BY A LAND SURVEYOR WHO IS LICENSED PURSUANT TO MINNESOTA STATUTES, SECTIONS 326.02 TO 326.15.	2021-11-01	35.50	21.84	57.34
		2022-05-01	37.00	22.39	59.39
111	TRAFFIC CONTROL PERSON (TEMPORARY SIGNAGE)	2021-11-01	35.50	21.84	57.34

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
		2022-05-01	37.00	22.39	59.39
112	QUALITY CONTROL TESTER (FIELD AND COVERED OFF-SITE FACILITIES; TESTING OF AGGREGATE, ASPHALT, AND CONCRETE MATERIALS); LIMITED TO MN DOT HIGHWAY AND HEAVY CONSTRUCTION PROJECTS WHERE THE MN DOT HAS RETAINED QUALITY ASSURANCE PROFESSIONALS TO REVIEW AND INTERPRET THE RESULTS OF QUALITY CONTROL TESTERS. SERVICES PROVIDED BY THE CONTRACTOR.	2021-11-01	16.28	4.07	20.35
SPECIAL EQUIPMENT (201 - 204)					
201	ARTICULATED HAULER	2021-11-01	40.04	22.55	62.59
		2022-05-02	41.29	23.45	64.74
202	BOOM TRUCK	2021-11-01	40.04	22.55	62.59
		2022-05-02	41.29	23.45	64.74
203	LANDSCAPING EQUIPMENT, INCLUDES HYDRO SEEDER OR MULCHER, SOD ROLLER, FARM TRACTOR WITH ATTACHMENT SPECIFICALLY SEEDING, SODDING, OR PLANT, AND TWO-FRAMED FORKLIFT (EXCLUDING FRONT, POSIT-TRACK, AND SKID STEER LOADERS), NO EARTHWORK OR GRADING FOR ELEVATIONS	2021-11-01	25.75	18.70	44.45
		2022-05-01	26.89	19.31	46.20
204	OFF-ROAD TRUCK	2021-11-01	40.04	22.55	62.59
205	PAVEMENT MARKING OR MARKING REMOVAL EQUIPMENT (ONE OR TWO PERSON OPERATORS); SELF-PROPELLED TRUCK OR TRAILER MOUNTED UNITS.	2021-11-01	32.04	21.96	54.00
HIGHWAY/HEAVY POWER EQUIPMENT OPERATOR					
GROUP 2		2021-11-01	40.89	22.55	63.44

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
		2022-05-02	42.14	23.45	65.59
302	HELICOPTER PILOT (HIGHWAY AND HEAVY ONLY)				
303	CONCRETE PUMP (HIGHWAY AND HEAVY ONLY)				
304	ALL CRANES WITH OVER 135-FOOT BOOM, EXCLUDING JIB (HIGHWAY AND HEAVY ONLY)				
305	DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR OTHER SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS THREE CUBIC YARDS AND OVER MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS. (HIGHWAY AND HEAVY ONLY)				
306	GRADER OR MOTOR PATROL				
307	PILE DRIVING (HIGHWAY AND HEAVY ONLY)				
308	TUGBOAT 100 H.P. AND OVER WHEN LICENSE REQUIRED (HIGHWAY AND HEAVY ONLY)				
GROUP 3		2021-11-01	40.34	22.55	62.89
		2022-05-02	41.59	23.45	65.04
309	ASPHALT BITUMINOUS STABILIZER PLANT				
310	CABLEWAY				
311	CONCRETE MIXER, STATIONARY PLANT (HIGHWAY AND HEAVY ONLY)				
312	DERRICK (GUY OR STIFFLEG)(POWER)(SKIDS OR STATIONARY) (HIGHWAY AND HEAVY ONLY)				
313	DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS, UP TO THREE CUBIC YARDS MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS (HIGHWAY AND HEAVY ONLY)				
314	DREDGE OR ENGINEERS, DREDGE (POWER) AND ENGINEER				
315	FRONT END LOADER, FIVE CUBIC YARDS AND OVER INCLUDING ATTACHMENTS. (HIGHWAY AND HEAVY ONLY)				
316	LOCOMOTIVE CRANE OPERATOR				
317	MIXER (PAVING) CONCRETE PAVING, ROAD MOLE, INCLUDING MUCKING OPERATIONS, CONWAY OR SIMILAR TYPE				
318	MECHANIC . WELDER ON POWER EQUIPMENT (HIGHWAY AND HEAVY ONLY)				
319	TRACTOR . BOOM TYPE (HIGHWAY AND HEAVY ONLY)				
320	TANDEM SCRAPER				
321	TRUCK CRANE . CRAWLER CRANE (HIGHWAY AND HEAVY ONLY)				
322	TUGBOAT 100 H.P AND OVER (HIGHWAY AND HEAVY ONLY)				
GROUP 4		2021-11-01	40.04	22.55	62.59
		2022-05-02	41.29	23.45	64.74
323	AIR TRACK ROCK DRILL				
324	AUTOMATIC ROAD MACHINE (CMI OR SIMILAR) (HIGHWAY AND HEAVY ONLY)				
325	BACKFILLER OPERATOR				
326	CONCRETE BATCH PLANT OPERATOR (HIGHWAY AND HEAVY ONLY)				
327	BITUMINOUS ROLLERS, RUBBER TIRED OR STEEL DRUMMED (EIGHT TONS AND OVER)				
328	BITUMINOUS SPREADER AND FINISHING MACHINES (POWER), INCLUDING PAVERS, MACRO SURFACING AND MICRO SURFACING, OR SIMILAR TYPES (OPERATOR AND SCREED PERSON)				
329	BROKK OR R.T.C. REMOTE CONTROL OR SIMILAR TYPE WITH ALL ATTACHMENTS				
330					

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
	CAT CHALLENGER TRACTORS OR SIMILAR TYPES PULLING ROCK WAGONS, BULLDOZERS AND SCRAPERS				
331	CHIP HARVESTER AND TREE CUTTER				
332	CONCRETE DISTRIBUTOR AND SPREADER FINISHING MACHINE, LONGITUDINAL FLOAT, JOINT MACHINE, AND SPRAY MACHINE				
333	CONCRETE MIXER ON JOBSITE (HIGHWAY AND HEAVY ONLY)				
334	CONCRETE MOBIL (HIGHWAY AND HEAVY ONLY)				
335	CRUSHING PLANT (GRAVEL AND STONE) OR GRAVEL WASHING, CRUSHING AND SCREENING PLANT				
336	CURB MACHINE				
337	DIRECTIONAL BORING MACHINE				
338	DOPE MACHINE (PIPELINE)				
339	DRILL RIGS, HEAVY ROTARY OR CHURN OR CABLE DRILL (HIGHWAY AND HEAVY ONLY)				
340	DUAL TRACTOR				
341	ELEVATING GRADER				
342	FORK LIFT OR STRADDLE CARRIER (HIGHWAY AND HEAVY ONLY)				
343	FORK LIFT OR LUMBER STACKER (HIGHWAY AND HEAVY ONLY)				
344	FRONT END, SKID STEER OVER 1 TO 5 C YD				
345	GPS REMOTE OPERATING OF EQUIPMENT				
346	HOIST ENGINEER (POWER) (HIGHWAY AND HEAVY ONLY)				
347	HYDRAULIC TREE PLANTER				
348	LAUNCHER PERSON (TANKER PERSON OR PILOT LICENSE)				
349	LOCOMOTIVE (HIGHWAY AND HEAVY ONLY)				
350	MILLING, GRINDING, PLANNING, FINE GRADE, OR TRIMMER MACHINE				
351	MULTIPLE MACHINES, SUCH AS AIR COMPRESSORS, WELDING MACHINES, GENERATORS, PUMPS (HIGHWAY AND HEAVY ONLY)				
352	PAVEMENT BREAKER OR TAMPING MACHINE (POWER DRIVEN) MIGHTY MITE OR SIMILAR TYPE				
353	PICKUP SWEEPER, ONE CUBIC YARD AND OVER HOPPER CAPACITY(HIGHWAY AND HEAVY ONLY)				
354	PIPELINE WRAPPING, CLEANING OR BENDING MACHINE				
355	POWER PLANT ENGINEER, 100 KWH AND OVER (HIGHWAY AND HEAVY ONLY)				
356	POWER ACTUATED HORIZONTAL BORING MACHINE, OVER SIX INCHES				
357	PUGMILL				
358	PUMPCRETE (HIGHWAY AND HEAVY ONLY)				
359	RUBBER-TIRED FARM TRACTOR WITH BACKHOE INCLUDING ATTACHMENTS (HIGHWAY AND HEAVY ONLY)				
360	SCRAPER				
361	SELF-PROPELLED SOIL STABILIZER				
362	SLIP FORM (POWER DRIVEN) (PAVING)				
363	TIE TAMPER AND BALLAST MACHINE				
364	TRACTOR, BULLDOZER (HIGHWAY AND HEAVY ONLY)				
365	TRACTOR, WHEEL TYPE, OVER 50 H.P. WITH PTO UNRELATED TO LANDSCAPING (HIGHWAY AND HEAVY ONLY)				
366	TRENCHING MACHINE (SEWER, WATER, GAS) EXCLUDES WALK BEHIND TRENCHER (HIGHWAY AND HEAVY ONLY)				

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
367	TUB GRINDER, MORBARK, OR SIMILAR TYPE				
368	WELL POINT DISMANTLING OR INSTALLATION (HIGHWAY AND HEAVY ONLY)				
GROUP 5		2021-11-01	37.00	22.55	59.55
		2022-05-02	38.25	23.45	61.70
369	AIR COMPRESSOR, 600 CFM OR OVER (HIGHWAY AND HEAVY ONLY)				
370	BITUMINOUS ROLLER (UNDER EIGHT TONS)				
371	CONCRETE SAW (MULTIPLE BLADE) (POWER OPERATED)				
372	FORM TRENCH DIGGER (POWER)				
373	FRONT END, SKID STEER UP TO 1C YD				
374	GUNITE GUNALL (HIGHWAY AND HEAVY ONLY)				
375	HYDRAULIC LOG SPLITTER				
376	LOADER (BARBER GREENE OR SIMILAR TYPE)				
377	POST HOLE DRIVING MACHINE/POST HOLE AUGER				
378	POWER ACTUATED AUGER AND BORING MACHINE				
379	POWER ACTUATED JACK				
380	PUMP (HIGHWAY AND HEAVY ONLY)				
381	SELF-PROPELLED CHIP SPREADER (FLAHERTY OR SIMILAR)				
382	SHEEP FOOT COMPACTOR WITH BLADE . 200 H.P. AND OVER				
383	SHOULDERING MACHINE (POWER) APSCO OR SIMILAR TYPE INCLUDING SELF-PROPELLED SAND AND CHIP SPREADER				
384	STUMP CHIPPER AND TREE CHIPPER				
385	TREE FARMER (MACHINE)				
GROUP 6		2021-11-01	35.79	22.55	58.34
		2022-05-02	37.04	23.45	60.49
387	CAT, CHALLENGER, OR SIMILAR TYPE OF TRACTORS, WHEN PULLING DISK OR ROLLER				
388	CONVEYOR (HIGHWAY AND HEAVY ONLY)				
389	DREDGE DECK HAND				
390	FIRE PERSON OR TANK CAR HEATER (HIGHWAY AND HEAVY ONLY)				
391	GRAVEL SCREENING PLANT (PORTABLE NOT CRUSHING OR WASHING)				
392	GREASER (TRACTOR) (HIGHWAY AND HEAVY ONLY)				
393	LEVER PERSON				
394	OILER (POWER SHOVEL, CRANE, TRUCK CRANE, DRAGLINE, CRUSHERS, AND MILLING MACHINES, OR OTHER SIMILAR HEAVY EQUIPMENT) (HIGHWAY AND HEAVY ONLY)				
395	POWER SWEEPER				
396	SHEEP FOOT ROLLER AND ROLLERS ON GRAVEL COMPACTION, INCLUDING VIBRATING ROLLERS				
397	TRACTOR, WHEEL TYPE, OVER 50 H.P., UNRELATED TO LANDSCAPING				

TRUCK DRIVERS

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
GROUP 1		2021-11-01	31.25	17.50	48.75
601	MECHANIC . WELDER				
602	TRACTOR TRAILER DRIVER				
603	TRUCK DRIVER (HAULING MACHINERY INCLUDING OPERATION OF HAND AND POWER OPERATED WINCHES)				
GROUP 2		2021-11-01	30.70	17.50	48.20
604	FOUR OR MORE AXLE UNIT, STRAIGHT BODY TRUCK				
GROUP 3		2021-11-01	30.60	17.50	48.10
605	BITUMINOUS DISTRIBUTOR DRIVER				
606	BITUMINOUS DISTRIBUTOR (ONE PERSON OPERATION)				
607	THREE AXLE UNITS				
GROUP 4		2021-11-01	23.90	6.91	30.81
608	BITUMINOUS DISTRIBUTOR SPRAY OPERATOR (REAR AND OILER)				
609	DUMP PERSON				
610	GREASER				
611	PILOT CAR DRIVER				
612	RUBBER-TIRED, SELF-PROPELLED PACKER UNDER 8 TONS				
613	TWO AXLE UNIT				
614	SLURRY OPERATOR				
615	TANK TRUCK HELPER (GAS, OIL, ROAD OIL, AND WATER)				
616	TRACTOR OPERATOR, UNDER 50 H.P.				
SPECIAL CRAFTS					
701	HEATING AND FROST INSULATORS	2021-11-01	47.10	24.40	71.50
702	BOILERMAKERS	2021-11-01	40.94	29.28	70.22
		2022-01-01	42.64	29.28	71.92
703	BRICKLAYERS	2021-11-01	36.05	19.68	55.73
704	CARPENTERS	2021-11-01	40.05	26.04	66.09
		2022-05-03	42.20	26.04	68.24
705	CARPET LAYERS (LINOLEUM)	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
706	CEMENT MASONS	2021-11-01	41.20	23.47	64.67

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
		2022-05-01	43.25	23.47	66.72
707	ELECTRICIANS	2021-11-01	47.94	31.76	79.70
		2022-05-01	50.49	31.76	82.25
711	GROUND PERSON	2021-11-01	34.48	17.92	52.40
		2022-04-03	35.60	18.55	54.15
712	IRONWORKERS	2021-11-01	39.35	31.80	71.15
713	LINEMAN	2021-11-01	49.26	22.29	71.55
		2022-04-03	50.86	23.06	73.92
714	MILLWRIGHT	2021-11-01	38.23	29.18	67.41
715	PAINTERS (INCLUDING HAND BRUSHED, HAND SPRAYED, AND THE TAPING OF PAVEMENT MARKINGS)	2021-11-01	25.00	9.51	34.51
716	PILEDRIVER (INCLUDING VIBRATORY DRIVER OR EXTRACTOR FOR PILING AND SHEETING OPERATIONS)	2021-11-01	40.00	26.04	66.04
		2022-05-02	42.15	26.04	68.19
717	PIPEFITTERS . STEAMFITTERS	2021-11-01	47.99	32.45	80.44
719	PLUMBERS	2021-11-01	50.87	25.33	76.20
721	SHEET METAL WORKERS	2021-11-01	44.46	29.17	73.63
723	TERRAZZO WORKERS	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
724	TILE SETTERS	2021-11-01	34.76	23.29	58.05
725	TILE FINISHERS	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
727	WIRING SYSTEM TECHNICIAN	2021-11-01	42.46	19.41	61.87
		2022-07-01	43.52	19.41	62.93

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
728	WIRING SYSTEMS INSTALLER	2021-11-01	29.02	15.34	44.36
729	ASBESTOS ABATEMENT WORKER	2021-11-01	34.85	21.64	56.49
		2022-01-01	36.23	22.26	58.49
730	SIGN ERECTOR	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			

PREVAILING-WAGE: REGION 9 MINIMUM TRUCK RENTAL RATES

The operating costs were determined by survey on a statewide basis. The operating cost for “four or more axle units, straight-body trucks” is determined to be $51.50 an hour. The operating cost for “three-axle units” is determined to be $37.35 an hour. The operating cost for “tractor only” is determined to be $54.96 an hour. The operating cost for “tractor trailers” is determined to be $66.42 an hour.

Based on surveys reported to the department, the average broker fee paid in 2018 for a tractor was $10.27 an hour and for a four or more axle unit, straight-body truck was $6.81 an hour. The Department of Labor and Industry did not receive sufficient surveys for a three-axle unit or trailer and therefore, no broker fees were reported.

Adding the prevailing wage for drivers of these four types of trucks from each of the state’s 10 highway and heavy construction areas to the operating costs, the minimum hourly truck rental rate for the four types of trucks in each area is certified as follows:

Region 9 minimum hourly truck rental rates

Effective	Tractor trailer	Four or more axle	Three axle	Tractor only
Dec. 27, 2021	$115.17	$99.70	$85.45	$103.71

BACK TO LIST OF REGIONS ▶

MAIN TRUCK RENTAL RATES PAGE ▶

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Work under this section includes descriptions of the measurement and payment methods for each quote item including directing the CONTRACTOR which work items shall have their prices merged and which are considered incidental to the project. The CONTRACTOR shall coordinate material supply, material delivery/unloading, application, and inspection to assure efficient and orderly completion of the Work.

1.2 MEASUREMENT AND PAYMENT

A. General

1. Payment:

a. Payment for each lump sum and unit price stated in the itemized bill shall constitute full compensation for all required labor, products, tools, equipment, plant, transportation, services, and incidentals: erections, application or installation of an item of the work required to complete all work specified under that particular item including cleanup, and all costs for doing related work as set forth in these specifications and/or on the Drawings or implied in carrying out their intent.

1) The quote price sum stated in the itemized quote shall be deemed to include an allowance for overhead and profit.

b. Final payment for work will be made on the basis of quote accepted by OWNER.

c. Requests for payment shall be in accordance with the General Conditions of the Construction Agreement.

d. Payment will be made to the limits as specified in the Contract Documents and as shown on the Drawings.

e. No partial payment shall be made for material delivered to the site and stored until installation.

f. Payment for unit price items will be made monthly until completion of each unit price based on quantity estimated by CONTACTOR and verified by OWNER. Final payment will be based on actual field measured quantities.

2. Improper Work Assessment:

a. Replace the work, or portions of the work, not conforming to specified requirements.

b. If, in the opinion of OWNER, it is not practical to remove and replace the work, OWNER will direct one of the following remedies:

1) The improper work may remain, but the unit/price will be adjusted to a new sum/price at the discretion of OWNER.

2) The improper work will be partially replaced to the instructions of OWNER, and the unit/sum price will be adjusted to a new sum/price at the discretion of the OWNER.

c. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

d. The authority of OWNER to assess the work and identify payment adjustment is final.

3. Non-Payment for Rejected Products:

a. Payment will not be made for any of the following:

1) Products wasted or disposed of in a manner that is not acceptable.

2) Products determined as unacceptable before or after placement.

3) Products not completely unloaded from the transporting vehicle.

4) Products placed beyond the lines and levels of the required work.

5) Products remaining on hand after completion of the work.

6) Loading, hauling, and disposing of rejected products.

B. Base Quote Items

1. Mobilization

a. Basis of Measurement: By lump sum.

b. Basis of Payment: According to the unit price as stated on the quote form. The Work in the CONTRACTOR'S Lump Sum Contract for mobilization as stated on the quote forms includes: preparatory work, all personnel, equipment, supplies and incidentals, including but not limited to, those necessary for the movement to and from the project site, etc. The amount of Lump Sum Quote shall not exceed 30 percent of the Total Base Quote.

Partial payment of the Lump Sum Quote Item "Mobilization and Demobilization" will be made using a percentage based on the following:

	Cumulative Percent
First Partial Payment	50
Percent of original contract earned – 100	100

2. Site Restoration – 32 92 19 Seeding and Restoration

a. Method of Measurement: By lump sum.

b. Basis of Payment: According to the unit price as stated on the bid form. Includes work and materials required to restore site in disturbed areas to the pre-existing conditions.

3. Traffic Control – 01 55 26 Traffic Control

a. Basis of Measurement: By lump sum.

b. Basis of Payment: According to the unit price as stated on the quote form. The lump sum payment shall be compensation in full for all costs of providing a Traffic Control Layout for review and approval by the Owner, furnishing, installing, maintaining, relocating, and removing the individual traffic control devices as required for the entire project. Traffic control quote item also includes all necessary flaggers and flagging devices.

4. Application of Aluminum Sulfate – 02 73 00 Water Alum Treatment
    a. Basis 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 02 73 00. 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.
    b. Basis of Payment: Contractor will be paid a unit price per gallon of aluminum sulfate applied, for aluminum sulfate, 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, store, and apply the chemical to selected areas, all complete as specified.

5. Application of Sodium Aluminate – 02 73 00 Water Alum Treatment
    a. Basis 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 02 73 00. 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.
    b. Basis of Payment: Contractor will be paid a unit price per gallon of sodium aluminate applied, for sodium aluminate, 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, store, and apply the chemical to selected areas, all complete as specified.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 - GENERAL

1.1 FINAL CLEANUP

A. The CONTRACTOR shall promptly remove from the vicinity of the completed WORK, all rubbish, unused materials, and temporary facilities and erosion control used during construction. Final acceptance by the OWNER will be withheld until the CONTRACTOR has satisfactorily performed the final cleanup.

1.2 FINAL SUBMITTALS

A. The CONTRACTOR, prior to requesting final payment, shall obtain and submit the following items to the ENGINEER for transmittal to the OWNER:

1. Daily logs as required by 02 73 00.
2. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.
3. Form IC-134 as required per Minnesota Statute §290.97.

1.3 MAINTENANCE AND WARRANTY

A. The CONTRACTOR shall comply with the maintenance and warranty requirements contained in the specifications and contract. The CONTRACTOR shall warrant workmanship and materials, including growing for one year following final acceptance by the OWNER.

B. The CONTRACTOR shall make all corrections promptly upon receipt of a written order from the OWNER. If the CONTRACTOR fails to make such corrections promptly, the OWNER reserves the right to do the WORK and the CONTRACTOR and its surety shall be liable to the OWNER for the cost thereof.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 02 73 00
WATER ALUM TREATMENT

PART 1: GENERAL

1.01 DESCRIPTION

A. The aluminum treatment project is to apply aluminum (both aluminum sulfate and sodium aluminate) to Wassermann Lake to inactivate sediment phosphorus and to reduce internal phosphorus loading. All Work included in this section shall be performed in accordance with the following paragraphs, the General Requirements set forth in 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 supply, deliver, store, and apply aluminum (both aluminum sulfate and sodium aluminate) to Wassermann Lake, as shown on Figures 1-2. The Contractor shall:

1. Furnish, deliver, store and apply liquid aluminum sulfate and liquid sodium aluminate (collectively referred to as aluminum) to Wassermann Lake to mitigate the internal release of phosphorus from the lake sediment.

2. Treat at appropriate weather, temperature, and flow 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.

C. Access

1. Wassermann Lake

Access to Wassermann Lake and application staging areas are located in the Public Boat Launch. (Figure 2)

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. Aluminum treatment shall not begin until chemical applicator (Contractor) is approved by MCWD. Treatment is to occur once in the October of 2022 (see 1.03.C for the specifics on the aluminum application timing).

B. The Contractor shall be responsible for all labor, aluminum sulfate and sodium aluminate, aluminum application equipment and arrangements for the timely delivery of aluminum sulfate and sodium aluminate required to complete the project. This shall include: a) GPS-linked computer system for barge (boat) guidance that is integrated with real-time bathymetric measurements and simultaneous chemical dosing control for both aluminum sulfate and sodium aluminate pumping rates, b) treatment barge (boat) with on-board chemical storage tanks, and c) boom applicator for even chemical distribution of chemicals.

C. The aluminum application must be complete before the surface temperature of water temperature has risen above 60º F. Application of aluminum sulfate shall not occur if it can be reasonably expected that the surface temperature of Wassermann Lake will drop below 40º F within 24 hours after treatment completion. See Section 3.02 below for more details.

1.04 SUBMITTALS

A. 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 sulfate and sodium aluminate lot testing of materials delivered to the site, including an analysis of the metals content of the material, before treatment.

B. 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.

C. The Contractor shall submit a Plan of Work for approval by the Engineer prior to the issuance of the Notice to Proceed. The Plan of work shall include, at a minimum, the following items:

1. Description of the temporary lakeshore chemical storage facilities including a spill prevention, control and contingency plan (SPCC Plan). Provide manufacturer's model number and material type for alum storage tanks.
2. Method of chemical distribution documenting the computer control of chemical pumping rate into the lake based on application vessel speed, real time GPS navigation, bathymetric measurements to ensure:

Table 1: Buffered Alum Treatment Dose

Waterbody	**Aluminum Sulfate (gal)**	**Sodium Aluminate (gal)**	**Figure**
Wassermann Lake Zone 1	13,500	6,750	1
Wassermann Lake Zone 2	7,654	3,827	1

3. Explanation of navigational guidance system detailing real-time GPS linked computer system for barge (boat) guidance and chemical metering control to ensure complete and uniform chemical coverage during application.
4. Description of all backup systems to minimize down time.
5. Description of land-to-vessel chemical transfer method.

6. Anticipated treatment capacity (acre/hour or gallons/day).
7. Plan for adjusting application procedures or taking other steps to respond to unfavorable lake pH or other adverse occurrence during application.

1.05 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 01 20 00, 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.

C The aluminum solutions supplied under this standard shall contain no soluble mineral or organic substances in quantities capable of producing deleterious or injurious effects on public health or water quality.

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 Bid, 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 storage of equipment and materials within the Project Limits 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 OWNER If gradual off-loading is required the Contractor shall be responsible for all demurrage charges.

B. The staging and delivery of materials shall not disrupt the flow of traffic on Marsh Lake Road.

C. The Contractor shall provide notice to MCWD of delivery of equipment and materials three days prior to the delivery date.

D. Contractor will be responsible to address any chemical spill or release in accordance with its spill prevention and contingency plan, and all laws and proper practices. Contractor will inform the engineer of any such spill or release as soon as possible.

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

F. OWNER will hold the DNR access permit and will provide a copy to the Contractor before mobilization. The Contractor is responsible for complying with all conditions of the permit, including allowable dates for use of the staging area and lake access.

G. The Contractor is responsible for restoring all areas directly or indirectly disturbed by the Work to its existing conditions, including boat launch grading.

3.02 UNFAVORABLE TREATMENT CONDITIONS

A. The Engineer and MCWD will be responsible to monitor wind, water column temperature, and precipitation in order to make judgments about weather condition suitability for application.

B. Application of aluminum shall not occur when wind speeds 6 feet above the lake surface exceed 15 miles per hour.

C. Application of aluminum shall not occur if it can be reasonably expected (forecast) that a significant precipitation event (greater than 1.0 inch in 24 hours) shall occur during treatment or begin within 24 hours after treatment completion.

D. Application of aluminum shall not occur if the surface water temperature is below 40^0 F or above 60^0 F.

3.03 LOCATION OF WORK

A. Project Limits shall be the entire water surface area of Lake and access areas indicated on Figure 2, respectively, except for a 20 foot buffer zone around the shoreline of each lake. The Contractor shall not apply aluminum outside the indicated area on Figures 1.
B. The staging area is located at the Public boat launch.

3.04 ALUMINUM APPLICATION

A. The Contractor shall be responsible for the purchase, delivery, scheduling, and application of the chemicals including all labor.

B. The Contractor shall be responsible for all staging area setup, security, cleanup, and restoration to its original condition. The Contractor shall meet all local and county requirements and take reasonable steps to minimize impacts on residents and lake users in noise, parking, safety, equipment and supply storage, smells, and general condition of the site.

C. The Contractor shall conduct the aluminum application utilizing a barge or similar vessel with an Engineer approved injection system that allows for uniform application of liquid aluminum. Aluminum application shall be made to the indicated

areas of Wassermann Lake as shown in Figure 1, respectively.

D. The Contractor shall ensure that the aluminum sulfate and sodium aluminate are applied at a ratio of 2:1 (2 gallons of aluminum sulfate for every 1 gallon of sodium aluminate). This ratio must be maintained to ensure that the pH in the lake water is maintained between 6 and 9. The application of the aluminum sulfate and sodium aluminate liquids must occur simultaneously using one boat (or system).

E. The Contractor shall ensure that the aluminum sulfate is evenly distributed throughout the treatment area and that the appropriate dose is applied to the appropriate zones shown in Figure 1. The Contractor shall maintain records to verify the area of coverage (also see Section 1.04B).

F. Engineer will monitor the ambient pH in Wassermann Lake during the aluminum treatment application. If at any time during treatment, the depth-averaged ambient pH in the lake falls below 6.5 or increases above 9 S.U., Contractor will stop the treatment. Treatment will not resume until authorized by the Engineer.

G. The aluminum treatment shall be made at a sufficient rate to ensure 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:

Table 2: Buffered Alum Application Rate

Waterbody	Aluminum Sulfate (gal/acre)	Sodium Aluminate (gal/acre)
Wassermann Lake Zone 1	368	184
Wassermann Lake Zone 2	465	233

H. The Engineer estimates that the respective treatment rates will require a total material outlined in Table 1. It is Contractor's responsibility to ensure that enough material is available to complete the Work in accordance with the dosing requirements stated herein.

I. The Contractor shall conduct jar tests immediately prior to the start of the aluminum treatment and every morning before daily treatment begins to evaluate the effects of using the chemicals in lake water at the time of the treatment.

J. The Contractor will maintain ongoing communication with the Engineer and MCWD and will advise the Engineer on an ongoing basis as to application status, water pH readings, and all other conditions relevant to alum application and dosing. 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. Quantity of aluminum applied
3. Approximate acreage and volume treated
4. Approximate location (on map) of area treated
5. Summary of truck deliveries
6. Explanation of any downtime

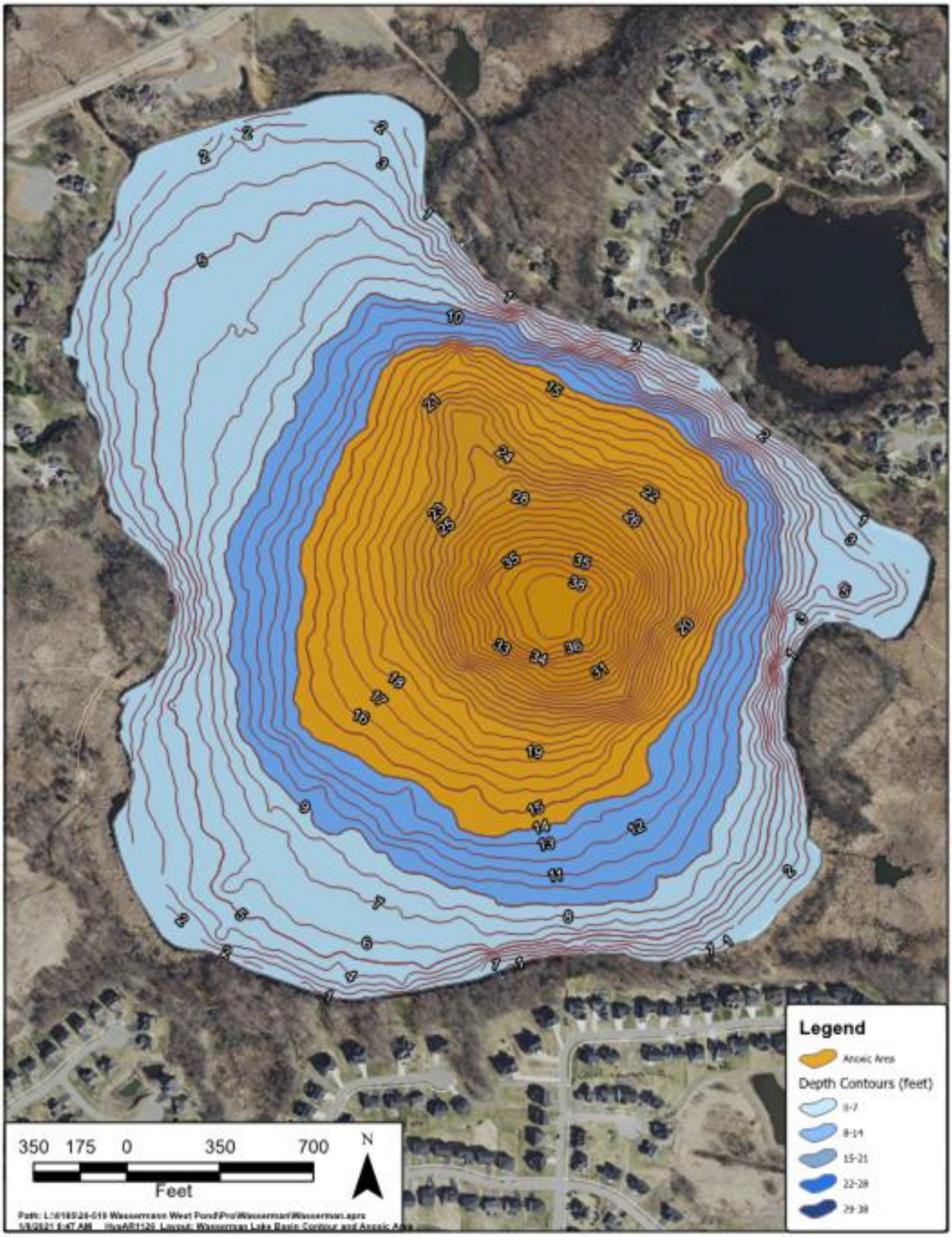

Figure 1: Wassermann Lake Buffered Alum Treatment Area (orange)

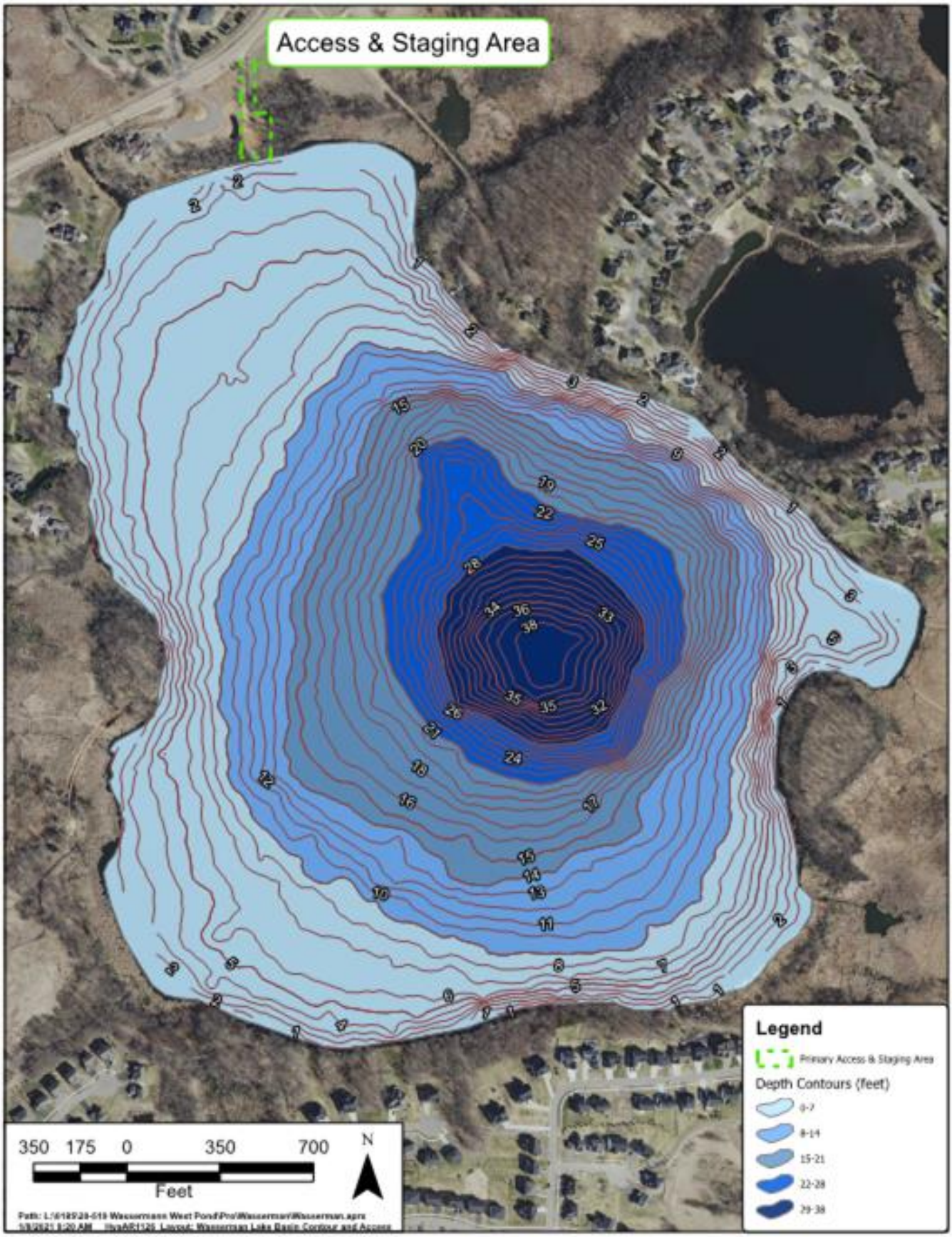

Figure 2: Wassermann Lake Access Area

APPENDIX B

Quote Sheet

Appendix B: Quote Sheet

Contractor Name

Minnehaha Creek Watershed District

Wassermann Lake Alum Treatment

BASE QUOTE – Wassermann Lake				
ITEM	UNIT	QUANTITY	UNIT COST	ITEM COST
Mobilization	LS	1	$	$
Site Restoration	LS	1	$	$
Aluminum Sulfate	GAL	21,154	$	$
Sodium Aluminate	GAL	10,577	$	$

BASE QUOTE TOTAL	$

APPENDIX C

Contract Template

MINNEHAHA CREEK WATERSHED DISTRICT
and
[insert name of contractor]

Wassermann Lake Alum Treatment Project

CONTRACT entered into between the Minnehaha Creek Watershed District, a political subdivision of the State of Minnesota (MCWD), and **[insert name of contractor]** ("CONTRACTOR"). The MCWD and CONTRACTOR agree as follows:

1. Scope of Work

CONTRACTOR will perform the work described in the Water Alum Treatment specifications and Scope of Work Report attached as Exhibit A and incorporated herein ("Work"). At its discretion, the MCWD may in writing suspend or delete the Work or a part thereof. Authorized work by CONTRACTOR will be compensated as a unit price contract in accordance with CONTRACTOR's quote at Exhibit B, attached and incorporated herein, and Paragraph 5, below.

2. Independent Contractor

CONTRACTOR is an independent contractor under this agreement. CONTRACTOR will select the means, method and manner of performing the Work. CONTRACTOR is not the agent, representative or employee of the MCWD in any manner. Personnel performing the Work on behalf of CONTRACTOR will not be considered employees of the MCWD and will not be entitled to any compensation, rights or benefits of any kind from the MCWD.

3. Subcontract and Assignment

CONTRACTOR will not assign, subcontract or transfer any obligation or interest in this contract or the Work without the written consent of the MCWD.

4. Standard of Care and Indemnification

CONTRACTOR will perform the Work in a proper, workmanlike and good quality manner and all materials and labor will be in strict conformity in every respect with Exhibit A. CONTRACTOR warrants all site stabilization measures and vegetation, for one year from the date the MCWD determines the Work to be complete. CONTRACTOR warrants that it has examined the site to the extent necessary to agree to the price of the Work and accepts any increased cost resulting from changes to the Work in response to site conditions that were foreseeable.

CONTRACTOR will indemnify, defend and hold harmless the MCWD, its board members, employees and agents from any and all actions, costs, damages and liabilities of any nature to the degree they are the result of CONTRACTOR's or a subcontractor's negligence

or other action or inaction by CONTRACTOR or a subcontractor that is the basis for CONTRACTOR's or the subcontractor's liability. For any claim subject to indemnification under this paragraph by an employee of CONTRACTOR, the indemnification obligation is not limited by a limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR under workers' compensation acts, disability acts or other employee benefit acts.

5. Compensation

When the MCWD has determined that the Work is complete, or pursuant to a pay schedule approved in writing by the MCWD, the MCWD will compensate CONTRACTOR in accordance with Exhibit B. Payment for undisputed work will be due within 30 days of receipt of pay request.

Final payment requires that CONTRACTOR provide proof of compliance with applicable state income tax withholding requirements under Minnesota Statutes §270C.66.

CONTRACTOR will maintain records concerning fees or costs incurred in connection with the Work for six years from the date the work is completed and agrees that the MCWD or the State Auditor may examine, audit, and copy any such records during normal business hours.

In accordance with Minnesota Statutes §471.425, subdivision 4a, CONTRACTOR will pay any subcontractor to which the MCWD, under paragraph 3, above, has consented within 10 days of CONTRACTOR's receipt of payment from MCWD for undisputed services provided by the subcontractor. CONTRACTOR will pay interest of 1½ percent per month or any part of a month to a subcontractor on any undisputed amount not paid on time to the subcontractor. The minimum monthly interest penalty payment for an unpaid balance of $100 or more is $10. For an unpaid balance of less than $100, CONTRACTOR will pay the actual penalty due to the subcontractor.

6. Insurance

At all times during the performance of the Work, CONTRACTOR will have and keep in force the following insurance coverages:

A. Commercial general liability (CGL): $1.5 million each occurrence and aggregate, covering contractor's work. The certificate will confirm contract liability coverage. The certificate must state that commercial general liability coverage includes standard marine services liability. The policy must afford coverage for bodily injury and damage to property of others arising out of the perils of boating accidents and chemical spills.

B. Automobile liability: combined single limit each occurrence coverage for bodily injury and property damage covering all vehicles, $1.5 million.

C. Workers' compensation: in accordance with legal requirements applicable to CONTRACTOR.

Insurance coverage will be on an occurrence basis. CONTRACTOR will not commence the Work until it has filed with the MCWD a certificate of insurance showing the required coverages. The certificate will name the MCWD as a holder and an additional insured under the CGL and automotive policies with primary coverage on a non-contributory basis, and will state that the MCWD will receive written notice under the same terms as CONTRACTOR before cancellation, non-renewal, or a change in the liability limit of any described policy. CONTRACTOR will not commence the Work until it has provided the MCWD with an endorsement establishing MCWD coverage as an additional insured as required above.

7. Compliance with Laws

CONTRACTOR will comply with the laws and requirements of all federal, state, local and other governmental units in connection with performing the Work.

CONTRACTOR's access and construction limits and its responsibility to protect and restore the work site and attached as Exhibit C hereto and incorporated herein. In addition, CONTRACTOR is responsible for site conditions relating to worker and public safety, cleanliness and environmental protection and in all other respects. CONTRACTOR will not injure or destroy any shrub or tree on site except as may be authorized by the MCWD in writing.

In performing the Work, CONTRACTOR will ensure that no person is excluded from full employment rights or participation in or the benefits of any program, service or activity on the ground of race, color, creed, religion, age, sex, disability, marital status, sexual orientation, public assistance status or national origin; and no person who is protected by applicable federal or state laws, rules or regulations against discrimination otherwise will be subjected to discrimination.

8. Minnesota Data Practices Act

The Minnesota Data Practices Act applies to this contract to the extent specified at Minnesota Statutes §13.05, subdivision 11.

9. Choice of Law, Venue and Jurisdiction

This contract will be construed under and governed by the laws of the State of Minnesota. Venue for any legal action under this contract will lie in Carver County, Minnesota.

10. Completion of Work

The Work must be complete by October 31, 2022.

11. Whole Contract

The entire contract between the parties is contained herein and this contract supersedes all oral contracts and negotiations relating to the subject matter hereof. The MCWD may amend this contract by means of a proper work change directive clearly denominated as such. Any other amendment must be signed by both parties.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver this contract.

[CONTRACTOR]

By_____ Date:
[type name and title]

Approved for form and execution:

By _____
MCWD Counsel

MINNEHAHA CREEK WATERSHED DISTRICT

By _____ Date:
James Wisker, Administrator

Stantec

Memo

To:	Anna Brown, MCWD Brian Beck, MCWD Kailey Cermak, MCWD	From:	Dendy Lofton, PhD, CLM Anne Wilkinson, PhD, EIT Golden Valley, MN
Project/File:	Wasserman Lake 227705063	Date:	July 25, 2022

Reference: Wasserman Lake Alum Dose Evaluation and Planning

Background

Wassermann Lake is located within the Minnehaha Creek Watershed District (the District) in Laketown Township near the City of Victoria, Minnesota. Wasserman Lake has an approximate surface area of 170 acres and a watershed area of 2,729 acres (4.3 square miles). Its mean depth is approximately 10 feet and its maximum depth is 41 feet. Nearly 73% of the lake surface area is in the littoral zone (i.e., having a depth of 15 feet or less).

Wassermann Lake was placed on the State of Minnesota's 303(d) list of impaired waters in 2004 and a Total Maximum Daily Load (TMDL) study for the lake was completed in 2011 (MPCA 2011). The TMDL study determined that internal loading is a large source of phosphorus to Wassermann Lake and that significant reductions would be needed to meet State water quality standards. Follow-up studies by the District determined that internal loading for Wassermann Lake will need to be reduced by approximately 337 lbs/yr (90%) in order for the lake to meet State water quality standards. Since internal loading is such a large percentage of the phosphorus budget, the District applied for and received a grant from the Minnesota Board of Water and Soil Resources (BWSR) in 2019 to conduct an aluminum sulfate (alum) treatment to reduce sediment release of phosphorus.

The District contracted with Stantec Consulting Services, Inc (Stantec; formerly Wenck Associates) to conduct an engineering feasibility of the alum treatment, and develop alum dose design and cost estimates for the treatment. The feasibility and dose recommendations were reported in a memo titled, "Wassermann Lake 1st Dose Alum Treatment Recommendations Report" (Wenck 2021). In that report, Wenck (now Stantec), recommended a buffered alum dose to be applied in two separate, evenly split applications to achieve the full effective dose. In addition, sediment chemistry results indicated higher redox-P in the deeper zones compared to more shallow areas indicating the need for a higher alum dose in the deeper areas, so the prescribed aluminum dose was higher for the deeper zones and lower in the shallower areas.

In May of 2021, Wasserman Lake received the first application of the prescribed buffered alum dose, which was one half of the calculated effective dose based on sediment chemistry collected in 2020. Table 1 shows the volumes of alum and sodium aluminate (buffer) that were applied to the treatment areas indicated in Figure 1.

Reference: Wasserman Lake Alum Dose Evaluation

Table 1: First Alum Dose Applied in 2021 to Zones 1 (shallow) and 2 (deep).

	ZONE	DEPTHS (FT)	ALUMINUM SULFATE (GAL)	SODIUM ALUMINATE (GAL)	DOSE RATE (mg/M^2)
FIRST DOSE	1	14-24	13,500	6,750	47
	2	24-38	7,653	3,826.5	59
	Total	14-38	21,153	10,576.5	

As part of the current scope of work, Stantec was tasked with the collection of sediment cores to measure post-application sediment chemistry and phosphorus release rates to evaluate the effectiveness of the first treatment and to assess if any changes to the second planned alum dose are warranted. The following sections describe Stantec's analysis of the post-treatment effectiveness of the first application, evaluation of the appropriateness of the second planned dose, and recommendations for future alum applications.

Reference: Wasserman Lake Alum Dose Evaluation

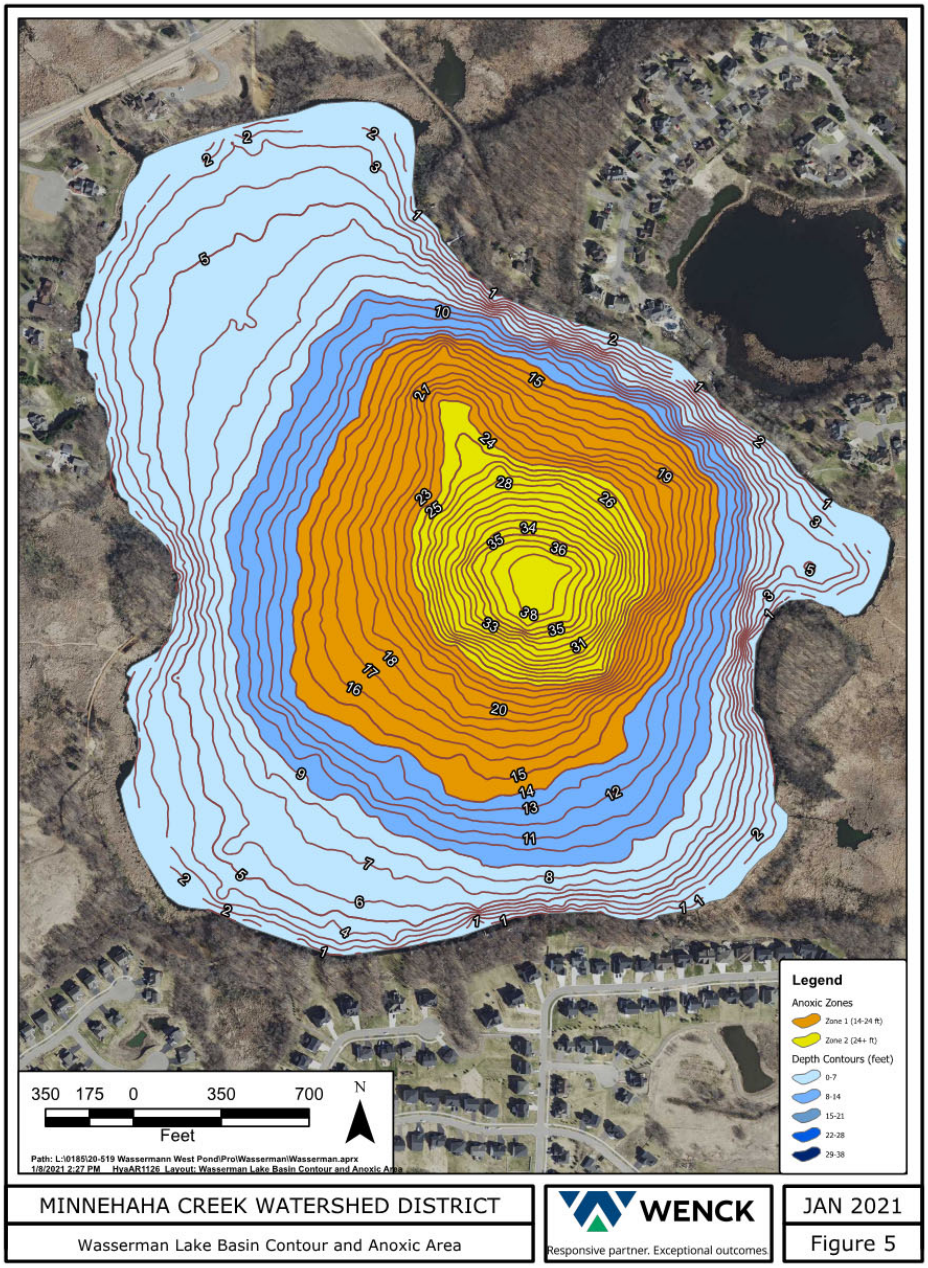

Figure 1. Buffered alum treatment zones in Wasserman Lake.

EVALUATION OF 2021 ALUM APPLICATION AND 2ND DOSE

Stantec evaluated the effectiveness of the first alum application in May 2021 by analyzing total phosphorus (TP) data collected by the District during summer 2021 and sediment chemistry data collected by Stantec in May 2022. Water column TP data was provided to Stantec by the District.

Intact sediment cores were collected by Stantec in May 2022 using a gravity sediment coring device equipped with an acrylic core liner (6.5-cm ID and 50-cm length). Sediment cores were collected from stations 1, 2, 4 and 6 for phosphorus fractionation chemistry analysis. A separate set of sediment cores were also collected from stations 1 and 3 to quantify rates of phosphorus release under anoxic conditions in the laboratory (Figure 2). All intact sediment cores were transported to the University of Wisconsin – Stout Discovery Center Laboratory where they were sectioned vertically at 2-cm intervals over the upper 10-cm sediment depth to evaluate variations in sediment physical-textural and chemical characteristics, including phosphorus fractionation.

The results of these analyses are presented in the following sections.

Reference: Wasserman Lake Alum Dose Evaluation

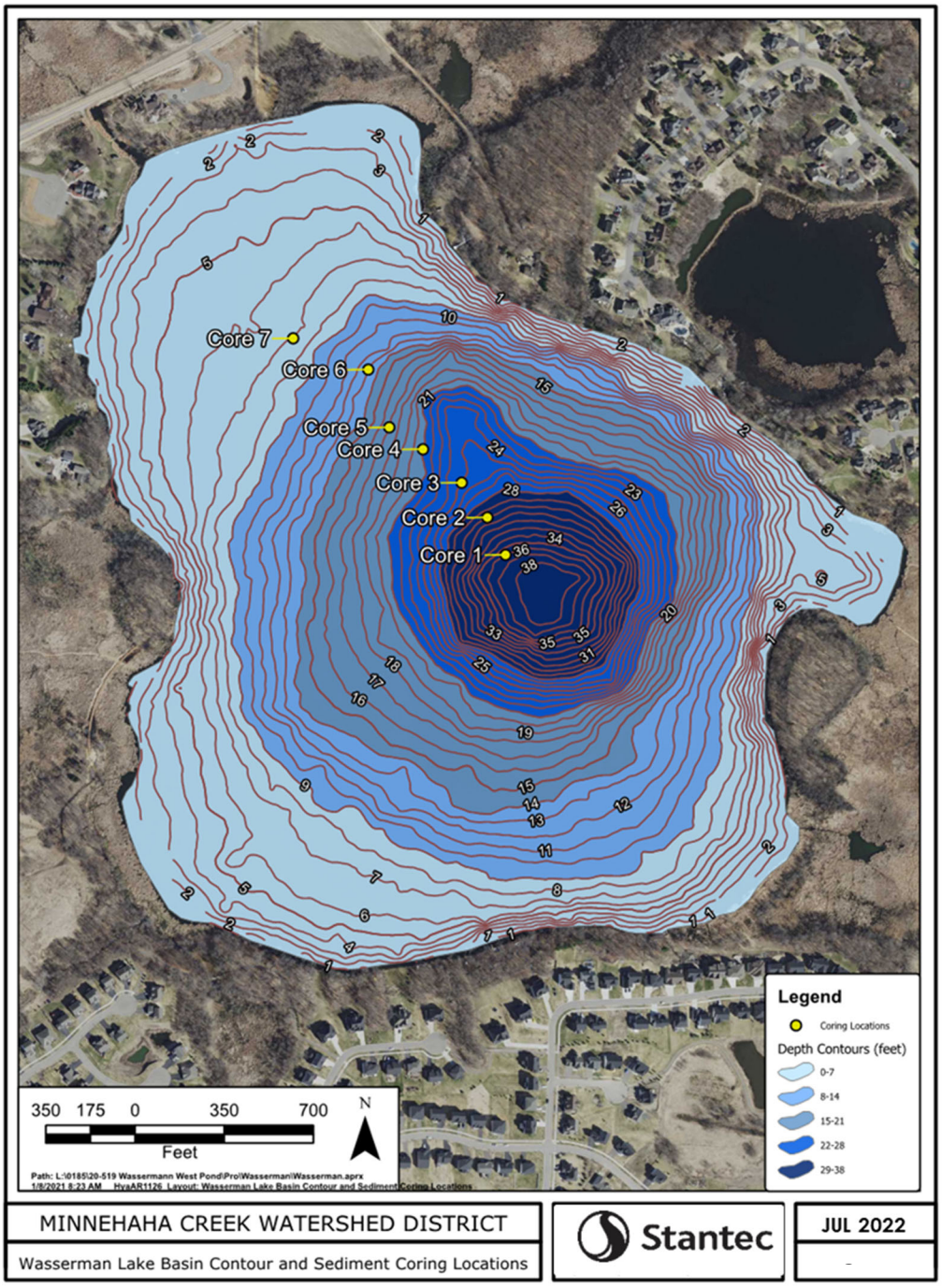

Figure 2. Sediment core locations. Cores were collected from sites 1-7 in 2021, and sites 1, 2, 3, 4 and 6 in 2022. Sediment cores from sites 1, 2, 4 and 6 were analyzed for phosphorus fractionation while cores from sites 1 and 3 were incubated in the laboratory for quantification of phosphorus release rates.

Stantec evaluated three primary lines of evidence to assess the effectiveness of the 2021 buffered alum application, which includes:

- Evaluation of lake response variables such as TP and how pre-treatment values compared to post-treatment values. We specifically focused on the hypolimnetic TP trends (i.e., bottom waters).
- Evaluation of whether aluminum-bound P increased post-treatment compared to pre-treatment conditions.
- Evaluation of post-treatment rates of sediment phosphorus release compared to pre-treatment rates.

Stantec reviewed the 2020 and 2021 TP data provided by the District (Figure 2). In the 2020 summer growing season, prior to the first alum treatment in May 2021, hypolimnetic TP accumulated over the course of the summer which is indicative of internal phosphorus loading from the sediments. In stratified lakes like Wasserman Lakes with anoxic hypolimnion, phosphorus released from the sediments is confined to the hypolimnion by the density gradient of the thermocline resulting in hypolimnetic TP accumulation until the lake layers full mix sometime in the fall. After the first alum treatment, the 2021 data showed lower hypolimnetic TP concentrations. The maximum hypolimnetic TP concentration in 2020 was 0.83 mg/L while the maximum concentration observed in 2021 was 0.35 mg/L, which is nearly a 57% reduction in observed TP maximum concentration. This observation provides strong evidence that the alum application is suppressing release of some phosphorus from the lake sediments. Application of the remaining buffered alum dose is expected to further reduce hypolimnetic TP.

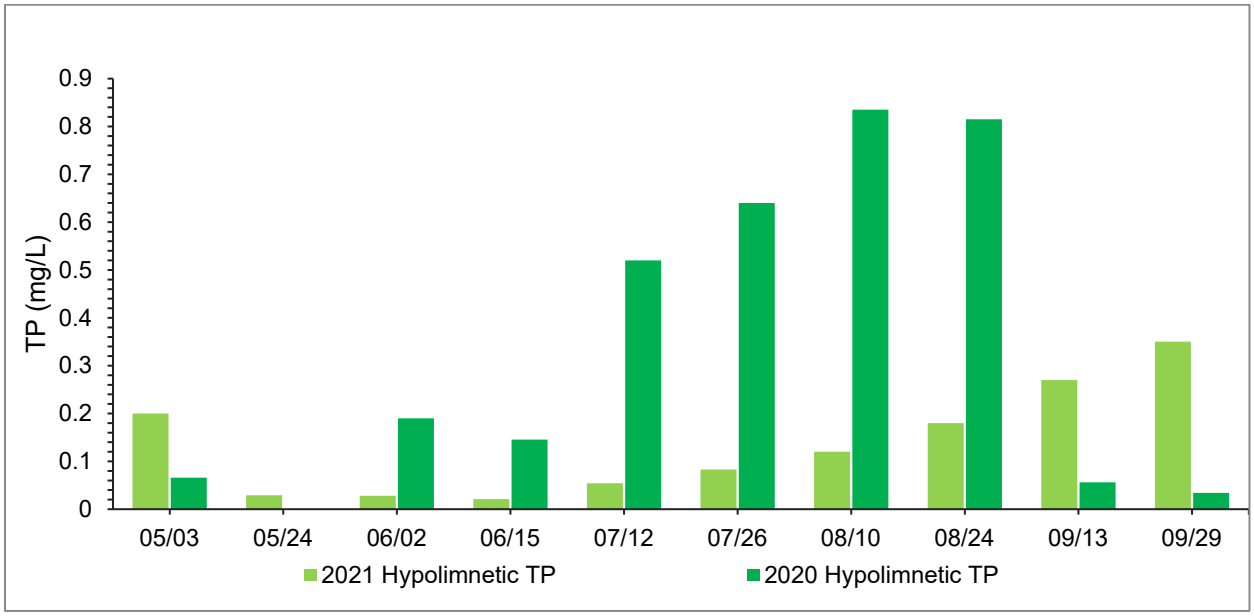

Figure 3: Comparison of pre- and post-treatment hypolimnetic total phosphorus (TP).

Reference: Wasserman Lake Alum Dose Evaluation

In addition to evaluating the hypolimnetic phosphorus data, Stantec also assessed phosphorus fractionation data measured in the post-treatment sediment cores. Phosphorus fractionation operationally characterizes the different types of sediment phosphorus into mobile and non-mobile pools. It is useful to assess non-mobile phosphorus since the goal of the alum treatment is to immobilize phosphorus in the sediments that could be contributing to internal phosphorus loading.

Aluminum-bound P characterizes the amount of phosphorus bound to aluminum within the sediment, which is useful since it should provide insight into how much phosphorus was immobilized by aluminum at each site. The results from this analysis show increased aluminum-bound P under post-treatment conditions compared to pre-treatment conditions at all sites where both sets of sediment cores (2020 and 2021) were collected (Figure 4). Aluminum-bound P increased the most dramatically after the alum treatment in stations 1 and 2 which may be due to the higher areal aluminum dose applied to that zone. Stations 4 and 6 showed some increase in aluminum-bound P after the aluminum treatment, but the increase was much lower in magnitude than the deeper stations.

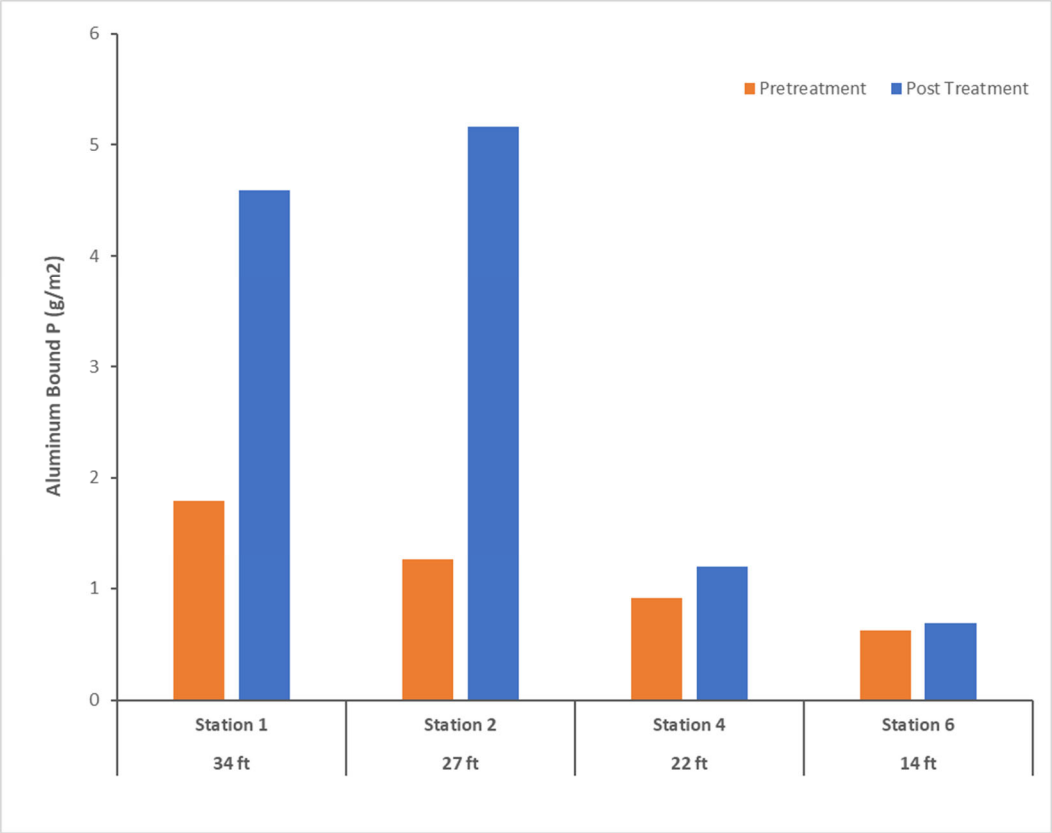

Figure 4. Pre- and post-treatment comparison of aluminum-bound P in the upper 10 cm of sediment cores collected from Wasserman Lake.

Lastly, Stantec compared sediment phosphorus release rates measured under pre-treatment conditions to those measured under post-treatment conditions. Sediment cores were inadvertently collected from station 1 instead of station 2 so post-treatment comparison in release rates cannot be confirmed for station 2. However, given the similarities in sediment conditions between stations 1 and 2, we might assume similar pre-treatment release rates at station 1 to that of station 2 which would indicate suppression of sediment phosphorus release as a result of the first buffered alum treatment.

No real difference in the release rates between pre- and post-treatment conditions were observed for station 3. Given that the aluminum-bound P data showed no real difference in pre- and post-treatment concentrations at station 4 or station 6, it is not surprising that no difference was observed in the release rates under pre- and post-treatment conditions in the shallower regions of the lake. Future assessments of the effectiveness of buffered alum treatments should include the collection and incubation of sediment cores from sites 1-5 to evaluate post-treatment release rates.

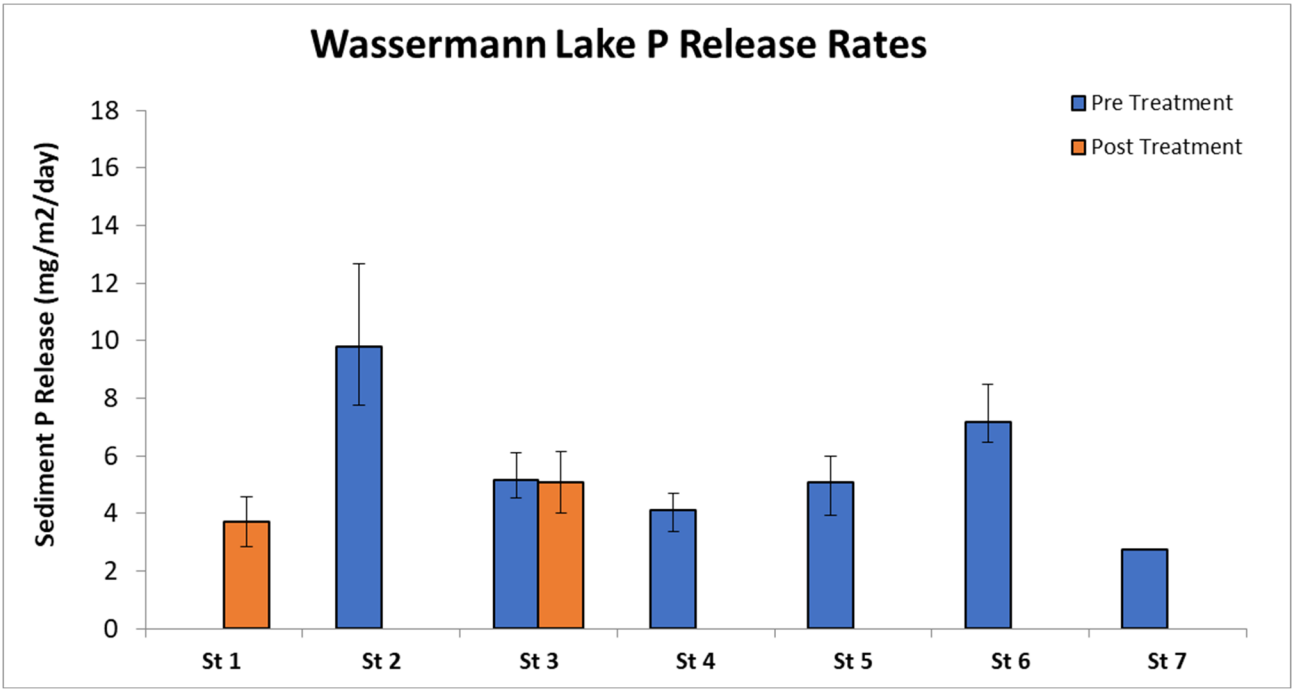

Figure 5. Pre- and post-treatment comparison of sediment phosphorus release rates from Wasserman Lake sediment cores incubated in the laboratory at UW-Stout.

SUMMARY

The data and relationships described above provide multiple lines of evidence that the first half of the planned buffered alum dose is suppressing some of internal phosphorus loading in Wasserman Lake, primarily in the deeper zone although with lower effectiveness observed in the shallower zone. In summary, these lines of evidence include the following observations:

- Reduction of summer accumulation of hypolimnetic TP after the first alum treatment compared to pre-treatment conditions.
- Increase in aluminum-bound P in post-treatment sediment cores compared to pre-treatment sediment cores. The magnitude of increase was greatest at the deep stations that received a higher aluminum dose.
- Some improvement in post-treatment release rates but the data isn't conclusive due to low sample size of post-treatment cores. Future efforts to measure post-treatment effectiveness of aluminum treatments to reduce internal phosphorus loading should include sediment cores from stations 1-5 to better constrain the post-treatment phosphorus release rates.

It is important to recognize that Wasserman Lake has only received half of the prescribed aluminum dose to-date, and thus, the data presented in this memo represent interim conditions. The interim data indicate that the applied dose was more successful at suppressing internal phosphorus load in the deeper areas of the lake but seems to have been less effective in the shallower area of the lake.

RECOMMENDATION

After reviewing the data and assessing all available lines of evidence, Stantec has determined that the first half of the prescribed aluminum dose is more effectively reducing phosphorus release rates in the deep areas of the lakes compared to the shallow areas that received alum. While the initial prescribed aluminum dose may have been viewed as somewhat conservative with intent to evaluate appropriateness of the 2nd planned dose based on interim data (Wenck 2021), there is not strong lines of evidence to modify the aluminum dose regime at this time. The original dose was based on a comprehensive set of sediment core data which indicated high redox-P (i.e., mobile phosphorus) in the sediments of Wasserman Lake. Consequently, Stantec recommends proceeding with application of the second half of the planned buffered alum treatment to Wasserman Lake, as funding allows.

It is Stantec's understanding that the District has approximately $200,000 remaining in grant funds to support the 2022 buffered alum treatment, which included fees for Stantec to collect sediment cores, analyze available data and assess effectiveness of the first application and oversight of the buffered alum application in fall 2022. Stantec's preliminary estimate for the contractor labor and material (alum + sodium aluminate) costs to apply the second dose in fall 2022 was $169,000 (Table 2). Material costs for alum and sodium aluminate are subject to market fluctuations and both are higher per unit cost than in previous years due to supply chain issues and inflation. Precise unit costs will not be available until a contractor provides a cost estimate to conduct the second buffered alum application. During development of this scope of work, Stantec estimated unit prices recognizing that the final bid to conduct the alum application could be higher or lower than our assumed estimate. Consequently, the second planned alum dose shown in Table 2 may need to be reduced if the material costs come in higher than what is remaining in the grant budget. Similarly, if the contractor provides a material cost estimate that is lower than what Stantec estimated, additional buffered alum can be applied to the lake in order to use all available grant funds to support this project.

Table 2: Material quantities, dose rate and estimated costs for second buffered alum application that is planned for fall 2022.

ZONE	DEPTHS (FT)	ALUMINUM SULFATE (GAL)	SODIUM ALUMINATE (GAL)	DOSE RATE (mg/M^2)	COST ESTIMATE ($)	AREA (ACRE)
1	14-24	13,500	6,750	47	$ 107,527.50	36.6
2	24-38	7,653	3,826.5	59	$ 60,956.15	16.4
TOTAL	14-38	21,153	10,576.5		$ 168,483.65	53

Should additional funding be available to purchase more aluminum sulfate and sodium aluminate after contractor selection, an increase in the planned 2nd dose could be executed via change order. The additional budget could be used to increase the aluminum application rate in the shallow application area (Zone 2) since the buffered alum treatment appears to have been less effective in this region based on sediment analysis results.

Once an alum applicator's bid has been selected by the District, Stantec will work with the District to adjust the alum dose accordingly, if additional material or less material is needed based on the contractor's cost and remaining grant funds.

CONSIDERATIONS FOR FUTURE TREATMENTS

Given the inconsistent reduction in phosphorus release rates across treatment zones, additional aluminum treatments may be needed in the future following the second dose if the lake response variables and other lines of evidence indicate that substantial internal loading of phosphorus persists relative to pre-treatment conditions. Stantec has provided recommendations for ongoing and future monitoring of the effectiveness of aluminum treatments in Wasserman Lake to suppress internal phosphorus loading. These recommendations include the following:

- Continue collecting epilimnetic and hypolimnetic water quality data to monitor success of the alum treatments based on lake response variables (TP, dissolved or ortho-P, chlorophyll-a, Secchi disk depth).
- Collect multiple sediment cores from multiple depths and application zones for laboratory incubation to quantify phosphorus release rates to evaluate spatial effectiveness of treatments.

The monitoring data will inform whether future aluminum treatments are needed to meet internal load reduction goals outlined in the feasibility study (Wenck 2021).

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