Alum Treatment Final Completion Report

Skinequit Pond

Harwich, MA

Submitted: December 4, 2023

SOLitude Lake Management

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Project Background

Solitude Lake Management was contracted by the Town of Harwich to conduct an buffered alum treatment and associated tasks at Skinequit Pond in 2023. Pre & post monitoring tasks were completed by Water Resource Services as a subcontractor. Based on extensive assessments, the project specifications called for the application of liquid aluminum sulfate and sodium aluminate to achieve an aluminum dose of 100 g/m^2 of aluminum over Zone 1 (5.4 acres) and 50 g/m2 over Zone 2 (5.4 acres), corresponding with areas greater than 4 meters in depth (see map – left). This equated to 6,470 gallons of alum and 3,235 gallons of sodium aluminate. The selected dose was determined to lower available phosphorus in the water column and sediment and reduce the likelihood of nuisance algal blooms. The treatment was conducted during the period of October 16th to October 24th, where Zone 1 was traversed five times and Zone 2 was traversed three times, each time with a portion of the required dose. Splitting the dose over multiple passes was required by the Order of Conditions and a safeguard to limit the concentration of aluminum applied to the pond at any one time.

Project Permits and Documents

The Town provided SOLitude with a number of documents outlining the project background and specifications. These documents were reviewed by the staff assigned to the project. In particular, the following documents provided key project specifications and all activities were conducted in accordance with these documents.

- Order of Condition issued by the Town of Harwich Conservation Commission (DEP File #032-2538)
- Invitation for Bid – Phosphorus Inactivation of Surficial Sediments in Skinequit Pond, Harwich, Massachusetts

As part of the contracted work, SOLitude obtained or prepared the following documents prior to treatment.

- Proposal for Services - Alum Treatment
- MassDEP License to Apply Chemicals, #WM04-0001351
- Skinequit Pond Alum Treatment Monitoring Plan

Project Schedule & Main Elements

The following is a summary and timeline of the main project elements.

Timing	Tasks
October 13th, 2023	• 24 Hour Pre-Treatment Sampling • Tank Delivery/ Site Staging
October 16th, 2023	• Site Staging • Initial Product Delivery • Initial Day of Treatment
October 17th 2023	• Remainder of Product delivered • 2nd Day of Treatment
October 18th, 2023	• 3rd day of treatment, Zone 2 completed
October 23rd, 2023	• 4th day of treatment
October 24th, 2023	• Final day of treatment, Zone 1 completed • Site Breakdown/Equipment Removal
November 11th, 2023	• Storage Tanks Removed

Product Deliveries

The total quantity of both treatment products was delivered to the site in three deliveries. Both products were supplied by Holland Company of North Adams, MA. In total, 6,453 gallons of aluminum sulfate and 3,253 gallons of sodium aluminate were

delivered to the site. The delivered quantities represent a deviation from the proposed quantities of -0.3% for alum and +0.6% for sodium aluminate. Bills of Lading from the supplier are attached as **Appendix A**

Alum Application

The actual application of alum and sodium aluminate was performed on October 16-18 & October 23-24 using SOLitude's 23-foot Carolina Skiff equipped with specially designed application equipment. The application equipment consisted of separate tanks, pumps and spray booms with drop hoses for each product. Flow meters and adjustment valves on board the vessel allowed for the calibrated application of both products at precise flow rates based on the speed of the vessel and the prescribed dose. An on-board GPS unit, preloaded with the treatment area boundaries and position logging allowed for precise and even application with the designated treatment area.

The following table documents the amount of products applied each day by Zone.

Zone	Day 1 (October 16th)		Day 2 (October 17th)		Day 3 (October 18th)		Day 4 (October 23rd)		Day 5 (October 24th)		Total	
	Alum (gal)	SOAL (gal)	Alum (gal)	SOAL (gal)	Alum (gal)	SOAL (gal)	Alum (gal)	SOAL (gal)	Alum (gal)	SOAL (gal)	Alum (gal)	SOAL (gal)
1	776	388	776	388	776	388	993	496.5	976	514.5	4297	2175
2	776	388	776	388	604	302	0	0	0	0	2156	1078
								Total Applied			6453	3253

A map of the GPS recorded tracks of the treatment vessel for each day are provided in **Appendix B**.

Water Quality Monitoring

SOLitude conducted during treatment monitoring of pH & alkalinity levels. Solitude's monitoring was focused on ensuring a safe and effective application of alum, specifically making sure that the pH and alkalinity were maintained within the required range. The pre & post treatment monitoring was conducted by Water Resource Services.

During each day of the alum application, pH and alkalinity were measured three times each day (before start of treatment, mid-way during treatment and at the conclusion of treatment) at three locations (Control, Zone 1 & Zone 2). A baseline reading of pH and alkalinity was also collected on Friday, October 13th. The following table details the results of the application monitoring.

During Application Monitoring	Zone 1		Zone 2		Control	
	pH (SU)	Alkalinity (mg/l)	pH (SU)	Alkalinity (mg/l)	pH (SU)	Alkalinity (mg/l)
Pre Treatment - October 13th	7.0	25.0	7.0	25.0	7.0	25.0
Day 1 - October 16th						
Pre	7.00	25.0	7.00	25.0	7.00	25.0
Mid	7.00	20.0	6.75	20.0	7.00	22.5
End	6.75	20.0	7.00	22.5	6.75	22.5
Day 2 - October 17th						
Pre	6.75	20.0	6.50	20.0	6.75	20.0
Mid	6.50	20.0	6.75	20.0	7.25	20.0
End	6.75	20.0	6.75	20.0	6.75	20.0
Day 3 - October 18th						
Pre	7.00	22.5	6.50	22.5	7.00	22.5
Mid	6.75	22.5	7.00	22.5	6.75	22.5
End	6.50	20.0	6.50	22.5	6.75	22.5
Day 4 - October 23rd						
Pre	7.00	25.0	7.00	25.0	7.00	25.0
Mid	6.75	25.0	7.25	25.0	7.00	25.0
End	6.50	25.0	7.00	25.0	7.00	25.0
Day 5 - October 24th						
Pre	7.00	25.0	7.00	25.0	7.25	25.0
Mid	6.75	25.0	7.00	25.0	7.00	25.0
End	6.75	22.5	7.00	25.0	7.00	25.0

Monitoring showed that pH was maintained within the desirable range and varied only slightly from pre-treatment levels during the application. Alkalinity also varied only slightly from pre-treatment levels.

Conclusion

The alum application process at Skinequit Pond was successful in evenly applying the specified aluminum dose to the designated target areas. Monitoring showed that pH

and alkalinity remained stable throughout the application and no adverse effects were observed.

Appendices

- Appendix A – Bills of Lading
- Appendix B – Map of Treatment Areas & GPS Tracks

APPENDIX A – BILLS OF LADING

SŌLITUDE
LAKE MANAGEMENT

ORIGINAL- NOT NEGOTIABLE

STRAIGHT BILL OF LADING - SHORT FORM

RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading, the property described below, in apparent good order, except as noted (contents and conditions of contents of packages unknown), marked, consigned and destined as indicated below, which said carrier (the word carrier being understood throughout this contract as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery as said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed, as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at a time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or rail-water shipment, (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment. **Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment, and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.**

Holland Company, Inc.
153 Howland Avenue
Adams, MA 01220
Permanent post office address of shipper: 153 Howland Avenue, Adams, MA 01220

COSIGNED TO AND DESTINATION
SoLitude Lake Management
Ocean Street
Skinequit Pond
Harwich, MA 02645

Customer Number	Customer Purchase Order #	Shipper Number	Shipping Date	Freight	Carrier
3252	33386	54225	10/16/23		HOL

Description

~~5,000~~ 5,026	GA	UN 3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, PG-III, RQ, (ALUMINUM SULFATE SOLUTION)	COMMERCIAL ALUMINUM SULFATE	MUL = 150 mg/L	BULK

Certified by NSF International as meeting NSF/ANSI/CAN Standard 60 for Water Treatment Chemicals
Deliver alum at 10 am Dominic 508-373-4526

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is a carrier's or shipper's weight.
NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper not to be exceeding per
The fiber boxes used for this shipment conform to the specifications set forth in the box maker's certificate thereon, and all other requirements of the Consolidated Freight Classification.

HOLLAND COMPANY, INC. Shipper, Per _____ Agent, Per _____

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement. The carrier shall not make delivery if this shipment with payment of the freight and all other lawful charges.

_____
(Signature of Consignor)

Received $ _____ To apply in prepayment of the charges On the property described hereon.

_____ AGENT OR CASHIER

_____ PER
The signature here acknowledges only the amount prepaid

Charges Advanced: $ _____

Shipper imprint in lieu of stamp; not part of Bill of Lading approved by the Interstate Commerce Commission.

Approval of Product & Unload By Dominic Mesiugo

Product Received By _____

Date Received _____

**NSF Tank Certification ** Date: 10-14-23

Drivers Initials: _____

Washout Required _____ Yes _____ No

Tank No. 70 Water _____ Other _____

CNN 227714
For Chemical Emergency
Call CHEMTREC Day or Night
800-424-9300

Seal Numbers:

Front	Rear
9504 Top	_____ Top
9503 Bottom	_____ Bottom

ORIGINAL- NOT NEGOTIABLE

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Permanent post office address of shipper: 153 Howland Avenue, Adams, MA 01220

COSIGNED TO AND DESTINATION
SoLitude Lake Management
Ocean Street
Skinequit Pond
Harwich, MA 02645

Customer Number	Customer Purchase Order #	Shipper Number	Shipping Date	Freight	Carrier
3252	33386	54226	10/17/23		HOL

Description

~~1,400~~ 1,427	GA	UN 3082	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, PG-III, RQ, (ALUMINUM SULFATE SOLUTION)	COMMERCIAL ALUMINUM SULFATE	MUL = 150 mg/L	BULK

Certified by NSF International as meeting NSF/ANSI/CAN Standard 60 for Water Treatment Chemicals

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is a carrier's or shipper's weight.
NOTE: Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.
The agreed or declared value of the property is hereby specifically stated by the shipper not to be exceeding
per
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HOLLAND COMPANY, INC. Shipper, Per _____ Agent, Per _____

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_____
(Signature of Consignor)

Received $ _____ To apply in prepayment of the charges On the property described hereon.

_____ AGENT OR CASHIER

_____ PER
The signature here acknowledges only the amount prepaid

Charges Advanced: $ _____

Shipper imprint in lieu of stamp; not part of Bill of Lading approved by the Interstate Commerce Commission.

Approval of Product & Unload By Dominic Meringolo Dominic Meringolo

Product Received By DELIVERED 9:15 AM CF

Date Received _____

**NSF Tank Certification ** Date: 10.11.23

Drivers Initials: CF

Washout Required _____ Yes _____ No

Tank No. 20 Water _____ Other _____

CNN 227714
For Chemical Emergency
Call CHEMTREC Day or Night
800-424-9300

Seal Numbers:

Front	Rear
84384 Top	_____ Top
84383 Bottom	_____ Bottom

ORIGINAL- NOT NEGOTIABLE

STRAIGHT BILL OF LADING - SHORT FORM

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Holland Company, Inc.
153 Howland Avenue
Adams, MA 01220
Permanent post office address of shipper: 153 Howland Avenue, Adams, MA 01220

COSIGNED TO AND DESTINATION
SoLitude Lake Management
Ocean Street
Skinequit Pond
Harwich, MA 02645

Customer Number	Customer Purchase Order #	Shipper Number	Shipping Date	Freight	Carrier
3252	33386	54277	10/16/23	DELIVERED	HOL

Description

~~3,235~~ 3,253	GA	UN 1819	SODIUM ALUMINATE SOLUTION, 8 , PG-II (SODIUM ALUMINATE SOLUTION), MUL = 40 MG/L	SODIUM ALUMINATE	MUL = 40 mg/L	BULK

Certified by NSF International as meeting NSF/ANSI/CAN Standard 60 for Water Treatment Chemicals

If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is a carrier's or shipper's weight.
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per
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_____
(Signature of Consignor)

Received $ _____ To apply in prepayment of the charges On the property described hereon.

_____ AGENT OR CASHIER

_____ PER
The signature here acknowledges only the amount prepaid

Charges Advanced: $ _____

Shipper imprint in lieu of stamp; not part of Bill of Lading approved by the Interstate Commerce Commission.

Dominic Meringolo

Approval of Product & Unload By _____

Product Received By _____

Date Received _____

**NSF Tank Certification ** Date: 10-16-23

Drivers Initials: _____

Washout Required X Yes _____ No

Tank No. 10 Water X Other _____

CNN 227714
For Chemical Emergency
Call CHEMTREC Day or Night
800-424-9300

WASHOUT COMPLETE
OCT 16 '23 AM 7:28

Seal Numbers:

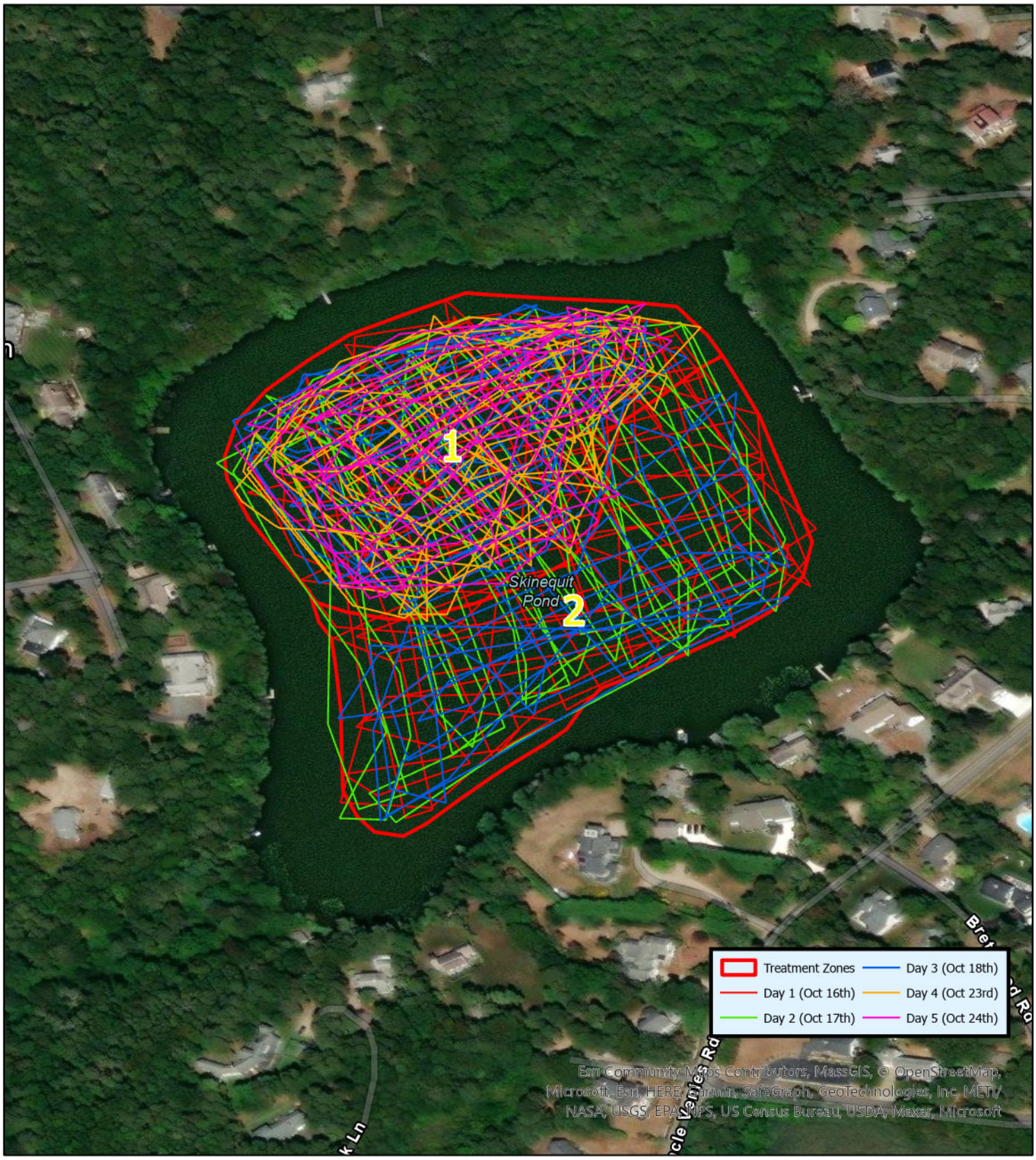
Front		Rear	
_____	Top	9298452	Top
_____	Bottom	9298451	Bottom

APPENDIX B – MAP OF TREATMENT AREAS AND GPS TRACKS

SŌLITUDE
LAKE MANAGEMENT

Figure 1: Skinequit Pond Alum Treatment Areas & Recorded Treatment Tracks

SOLITUDE LAKE MANAGEMENT
888.480.5253
solitudelakemanagement.com



Skinequit Pond
Harwich, MA

Skinequit Pond

0 190 380
Feet
1:2,780

N

Map Date: 12/5/2023
Prepared by: DMM
Office: SHREWSBURY, MA