Received 2/15/2024

A Notice of Intent for a Supplemental Phosphorus Inactivation Project at Mystic Lake, Barnstable, Massachusetts

PREPARED FOR THE TOWN OF BARNSTABLE BY
WATER RESOURCE SERVICES, INC.
WILBRAHAM, MA

JANUARY 2024

NOTICE OF INTENT
Supplemental Phosphorus Inactivation Project for Mystic Lake, Barnstable, Massachusetts

TABLE OF CONTENTS

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

Mystic Lake (off Race Lane) — a. Street Address
Barnstable — b. City/Town
02601 — c. Zip Code

Latitude and Longitude:
N 41.67928 — d. Latitude
W 70.41542 — e. Longitude

062, 083 — f. Assessors Map/Plat Number
NA — g. Parcel /Lot Number

2. Applicant:

Mark — a. First Name
Ells — b. Last Name
Town of Barnstable — c. Organization
367 Main Street — d. Street Address
Barnstable — e. City/Town
MA — f. State
02601 — g. Zip Code
508-862-4610 — h. Phone Number
i. Fax Number
Mark.Ells@town.barnstable.ma.us — j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

a. First Name
b. Last Name
Commonwealth of Massachusetts (Great Pond) — c. Organization
d. Street Address
e. City/Town
f. State
g. Zip Code
h. Phone Number
i. Fax Number
j. Email address

4. Representative (if any):

Kenneth — a. First Name
Wagner — b. Last Name
Water Resource Services — c. Company
144 Crane Hill Road — d. Street Address
Wilbraham — e. City/Town
MA — f. State
01095 — g. Zip Code
413-219-8071 — h. Phone Number
i. Fax Number
kjwagner@charter.net — j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

0 — a. Total Fee Paid
0 — b. State Fee Paid
0 — c. City/Town Fee Paid

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

A. General Information (continued)

6. General Project Description:

Treatment of 77 acres of Land Under Water with aluminum compounds to inactivate phosphorus in surficial sediment and reduce cyanobacterial bloom potential

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ☒ Other

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☒ Yes ☐ No

If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

Other - Limitation of cyanobacteria blooms through phosphorus inactivation by aluminum

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

a. County

b. Certificate # (if registered land)

c. Book

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

1. ☐ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
2. ☒ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Barnstable
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☒ Bank	<50 1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☒ Land Under Waterbodies and Waterways	3354500 1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. ☐ Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. ☐ Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. ☐ Riverfront Area	1. Name of Waterway (if available) - **specify coastal or inland**	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project: _____ square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet _____ b. square feet within 100 ft. _____ c. square feet between 100 ft. and 200 ft. _____

5. Has an alternatives analysis been done and is it attached to this NOI? ☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f**. above.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. ☐ Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. ☐ Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. ☐ Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. ☐ Coastal Dunes	1. square feet	2. cubic yards dune nourishment

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
f. ☐ Coastal Banks	1. linear feet	
g. ☐ Rocky Intertidal Shores	1. square feet	
h. ☐ Salt Marshes	1. square feet	2. sq ft restoration, rehab., creation
i. ☐ Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. ☐ Land Containing Shellfish	1. square feet	
k. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above 1. cubic yards dredged	
l. ☐ Land Subject to Coastal Storm Flowage	1. square feet	

4. ☐ Restoration/Enhancement
If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

C. Other Applicable Standards and Requirements

☒ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

   a. ☐ Yes ☐ No

   If yes, include proof of mailing or hand delivery of NOI to:

   Natural Heritage and Endangered Species Program
   Division of Fisheries and Wildlife
   1 Rabbit Hill Road
   Westborough, MA 01581

   b. Date of map

   If *yes*, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); *OR* complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

   c. Submit Supplemental Information for Endangered Species Review*

      1. ☐ Percentage/acreage of property to be altered:

         (a) within wetland Resource Area — percentage/acreage

         (b) outside Resource Area — percentage/acreage

      2. ☐ Assessor's Map or right-of-way plan of site

2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **

   (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)

   (b) ☐ Photographs representative of the site

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* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see https://www.mass.gov/ma-endangered-species-act-mesa-regulatory-review).
Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Barnstable
City/Town

C. Other Applicable Standards and Requirements (cont'd)

(c) ☐ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review).
Make check payable to "Commonwealth of Massachusetts - NHESP" and ***mail to NHESP*** at above address

*Projects altering **10 or more acres** of land, also submit:*

(d) ☐ Vegetation cover type map of site

(e) ☐ Project plans showing Priority & Estimated Habitat boundaries

(f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # b. Date submitted to NHESP

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

a. ☐ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Bourne to Rhode Island border, and the Cape & Islands:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

North Shore - Plymouth to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

C. Other Applicable Standards and Requirements (cont'd)

Online Users: Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

   a. ☐ Yes ☐ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.

   b. ACEC

5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?

   a. ☐ Yes ☐ No

6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

   a. ☐ Yes ☐ No

7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?

   a. ☐ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:

      1. ☐ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)

      2. ☐ A portion of the site constitutes redevelopment

      3. ☐ Proprietary BMPs are included in the Stormwater Management System.

   b. ☐ No. Check why the project is exempt:

      1. ☐ Single-family house

      2. ☐ Emergency road repair

      3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

☒ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☐ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)

2. ☐ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

D. Additional Information (cont'd)

3. ☐ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

Supplemental Phosphorus Inactivation Project - Mystic Lake
a. Plan Title

Water Resources Services, Inc.
b. Prepared By

Kenneth Wagner, PhD.
c. Signed and Stamped by

January 2024
d. Final Revision Date

NA
e. Scale

See figures: 2 (pg 31), 4 (pg 37), 5 (pg 39), and 6, (pg 40) of the Project Narrative.
g. Date

5. X If there is more than one property owner, please attach a list of these property owners not listed on this form.

6. X Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.

7. X Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.

8. X Attach NOI Wetland Fee Transmittal Form

9. ☐ Attach Stormwater Report, if needed.

E. Fees

1. ☒ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:
MassDEP File Number
Document Transaction Number
Barnstable
City/Town

F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

1. Signature of Applicant

2. Date: 1.22.2024

3. Signature of Property Owner (if different)

4. Date

5. Signature of Representative (if any): Kenneth J. Wagner

6. Date: 1/12/24

For Conservation Commission:
Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:
One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

A. Applicant Information

1. Location of Project:

Mystic Lake (off Race Lane)	Barnstable
a. Street Address	b. City/Town
	0 (exempt municipal project)
c. Check number	d. Fee amount

2. Applicant Mailing Address:

Mark	Ells	
a. First Name	b. Last Name	
Town of Barnstable		
c. Organization		
367 Main Street		
d. Mailing Address		
Barnstable	MA	02601
e. City/Town	f. State	g. Zip Code
508-862-4610		Mark.Ells@town.barnstable.ma.us
h. Phone Number	i. Fax Number	j. Email Address

3. Property Owner (if different):

a. First Name	b. Last Name	
Commonwealth of Massachusetts (Great Pond)		
c. Organization		
d. Mailing Address		
e. City/Town	f. State	g. Zip Code
h. Phone Number	i. Fax Number	j. Email Address

B. Fees

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract $12.50. To calculate the city/town share of the fee, divide the total fee in half and add $12.50.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

NOI Wetland Fee Transmittal Form

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee

Step 5/Total Project Fee: 0 (exempt municipal)

Step 6/Fee Payments:

Total Project Fee:	0 a. Total Fee from Step 5
State share of filing Fee:	0 b. 1/2 Total Fee **less $**12.50
City/Town share of filling Fee:	0 c. 1/2 Total Fee **plus** $12.50

C. Submittal Requirements

a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Eligibility Checklist

This Ecological Restoration Limited Project Eligibility Checklist guides the applicant in determining if their project is eligible to file as an Inland or Coastal Ecological Restoration Limited Project (310 CMR 10.53(4) or 310 CMR 10.24(8) respectively). These criteria must be met when submitting the Ecological Restoration Limited Project Notice of Intent to ensure that the restoration and improvement of the natural capacity of a Resource Area(s) to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

Regulatory Features of All Coastal and Inland Ecological Restoration Limited Projects

(a) May result in the temporary or permanent loss of/or conversion of Resource Area: An Ecological Restoration Limited Project that meets the requirements of 310 CMR 10.24(8) may result in the temporary or permanent loss of Resource Areas and/or the conversion of one Resource Area to another when such loss is necessary to the achievement of the project's ecological restoration goals.

(b) Exemption from wildlife habitat evaluation: A NOI for an Ecological Restoration Limited Project that meets the minimum requirements for Ecological Restoration Projects and for a MassDEP Combined Application outlined in 310 CMR 10.12(1) and (2) is exempt from providing a wildlife habitat evaluation (310 CMR 10.60).

Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

(c) The following are considerations for applicants filing an Ecological Restoration Limited Project NOI and for the issuing authority approving a project as an Ecological Restoration Limited Project:

☒ The condition of existing and historic Resource Areas proposed for restoration.

☒ Evidence of the extent and severity of the impairment(s) that reduce the capacity of the Resource Areas to protect and sustain the interests identified in M.G.L. c. 131, § 40.

☒ The magnitude and significance of the benefits of the Ecological Restoration Project in improving the capacity of the affected Resource Areas to protect and sustain the other interests identified in M.G.L. c. 131, § 40.

☒ The magnitude and significance of the impacts of the Ecological Restoration Project on existing Resource Areas that may be modified, converted and/or lost and the interests for which said Resource Areas are presumed significant in 310 CMR 10.00, and the extent to which the project will:

a. avoid adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that can be avoided without impeding the achievement of the project's ecological restoration goals.

b. minimize adverse impacts to Resource Areas and the interests identified in M.G.L. c. 131, § 40, that are necessary to the achievement of the project's ecological restoration goals.

c. utilize best management practices such as erosion and siltation controls and proper construction sequencing to avoid and minimize adverse construction impacts to resource areas and the interests identified in M.G.L. c. 131, § 40.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8))

Complete this Eligibility Criteria Checklist ***before*** filling out a Notice of Intent Application to determine if your project qualifies as a Coastal Ecological Restoration Limited Project. (310 CMR 10.24(8)) Sign the Eligibility Certification at the end of Appendix A, and attach the checklist with supporting documentation and the Eligibility Certification to your Notice of Intent Application.

General Eligibility Criteria for All Coastal Ecological Restoration Limited Projects

Notwithstanding the requirements of 310 CMR 10.25 through 10.35, 310 CMR 10.54 through 10.58, and the Wildlife Habitat evaluations in 310 CMR 10.60, the Issuing Authority may issue an Order of Conditions permitting an Ecological Restoration Project listed in 310 CMR 10.24(8)(e) as an Ecological Restoration Limited Project and impose such conditions as will contribute to the interests identified in the WPA M.G.L. provided that the project meets all the requirements in 310 CMR 10.24 (8).

☐ The project is an Ecological Restoration Project as defined in 310 CMR 10.04 and is a project type listed below [310 CMR 10.24(8)(e)].

☐ Tidal Restoration.

☐ Shellfish Habitat Restoration.

☐ Other Ecological Restoration Limited Project Type.

☐ The project will further at least one of the WPA (M.G.L. c. 131, § 40) interests identified below.

- ☐ Protection of public or private water supply.
- ☐ Protection of ground water supply.
- ☐ Flood control.
- ☐ Storm damage prevention.
- ☐ Prevention of pollution.
- ☐ Protection of land containing shellfish.
- ☐ Protection of fisheries.
- ☐ Protection of wildlife habitat.

☐ If the project will impact an area located within estimated habitat which is indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands, a NHESP preliminary written determination is attached to the NOI submittal that the project will not have any adverse long-term and short-term effects on specified habitat sites of Rare Species or the project will be carried out in accordance with an approved NHESP habitat management plan.

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

General Eligibility Criteria for All Coastal Ecological Restoration Limited Projects (cont.)

☐ If the project is located in a Coastal Dune or Barrier Beach, the project avoids and minimizes armoring of the Coastal Dune or Barrier Beach to the maximum extent practicable.

☐ The project complies with all applicable provisions of 310 CMR 10.24(1) through (6) and 310 CMR 10.24(9) and (10).

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

These additional criteria must be met to qualify as an Ecological Restoration Limited Project to ensure that the restoration and improvement of the natural capacity of a Resource Area to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

☐ This Ecological Restoration Limited Project application meets the eligibility criteria for Ecological Restoration Limited Project [310 CMR 10.24(8)(a) through (d) and as proposed, furthers at least one of the WPA interests is for the project type identified below.

☐ **Tidal Restoration Projects**

☐ A project to restore tidal flow that will not significantly increase flooding or storm damage impacts to the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure.

☐ **Shellfish Habitat Restoration Projects**

☐ The project has received a Special Projects Permit from the Division of Marine Fisheries or, if a municipality, has received a shellfish propagation permit.

☐ The project is made of cultch (e.g., shellfish shells from oyster, surf or ocean clam) or is a structure manufactured specifically for shellfish enhancement (e.g., reef blocks, reef balls, racks, floats, rafts, suspended gear).

☐ **Other Ecological Restoration Projects** that meet the criteria set forth in 310 CMR 10.24(8)(a) through (d).

☐ Restoration, enhancement, or management of Rare Species habitat.

☐ Restoration of hydrologic and habitat connectivity.

☐ Removal of aquatic nuisance vegetation to impede eutrophication.

☐ Thinning or planting of vegetation to improve habitat value.

☐ Fill removal and re-grading.

☐ Riparian corridor re-naturalization.

☐ River floodplain re-connection.

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

- ☐ In-stream habitat enhancement.
- ☐ Remediation of historic tidal wetland ditching.
- ☐ Eelgrass restoration.
- ☐ Invasive species management.
- ☐ Installation of fish passage structures.
- ☐ Other. Describe: _____

☐ This project involves the construction, repair, replacement or expansion of public or private infrastructure (310 CMR 10.24(9).

- ☐ The NOI attachment labeled _____ is an operation and maintenance plan to ensure that the infrastructure will continue to function as designed.
- ☐ The operation and maintenance plan will be implemented as a continuing condition in the Order of Conditions and the Certificate of Compliance.
- ☐ This project proposes to replace an existing stream crossing (310 CMR 10.24(10). The crossing complies with the Massachusetts Stream Crossing Standards to the maximum extent practicable with details provided in the NOI. The crossing type:
  - ☐ Replaces an existing non-tidal crossing that is part of an Anadromous/Catadromous Fish Run (310 CMR 10.35)
  - ☐ Replaces an existing tidal crossing that restricts tidal flow. The tidal restriction will be eliminated to the maximum extent practicable.
- ☐ At a minimum, in evaluating the potential to comply with the standards to the maximum extent practicable the following criteria have been consider site constraints in meeting the standard, undesirable effects or risk in meeting the standard, and the environmental benefit of meeting the standard compared to the cost, by evaluating the following:
  - ☐ The potential for downstream flooding;
  - ☐ Upstream and downstream habitat (in-stream habitat, wetlands);
  - ☐ Potential for erosion and head-cutting;
  - ☐ Stream stability;
  - ☐ Habitat fragmentation caused by the crossing;
  - ☐ The amount of stream mileage made accessible by the improvements;
  - ☐ Storm flow conveyance;

Eligibility Criteria - Coastal Ecological Restoration Limited Projects (310 CMR 10.24(8)) (Cont.)

Additional Eligibility Criteria for Specific Coastal Ecological Restoration Limited Project Types

- ☐ Engineering design constraints specific to the crossing;
- ☐ Hydrologic constraints specific to the crossing;
- ☐ Impacts to wetlands that would occur by improving the crossing;
- ☐ Potential to affect property and infrastructure; and
- ☐ Cost of replacement.

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4))

Complete this Eligibility Criteria Checklist ***before*** filling out a Notice of Intent Application to determine if your project qualifies as an Inland Ecological Restoration Limited Project. (310 CMR 10.53(4)) Sign the Eligibility Certification at the end of Appendix A, and attach the checklist with supporting documentation and the Eligibility Certification to your Notice of Intent Application.

General Eligibility Criteria for All Inland Ecological Restoration Limited Projects

Notwithstanding the requirements of any other provision of 310 CMR 10.25 through 10.35, 310 CMR 10.54 through 10.58, and 310 CMR 10.60, the Issuing Authority may issue an Order of Conditions permitting an Ecological Restoration Project listed in 310 CMR 10.53(4)(e) as an Ecological Restoration Limited Project and impose such conditions as will contribute to the interests identified in M.G.L. c. 131, § 40, provided that:

☒ The project is an Ecological Restoration Project as defined in 310 CMR 10.04 and is a project type listed below [310 CMR 10.53(4)(e)].

- ☐ Dam Removal
- ☐ Freshwater Stream Crossing Repair and Replacement
- ☐ Stream Daylighting
- ☐ Tidal Restoration
- ☐ Rare Species Habitat Restoration
- ☐ Restoring Fish Passageways
- ☒ Other (describe project type): Limitation of cyanobacteria blooms through phosphorus inactivation with aluminum

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

General Eligibility Criteria for All Inland Ecological Restoration Limited Projects

☒ The project will further at least one of the WPA (M.G.L. c. 131, § 40) interests identified below.

- ☒ Protection of public or private water supply
- ☒ Protection of ground water supply
- ☐ Flood control
- ☐ Storm damage prevention
- ☒ Prevention of pollution
- ☒ Protection of land containing shellfish
- ☒ Protection of fisheries
- ☒ Protection of wildlife habitat

☒ If the project will impact an area located within estimated habitat which is indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands, a NHESP preliminary written determination is attached to the NOI submittal that the project will have no adverse long-term and short-term effects on specified habitat sites of Rare Species or the project will be carried out in accordance with an approved NHESP habitat management plan.

☒ The project will be carried out in accordance with any time of year restrictions or other conditions recommended by the Division of Marine Fisheries for coastal waters and the Division of Fisheries and Wildlife in accordance with 310 CMR 10.11(3).

☐ If the project involves the dredging of 100 cubic yards of sediment or more or dredging of any amount in an Outstanding Resource Water, a Water Quality Certification has been applied for or obtained.

☒ The project complies with all applicable provisions of 310 CMR 10.53(1), (2), (7), and (8).

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

Additional Eligibility Criteria for Specific Inland Ecological Restoration Limited Project Types

These additional criteria must be met to qualify as an Ecological Restoration Limited Project to ensure that the restoration and improvement of the natural capacity of a Resource Area to protect and sustain the interests identified in the WPA is **necessary** to achieve the project's ecological restoration goals.

☒ This project application meets the eligibility criteria for Ecological Restoration Limited Project in accordance with [310 CMR 10.53(4)(a) through (d) and as proposed, furthers at least one of the WPA interests is for the project type identified below:

☐ **Dam Removal**

☐ Project is consistent with MassDEP's 2007 Dam Removal Guidance.

☐ **Freshwater Stream Crossing Repair and Replacement**. The project as proposed and the NOI describes how:

☐ Meeting the eligibility criteria set forth in 310 CMR 10.13 would result in significant stream instability or flooding hazard that cannot otherwise be mitigated, and site constraints make it impossible to meet said criteria.

☐ The project design ensures that the stability of the bank is NOT impaired.

☐ To the maximum extent practicable, the project provides for the restoration of the stream upstream and downstream of the structure as needed to restore stream continuity and eliminate barriers to aquatic organism movement.

☐ The project complies with the requirements of 310 CMR 10.53(7) and (8).

☐ **Stream Daylighting Projects**

☐ The project meets the eligibility criteria for Ecological Restoration Limited Project [310 CMR 10.53(4)(a) through (d)] and as proposed the NOI describes how the proposed project meets to the maximum extent practicable, consistent with the project's ecological restoration goals, all the performance standards for Bank and Land Under Water Bodies and Waterways.

☐ The project meets the requirements of 310 CMR 10.12(1) and (2) and a wildlife habitat evaluation is not included in the NOI.

☐ **Tidal Restoration Project**

☐ Restores tidal flow.

☐ the project, including any proposed flood mitigation measures, will not significantly increase flooding or storm damage to the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure.

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

☒ **Other Ecological Restoration Projects** that meet the criteria set forth in 310 CMR 10.53 (4) (a) through (d).

- ☒ Restoration, enhancement, or management of Rare Species habitat.
- ☐ Restoration of hydrologic and habitat connectivity.
- ☐ Removal of aquatic nuisance vegetation to impede eutrophication.
- ☐ Thinning or planting of vegetation to improve habitat value.
- ☐ Riparian corridor re-naturalization.
- ☐ River floodplain re-connection.
- ☐ In-stream habitat enhancement.
- ☐ Fill removal and re-grading.
- ☐ Flow restoration.
- ☐ Installation of fish passage structures.
- ☐ Invasive species management.
- ☒ Other. Describe: Limitation of cyanobacteria blooms

☐ This project involves the construction, repair, replacement or expansion of public or private infrastructure. (310 CMR 10.53(7))

- ☐ The NOI attachment labeled _____ is an operation and maintenance plan to ensure that the infrastructure will continue to function as designed.
- ☐ The operation and maintenance plan will be implemented as a continuing condition in the Order of Conditions and the Certificate of Compliance.

☐ This project replaces an existing stream crossing (310 CMR 10.53(8)). The crossing type:

- ☐ Replaces an existing non-tidal crossing designed to comply with the Massachusetts Stream Crossing Standards to the maximum extent practicable with details provided in the NOI.
- ☐ Replaces an existing tidal crossing that restricts tidal flow. The tidal restriction will be eliminated to the maximum extent practicable.

Eligibility Criteria - Inland Ecological Restoration Limited Project (310 CMR 10.53(4)) (cont.)

☐ At a minimum, in evaluating the potential to comply with the standards to the maximum extent practicable the following criteria have been consider site constraints in meeting the standard, undesirable effects or risk in meeting the standard, and the environmental benefit of meeting the standard compared to the cost, by evaluating the following:

- ☐ The potential for downstream flooding;
- ☐ Upstream and downstream habitat (in-stream habitat, wetlands);
- ☐ Potential for erosion and head-cutting;
- ☐ Stream stability;
- ☐ Habitat fragmentation caused by the crossing;
- ☐ The amount of stream mileage made accessible by the improvements;
- ☐ Storm flow conveyance;
- ☐ Engineering design constraints specific to the crossing;
- ☐ Hydrologic constraints specific to the crossing;
- ☐ Impacts to wetlands that would occur by improving the crossing;
- ☐ Potential to affect property and infrastructure; and
- ☐ Cost of replacement.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Required Actions (310 CMR 10.11)

Complete the Required Actions before submitting a Notice of Intent Application for an Ecological Restoration Project and submit a completed copy of this Checklist with the Notice of Intent.

☒ **Massachusetts Environmental Policy Act (MEPA) / Environmental Monitor**
https://www.mass.gov/service-details/the-environmental-monitor

For Ecological Restoration Limited Projects, there are no changes to MEPA requirements.

☒ Submit written notification at least 14 days prior to the filing of a Notice of Intent (NOI) to the Environmental Monitor for publication. A copy of the written notification is attached and provides at minimum:

- ☒ A brief description of the proposed project.
- ☒ The anticipated NOI submission date to the conservation commission.
- ☒ The name and address of the conservation commission that will review the NOI.
- ☒ Specific details as to where copies of the NOI may be examined or acquired and where to obtain the date, time, and location of the public hearing.

☒ **Massachusetts Endangered Species Act (MESA) /Wetlands Protection Act Review**

☒ Preliminary Massachusetts Endangered Species Act Review from the Natural Heritage and Endangered Species Program (NHESP) has been met and the written determination is attached.

☒ Supplemental Information for Endangered Species Review has been submitted.

1. ☒ Percentage/acreage of property to be altered:
   a. Within Wetland Resource Area — 52%/77 acres (Percentage/acreage)
   b. Outside Wetland Resource Area — 0 (Percentage/acreage)
2. ☐ Assessor's Map or right-of-way plan of site
3. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work.
4. ☒ Project description (including description of impacts outside of wetland resource area & buffer zone)
5. ☐ Photographs representative of the site
6. ☒ MESA filing fee (fee information available at https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review)

Required Actions (310 CMR 10.11) (cont.)

Make check payable to "Commonwealth of Massachusetts - NHESP" and mail to NHESP:

Natural Heritage & Endangered Species Program
MA Division of Fisheries & Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

7. Projects altering 10 or more acres of land, also submit:

   a. ☐ Vegetation cover type map of site

   b. ☐ Project plans showing Priority & Estimated Habitat boundaries

OR Check One of the Following:

1. ☐ Project is exempt from MESA review.

Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, https://www.mass.gov/service-details/ma-endangered-species-act-mesa-overview; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59 – see C4 below)

2. ☐ Separate MESA review ongoing.

a. NHESP Tracking # _____ b. Date submitted to NHESP _____

3. ☐ Separate MESA review completed. Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

☒ **Estimated Habitat Map of State-Listed Rare Wetlands Wildlife**

If a portion of the proposed project is located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP), complete the portion below. To view habitat maps, see the **Massachusetts Natural Heritage Atlas** or view the maps electronically at: https://www.mass.gov/guides/masswildlife-publications#-massachusetts-natural-heritage-atlas-

☒ A preliminary written determination from Natural Heritage and Endangered Species Program (NHESP) must be obtained indicating that:

☒ Project will NOT have long- or short-term adverse effect on the actual Resource Area located within estimated habitat indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife published by NHESP.

☐ Project will have long- or short-term adverse effect on the actual Resource Area located within estimated habitat indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetlands Wildlife published by NHESP. A copy of NHESP's written preliminary determination in accordance with 310 CMR 10.11(2) is attached. This specifies:

☐ Date of the map: _____

Required Actions (310 CMR 10.11) (cont.)

☒ If the Rare Species identified is/are likely to continue to be located on or near the project, and if so, whether the Resource Area to be altered is in fact part of the habitat of the Rare Species.

☒ That if the project alters Resource Area(s) within the habitat of a Rare Species:

☒ The Rare Species is identified;

☒ NHESP's recommended changes or conditions necessary to ensure that the project will have no short or long term adverse effect on the habitat of the local population of the Rare Species is provided; or

☐ An approved NHESP habitat management plan is attached with this Notice of Intent.

Send the request for a preliminary determination to:
Natural Heritage & Endangered Species Program
MA Division of Fisheries & Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

☒ **Division of Marine Fisheries**

☒ If the project will occur within a coastal waterbody with a restricted Time of Year, [see Appendix B of the Division of Marine Fisheries (DMF) Technical Report TR 47 "Marine Fisheries Time of Year Restrictions (TOYs) for Coastal Alteration Projects" dated April 2011 https://www.nae.usace.army.mil/Portals/74/docs/regulatory/StateGeneralPermits/MA/TR-47.pdf].

☒ Obtain a DMF written determination stating:

☐ The proposed work does NOT require a TOY restriction.

☒ The proposed work requires a TOY restriction. Specific recommended TOY restriction and recommended conditions on the proposed work is attached.

☒ If the project may affect a diadromous fish run [re: Division of Marine Fisheries (DMF) Technical Reports TR 15 through 18, dated 2004: https://www.mass.gov/service-details/marine-fisheries-technical-reports]

☒ Obtain a DMF written determination stating:

☒ The design specifications and operational plan for the project are compatible with the passage requirements of the fish run.

☐ The design specifications and operational plan for the project are not compatible with the passage requirements of the fish run.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Required Actions (310 CMR 10.11) (cont.)

Send the request for a written or electronic determination to:

South Shore – Bourne to Rhode Island border, and the Cape & Islands:
Division of Marine Fisheries –
South Coast Field Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: DMF.EnvReview-South@state.ma.us

North Shore – Plymouth to New Hampshire border:
Division of Marine Fisheries –
North Shore Field Station
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

☐ **Division of Fisheries and Wildlife –** https://www.mass.gov/orgs/division-of-fisheries-and-wildlife

☐ Projects that involve silt-generating, in-water work that will impact a non-tidal perennial river or stream and the in-water work will not occur between May 1 and August 30.

☐ Obtain a written determination from the Division of Fisheries and Wildlife (DFW) as to whether the proposed work requires a TOY restriction.

☐ The proposed work does NOT require a TOY restriction.

☐ The proposed work requires a TOY restriction. The DFW determination with TOY restriction and other conditions is attached.

☐ **MassDEP Water Quality Certification**

☐ Project involves dredging of 100 cubic yards or more in a Resource Area or dredging of any amount in an Outstanding Resource Water (ORW). A copy and proof of the MassDEP Water Quality Certification pursuant to 314 CMR 9.00 is attached to the NOI.

☐ This project is a Combined Permit Application for 401 Dredging and Restoration (BRP WW 26).

☐ **MassDEP Wetlands Restriction Order**

Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?

☐ Yes ☒ No

☐ **Department of Conservation and Recreation**

Office of Dam Safety

☐ For Dam Removal Projects, obtain a written determination from the Department of Conservation and Recreation Office of Dam Safety that the dam is not subject to the jurisdiction of the Office under 302 CMR 10.00, a written determination that the dam removal does not require a permit under 302 CMR 10.00 or a permit authorizing the dam removal in accordance with 302 CMR 10.00 has been issued.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Required Actions (310 CMR 10.11) (cont.)

Areas of Critical Environmental Concern (ACECs)

Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?

☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations).

Name of ACEC

Minimum Required Documents (310 CMR 10.12)

Complete the Required Documents Checklist below and provide supporting materials before submitting a Notice of Intent Application for an Ecological Restoration Project.

☒ This Notice of Intent meets all applicable requirements outlined in for Ecological Restoration Projects in 310 CMR 10.12. Use the checklist below to ensure that all documentation is included with the NOI.

At a minimum, a Notice of Intent for an Ecological Restoration Project shall include the following:

☒ Description of the project's ecological restoration goals;

☒ The location of the Ecological Restoration Project;

☒ Description of the construction sequence for completing the project;

☒ A map of the Areas Subject to Protection Under M.G.L. c. 131, § 40, that will be temporarily or permanently altered by the project or include habitat for Rare Species, Habitat of Potential Regional and Statewide Importance, eel grass beds, or Shellfish Suitability Areas.

☐ The method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.) is attached with documentation methodology.

☐ List the titles and dates for all plans and other materials submitted with this NOI.

Mystic Lake Status Update 2020
a. Plan Title

WRS Inc.
b. Prepared by

Kenneth J. Wagner
c. Signed and Stamped by

November 2020
d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

☐ If there is more than one property owner, attach a list of these property owners not listed on this form.

☒ Attach NOI Wetland Fee Transmittal Form.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Minimum Required Documents (310 CMR 10.12)

- ☐ An evaluation of any flood impacts that may affect the built environment, including without limitation, buildings, wells, septic systems, roads or other man-made structures or infrastructure as well as any proposed flood impact mitigation measures;
- ☐ A plan for invasive species prevention and control;
- ☒ The Natural Heritage and Endangered Species Program written determination in accordance with 310 CMR 10.11(2), if needed;
- ☒ Any Time of Year restrictions and/or other conditions recommended by the Division of Marine Fisheries or the Division of Fisheries and Wildlife in accordance with 310 CMR 10.11(3), (4), (5), if needed;
- ☒ Proof that notice was published in the Environmental Monitor as required by 310 CMR 10.11(1;
- ☒ A certification by the applicant under the penalties of perjury that the project meets the eligibility criteria set forth in 310 CMR 10.13;
- ☐ If the Ecological Restoration Project involves the construction, repair, replacement or expansion of infrastructure, an operation and maintenance plan to ensure that the infrastructure will continue to function as designed;
- ☐ If the project involves dredging of 100 cubic yards or more or dredging of any amount in an Outstanding Resource Water, a Water Quality Certification issued by the Department pursuant to 314 CMR 9.00;
- ☐ If the Ecological Restoration Project involves work on a stream crossing, information sufficient to make the showing required by 310 CMR 10.24(10) for work in a coastal resource area and 310 CMR 10.53(8) for work in an inland resource area; and
- ☐ If the Ecological Restoration Project involves work on a stream crossing, baseline photo-points that capture longitudinal views of the crossing inlet, the crossing outlet and the upstream and downstream channel beds during low flow conditions. The latitude and longitude coordinates of the photo-points shall be included in the baseline data.
- ☐ This project is subject to provisions of the MassDEP Stormwater Management Standards. A copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) is attached.
- ☐ Provide information as the whether the project has the potential to impact private water supply wells including agricultural or aquacultural wells or surface water withdrawal points.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 3 – Notice of Intent
Appendix A: Ecological Restoration Limited Project Checklists

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Barnstable
City/Town

Certification that the Ecological Restoration Project Meets the Eligibility Criteria

I hereby certify under penalties of perjury that the Ecological Restoration Project Notice of Intent application does not meet the Eligibility criteria for an Ecological Restoration Order of Conditions set forth in 310 CMR 10.13, but does meet the Eligibility Criteria for a Ecological Restoration Limited Project set forth in 10.24(8) or 10.53(4) whichever is applicable. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

Signature of Applicant or Authorized Agent

Mark Ells, Town Manager
Printed Name of Applicant or Authorized Agent

1.22.2024
Date

The certification must be signed by the applicant; however, it may be signed by a duly authorized agent (named in Item 2) if this form is accompanied by a statement by the applicant designating the agent and agreeing to furnish upon request, supplemental information in support of the application.

1.0 Project Background

Mystic Lake is part of the Indian Ponds, a set of three kettlehole ponds (Figure 1) in Marstons Mills, MA, a village of Barnstable on Cape Cod in Massachusetts. These lakes are hydrologically connected by the passage of groundwater and a surface water connection between Mystic Lake and Middle Pond. Surface water leaving Middle Pond through the outlet is connected to the marine environment through the Marstons Mills River. Through this stream there is an anadromous herring (marine fish that return to fresh waters for breeding) run to Middle Pond and Mystic Lake.

Mystic Lake covers 149 acres (60 ha) to an average depth of 4.6 m (15 ft) with a maximum depth of 14.3 m (47 ft) and a volume of 3128 acre-feet (3.86 million m^3). It supplies recreational opportunity (swimming, boating, fishing, nature watching), aquatic habitat (including an alewife nursery), and water for cranberry farming in nearby bogs. Long considered a natural resource jewel, Mystic Lake experienced noticeably increased algae and decreased water clarity over the early 2000s. Internal release of phosphorus from surficial sediment exposed to anoxia was determined to be the primary source of total phosphorus to the lake at 46% of the total load, focused on the summer months, and was found to be the main driver for summer cyanobacteria blooms.

Mystic Lake is deep enough to thermally stratify into upper and lower water layers and experiences low oxygen (anoxia) in bottom waters during summer stratification due to high levels of sediment oxygen demand. By mid-summer, anoxia is prevalent in much of the hypolimnion (bottom water layer), limiting the distribution of biota (i.e., fish and benthos) and affecting chemical reactions at the surface of the sediment. Under this anoxia, phosphorus release from sediment was facilitated by the low reduction-oxidation (redox) conditions until the 2010 inactivation project that applied aluminum products to all sediment under water deeper than 9 m (30 ft). Phosphorus released from sediment can migrate upward in the bottom water layer and can fuel algal growth near the boundary between upper and lower water layers. Some algae, notably many cyanobacteria, can grow at the sediment-water interface with just a little light, then form gas pockets in cells and float upward to form blooms. While the watershed is ultimately the source of most phosphorus in the lake, this internal recycling mechanism can become dominant and tends to foster cyanobacteria blooms.

The original plan to conduct a phosphorus inactivation treatment using aluminum compounds was delayed in the permitting process as a consequence of concern over potential impacts to one of the most diverse and abundant mussel communities in the Commonwealth, including three species listed for protection under the Massachusetts Endangered Species Act. However, a major mussel die off in August of 2009, tentatively linked to a bloom of the cyanobacterium *Planktothrix*, and an additional die off in 2010 reduced that mussel community by over 90% and indicated that the ambient level of fertility and dominance by cyanobacteria was detrimental to mussels. The inactivation project was then allowed to proceed and was conducted in September and early October of 2010.

Figure 1. Mystic Lake and the other two Indian Ponds.

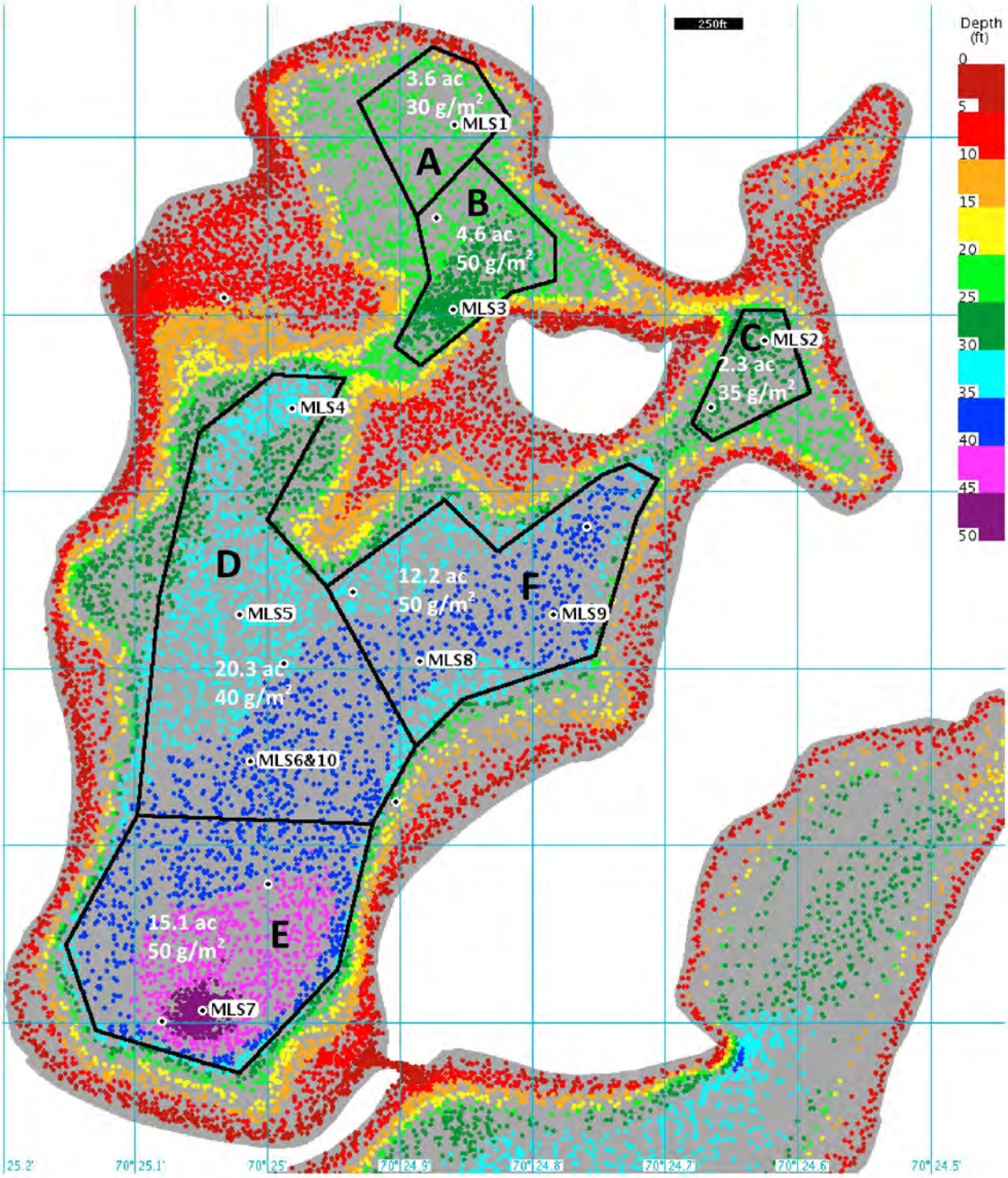
The 2010 aluminum treatment applied aluminum sulfate (ALUM) and sodium aluminate (SOAL) to just over 58 acres of Mystic Lake (Figure 2). Doses ranged from 30 to 50 g/m^2 over six delineated target areas. Area A at 3.6 acres and a dose of 30 g/m^2 was not actually an area initially targeted for phosphorus inactivation but was added as a permit condition to evaluate the impact of treatment on remaining mussel populations in this shallower area. A higher dose was recommended for areas B and E and may have been advisable for areas D and F, but the permit limited the maximum dose to 50 g/m^2 out of continued concern over impacts to mussels. The ALUM and SOAL were applied simultaneously at a ratio of 2:1 by volume to maintain the pH in the 6-8 SU range.

Greater detail on lake features, the watershed, loading analysis, and treatment planning and conduct are contained in the 2012 report by WRS. Additional follow-up monitoring was conducted over the next decade and is summarized in a 2020 report by WRS. Key findings from post-treatment monitoring included:

1. Cyanobacteria blooms were greatly reduced but water clarity did not increase as much as in most other aluminum treatments to that date. Extra phosphorus added by the large mussel die off and/or inadequate dosing to inactivate enough surficial sediment P were possible reasons, although very low zooplankton biomass also indicated low grazing potential.
2. Surface water layer phosphorus concentrations have not been high since treatment but were not especially high before treatment either. Treatment results are more a function of phosphorus control in deeper water and suggest that cyanobacteria initiate growth near the sediment-water interface or thermocline, getting most phosphorus from the sediment.
3. Maximum deep water phosphorus concentration was much reduced from pre-treatment levels but increased steadily over the ensuing decade. Suboptimal dosing for maximum benefit and longevity of control is suggested by the pattern of results. The need to treat a larger area is also suggested.
4. Low oxygen was encountered in water as shallow as 7 m in recent years, creating the potential for phosphorus release from sediment that was not treated in 2010 when 9 m was the shallowest target depth. Adequate light penetrates to this depth and can allow cyanobacteria to grow at the sediment-water interface. Some of those cyanobacteria can produce gas pockets in cells that allow synchronous upward movement and bloom formation.
5. Late season, isolated, peripheral cyanobacteria scums have been noted in multiple years since treatment. Densities of cyanobacteria have not been high out in open water, but windblown peripheral accumulations may represent a health threat. Inadequate toxin testing precludes confirmation, but further reduction in cyanobacteria production is desirable.
6. Iron-bound phosphorus averaged 3.7 g/m^2 for 10 cm cores prior to treatment (2010) and dropped to 0.5 g/m^2 after treatment (2012). It increased to 0.6 g/m^2 in 2018 but was 1.0 g/m^2 in 2020 with elevated iron-bound phosphorus in the upper 2 cm, the zone that interacts most strongly with the overlying water. The effectiveness of the treatment appears to be waning.
7. Summer zooplankton are minimized by juvenile alewife at high densities in the lake, so there is little grazing on algae, and the maximum summer phytoplankton biomass can be expected for whatever level of fertility exists. Lakes with alewife gain less clarity after treatment than lakes without alewife, typically by about a meter.
8. A required study of the impact of treatment on mussels found no mortality or behavioral anomalies as a result of aluminum application, but mussel populations as of 2011 were very low compared to pre-2009 levels. Mussel recovery has been documented since treatment occurred and was at about 70% of pre-2009 levels as of 2017.

Additional control of internal phosphorus loading was recommended to further control cyanobacteria.

Figure 2. Target areas and doses for the 2010 Mystic Lake phosphorus inactivation treatment.



2.0 Phosphorus Control Options

The 2010 NOI for phosphorus inactivation with aluminum discussed the various options for reducing phosphorus availability in Mystic Lake and concluded that reducing internal loading was an essential action. While watershed management is always appropriate to protect a pond, it is unlikely to be sufficient to remediate a pond that has become overloaded with phosphorus. Control of internal phosphorus loading is necessary in the vast majority of cases where cyanobacteria blooms have occurred, and Mystic Lake is no exception. Management of internal loading requires control of the interchange between sediment and overlying water, especially where oxygen is low. There are three main options for achieving such control: dredging, oxygenation, and phosphorus inactivation, the last of which was conducted in Mystic Lake in 2010. Each can be effective, but cost and regulatory/community acceptability are also important in choosing an approach. This does not eliminate the need for watershed management to protect the pond in the future, but immediate relief depends on internal load control.

An appropriate analogy is a leaky boat, which represents the lake. If the boat fills with water (or excess phosphorus in the case of the lake) it will be unusable, so patching leaks has a high priority, but if the boat is already filled with water, patching the leaks will not make the boat useful until the accumulated water has been removed. If the leaks are small, removing the water from the boat will temporarily restore utility. Reducing internal sources of phosphorus can greatly improve lake condition, but it will not last indefinitely if the watershed is still a significant source and/or not enough of the internal phosphorus load is inactivated.

Dredging to remove problem sediment can be true restoration, setting the lake back in geologic time. Dredging would be the best technical approach to improving water quality, but this approach suffers from great expense and regulatory constraints. It is very unusual for a lake to be dredged when lost depth does not need to be recovered. The cost of dredging is a minimum of $50,000 per acre-foot of sediment removed, with values up to 3 times that cost possible if there are technical difficulties (e.g., uphill pumping of sediment slurry, disposal area limitations) or sediment contamination (especially by hydrocarbons and metals). The exact depth of sediment that would need to be removed is unknown, and a proper feasibility study could cost >$100,000. The cost of dredging would likely be millions of dollars after completion of engineering and permitting. This is an unlikely course of action for Mystic Lake, as concluded in past reports.

Oxygenation involves adding enough oxygen to counter the existing demand, thereby avoiding low oxygen and keeping iron-bound phosphorus sequestered in the sediment. This approach could also oxygenate the bottom waters to a degree that would better support aquatic life such as fish and invertebrates during summer when there is currently inadequate oxygen in water deeper than 7 to 9 m. Oxygenation can be accomplished by destratifying the lake, using air bubbled from the bottom or by pumping water upward or downward. Oxygenation can also be accomplished by adding oxygen to deep water, either directly or in chambers that facilitate input without destratifying the lake.

Upward pumping or air-driven circulation carries the risk of bringing poor quality water to the surface if the system is undersized or shuts down and is restarted later; both have been problems with this approach, as illustrated by Santuit Pond in Mashpee and Lovells Pond in Cotuit. Downward pumping is usually not

attempted where the water is <9 m deep, as sediment can be resuspended by the water flowing downward if it cannot be released below the thermocline but far enough above the sediment-water interface. That could be an issue in Mystic Lake, as low oxygen occurs at about 7 m of water depth and much of the target area is not much more than 9 m deep. Destratifying approaches are probably not worth pursuing for Mystic Lake, as maintenance of stratification is ecologically desirable, and the technical problems with the options are challenging.

The alternative approach of adding oxygen to the deeper waters without destratifying the lake could involve air or pure oxygen. Use of air can be effective but requires an interchange chamber and is inefficient, given the low oxygen content of air and the slow exchange with water. Additionally, power costs have limited recent application of that approach. Use of pure oxygen is more efficient and has been applied by releasing fine bubbles of pure oxygen near the bottom with the intent of having them completely dissolved before they reach the thermocline and cause destratification. This has worked well where the hypolimnion is at least 5 m thick, but that is not the case in much of Mystic Lake. Nanobubble technology has been developed to avoid this problem, but has not been reliable in trials to date, including one in a pond in Orleans. This leaves sidestream supersaturation approaches, where water is pulled from the target zone, oxygenated, and put back, as the most viable technique.

Sidestream supersaturation is a more expensive option than inactivation, even just considering capital cost, and it must be applied each year, adding significant operational cost. It could work and would improve other aspects of water quality (e.g., increased oxygen concentration, lowered ammonium and iron, less dissolved organic matter awaiting decomposition), but it is an expensive option with ongoing operational costs. Application of such an approach in an Orleans Pond took three years to achieve target goals and the monitoring and maintenance requirements dictate a major commitment by the operating group. Advances in materials, automation, and strategies have made oxygenation by this approach worth considering, but without a major commitment by the Town of Barnstable or Indian Ponds Association to operate such a system, supplementing the past aluminum treatment appears preferable.

Phosphorus inactivation involves adding chemicals that bind the currently available phosphorus and prevent its release from sediment, even with future exposure to anoxia. The primary target phosphorus is bound to iron, as under anoxia the iron and phosphorus can dissociate and dissolve in the overlying water. This is what was done in Mystic Lake in 2010, but at a dose that was apparently insufficient and with increased iron-bound phosphorus availability near the sediment surface after a decade. Targeting at least the iron-bound phosphorus in the upper 2 cm of sediment in water >7 m deep appears to be the minimum requirement at Mystic Lake.

Inactivation in low oxygen situations can be accomplished with the addition of calcium, aluminum, or lanthanum. Calcium treatments have not been overly successful, as calcium tends to stay in the sediment only with very high pH, and the pH on Cape Cod is routinely low. Lanthanum is a newer inactivator, applied with a clay solution that is not yet approved for use in Massachusetts. However, it is applied with bentonite clay and has a high specificity for phosphorus, so it has the potential to be more efficient than other inactivators and the clay may coat the organic sediment and reduce oxygen demand on the overlying water. Lanthanum products tend to be more expensive than aluminum in most comparisons but may offer some advantages. If

approval could be gained, this approach may be worth at least testing, but at this time aluminum is the binder of choice for Mystic Lake.

Aluminum compounds have been the most applied phosphorus inactivators and aluminum has been used very successfully in Massachusetts lakes, including in Hamblin Pond in 1995 and 2015. Not all applications have resulted in conditions as desirable as in Hamblin Pond, however. Lovells Pond in Cotuit and Cliff Pond in Nickerson State Park in Brewster were treated and while conditions are far better than before treatment, they have had cyanobacteria at levels of concern on an intermittent basis both spatially and temporally. In cases where benefits have been less than expected, underdosing is suspected and additional application of aluminum could provide further benefit. Current thinking for aluminum treatments is that the efficiency of inactivation is improved by adding larger doses in several smaller increments over multiple years (James 2017), although waiting a decade has not been suggested. Based on the sediment data collected in 2018 and 2020, a dose of 25 g/m^2 may be adequate to manage current internal loading and a dose of no more than 50 g/m^2 would be recommended.

Based on recent costs of similar projects and an apparent need for 25 g/m^2 over an area of 82 acres, treatment cost is currently projected at between $100,000 and $115,000. The cost of aluminum products has increased markedly over the last 3 years for multiple and largely uncontrollable reasons. The dose and cost could be increased to provide a margin of safety, but the 25 g/m^2 dose should suffice for immediate relief. Duration of benefits is difficult to predict, but at least a decade of improved conditions is expected. Later additions would be possible if necessary and such sequential addition is becoming common in phosphorus inactivation programs.

3.0 Proposed Project

Phosphorus inactivation has been conducted in Mystic Lake previously, specifically in September and October of 2010. This project represents a similar effort at no more than the maximum dose allowed during the 2010 treatment. A slightly larger area will be treated, probably at 25 g/m^2 based on available funds, although a dose of up to 50 g/m^2 should be allowed. Other projects in Barnstable have employed aluminum applications, notably Hamblin Pond, Lovells Pond, and most recently Shubael Pond. Over a dozen other ponds on Cape Cod have been treated using the same process. Conditions have been improved in all cases, although not all treatment goals have been met in all lakes and follow-up treatment is to be expected some years later even when complete success is achieved. This project represents a supplemental treatment of Mystic Lake, both as a function of lower than ideal dose back in 2010 and what will have been 14 years of elapsed time since that treatment, with ongoing external loading and increasing internal loading. A slightly larger area will also be treated, extending phosphorus inactivation to areas >7 m deep, as compared to >9 m in the 2010 treatment, covering 77 acres in 2023 vs 58 acres in 2010.

3.1 Application Procedures for Mystic Lake

Aluminum products, ALUM and SOAL, will be added to the water at a dose equivalent to 25 g/m^2 in any target area on any one day with a maximum areal dose of 50 g/m^2. Unless aluminum costs or the budget changes,

the maximum dose is expected to be 25 g/m^2, but approval is sought for whatever dose can be afforded up to 50 g/m^2.

With a typical mixing zone of 5 m, application of 25 g/m^2 equates to an initial concentration of 5 mg/L of aluminum, a dose not found to be toxic to any aquatic organisms in any application of the last two decades in New England. ALUM is added at approximately twice the volume of SOAL, balancing the effect on pH and maintaining the pH near the ambient value. Once aluminum products are added, colloidal aggregates of aluminum hydroxide ($Al(OH)_3$) are formed. These aggregates rapidly grow into a visible, brownish white floc, a precipitate that settles to the sediments in a few hours to a day, carrying sorbed phosphorus and bits of organic and inorganic particulate matter in the floc. The floc settling through the water column typically has a very immediate clearing effect and increases water transparency. After the floc settles to the sediment surface it is incorporated into the sediment matrix over about a month, where it will continue to bind with phosphorus.

Application is made from a specially designed barge that can support the dual chemical injection system that extends into the water as well as chemical storage tanks (one for ALUM, one for SOAL). Application of the aluminum products is by subsurface injection and mixing that minimizes the concentration of aluminum in the treated volume of lake water and the limits the amount of drift of floc material by wind or wave action. The barge tanks need to be resupplied as application proceeds, with loading from storage tanks at a predetermined location on shore. Tanker trucks deliver aluminum products to the site, either filling the ALUM and SOAL tanks or acting themselves as storage tanks until emptied.

The barge applies the chemicals systematically to the lake (Figure 3) following pre-determined spatial limits (typically GPS-guided boat positioning, sometimes with marker buoys at the edge of treatment) over the course of several days to weeks depending on the size of the application. Aluminum products are pumped into the distribution system at a metered rate that achieves the target concentration over each unit of area. The total target zone will be all areas with >7 m water depth, which has been measured as 77 acres for Mystic Lake (Figure 4). Treatment should take no more than about two weeks.

3.2 Inactivation Chemical Ratio

A ratio of aluminum sulfate to sodium aluminate of approximately 2:1 is expected to cause no change in system pH where buffering is limited and acid or base addition could cause an undesirable pH shift. At pH <6.0, $Al(OH)_2$ and dissolved elemental aluminum (Al^{+3}) become the dominant forms. Both can be toxic to aquatic species at sufficient concentration. At pH values >8 similarly toxic forms can be abundant, so maintaining the pH between 6 and 8 SU is a condition of successful application. ALUM is acidic while SOAL is basic, so balancing their addition keeps the pH stable. Where the pH is close to 6 or 8, it may be desirable to shift the pH more toward the middle of the range by altering the ratio, as mixing during application is not perfect out of the distribution system. Likewise, if the pH is outside the range of 6 to 8, it can be moved within it by altering the ALUM to SOAL ratio, usually at a low aluminum concentration to start, to avoid toxicity until the pH is within the range where toxic forms of aluminum are minimal. Mystic Lake has surface water alkalinities that range from 6 to 16 mg/L (as $CaCO_3$) and those in the hypolimnion range from 8 to 36 mg/L, so there is some risk of pH moving outside the range of 6 to 8 if the aluminum products are not carefully balanced during application.

Figure 3. Aluminum treatment in progress

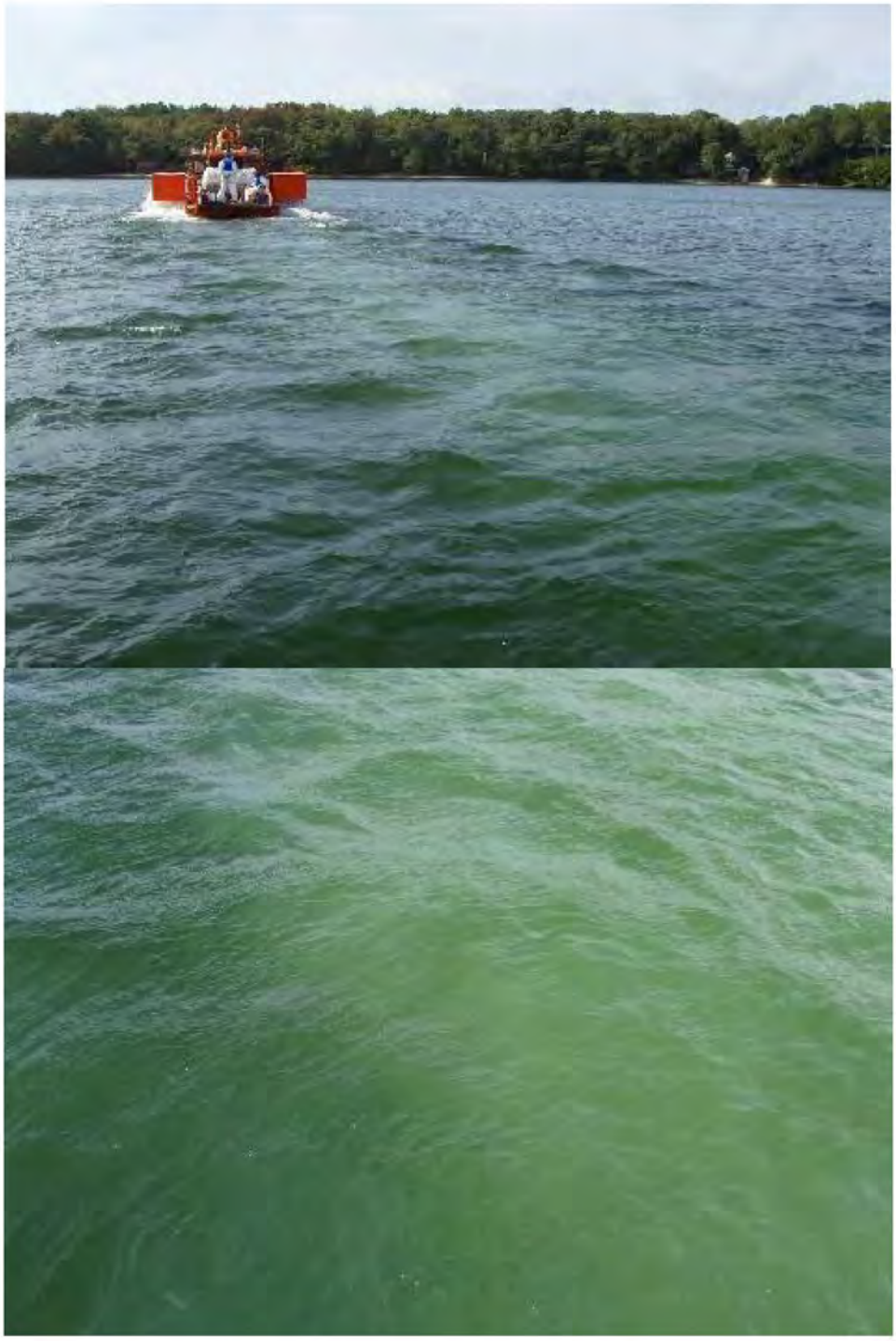
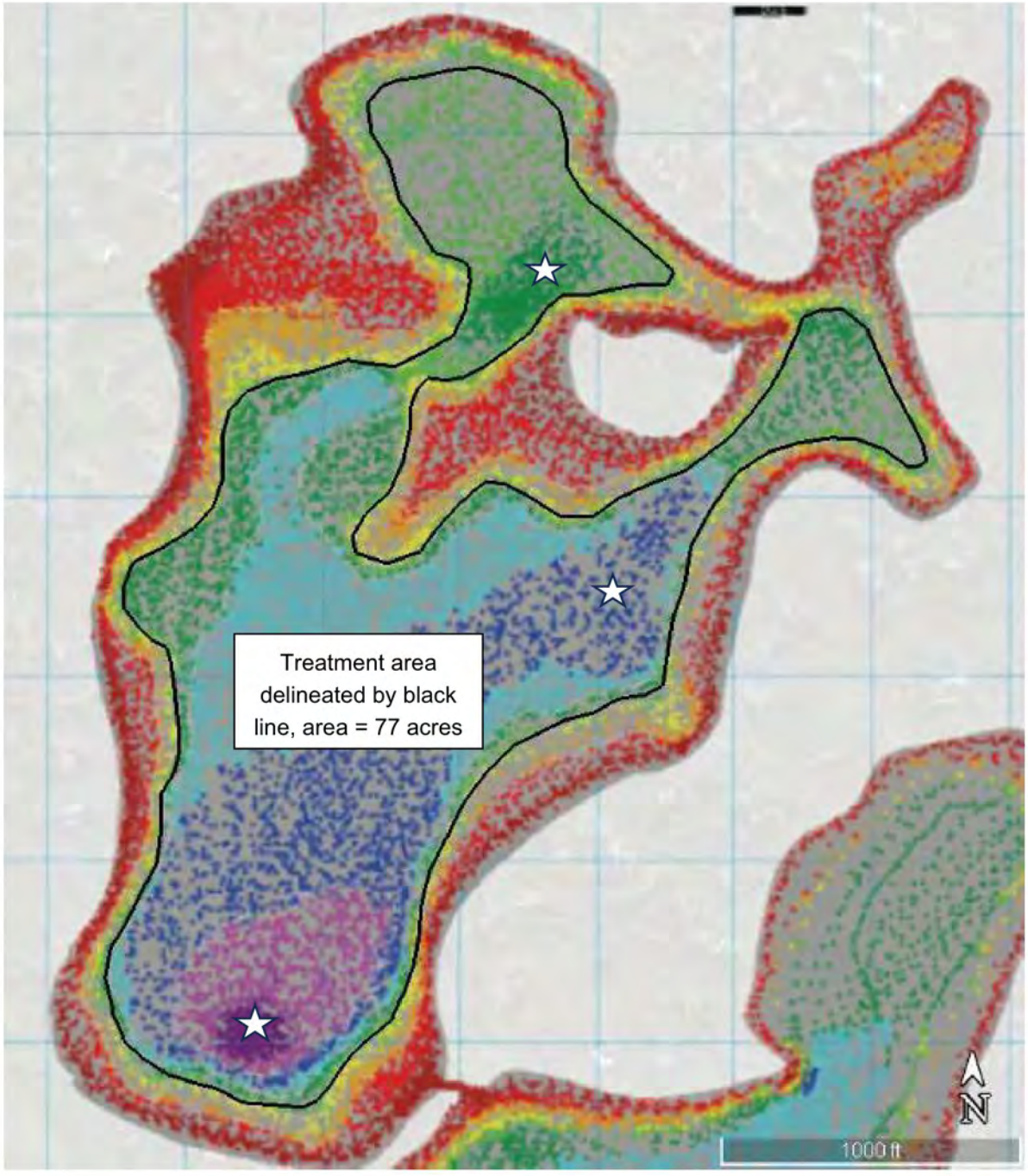


Figure 4. Target 2024 treatment area in Mystic Lake
(white stars indicate historic and proposed sampling locations)



3.3 Timing of Application

Timing of the application should be planned to avoid potential conflicts with ecological resources and recreational users of the lake to the extent practical, but there are regulations that may take precedence in setting the time of year when treatment may occur. For lakes that support alewife spawning and summer juvenile populations, a Time of Year (TOY) restriction is typically given for any activity that might affect alewife eggs, fry, and juveniles. That TOY could limit activities in the lake between the start of April and end of June, then again in late summer and early fall when juveniles tend to emigrate to saltwater, possibly from the start of September until mid-November. Advance discussion with MassDMF did not yield any recommendation. While late spring or early summer treatment may be possible, most aluminum applications on alewife lakes on Cape Cod have been conducted in autumn. The MassDMF will be given the opportunity to review this project and make a recommendation during the NOI review process. More immediate and desirable results tend to be obtained with late spring or early summer treatment, and stratification should not be an issue for the treatment of Mystic Lake, but input from MassDMF will be needed to determine when the treatment can be conducted.

3.4 Access

As with the 2010 treatment, the ALUM and SOAL storage tanks will be positioned off Race Lane (Map 083, no parcel number available) in the public access area (Figure 5) but would not have to completely restrict public access during the treatment period. The barge may be launched from one of the boat launches maintained by homeowner associations around the lake but is most likely to be launched from the private property (455 Turtleback Road, Map 062, Parcel 001) where it was launched for the 2010 treatment (Figure 6). The size of the barge will dictate accessibility of areas where it can be launched. The barge would receive aluminum products from the storage tanks off Race Lane via a temporary dock in Mystic Lake near that point. All access points have sandy, non-vegetated areas where minimal alteration is needed.

The Race Lane access has a small gravel/dirt parking area (approximately 68 x 20 ft) where an alum chemical supply tanker could pull off and fill tanks stationed for the duration of the treatment. A few overhanging branches may need to be trimmed as they were for the 2010 treatment. From the parking area there is a sloped 52 ft dirt path leading down to the lake. The path is 12 wide and is used as an access to the lake for cartop boats and people setting up chairs along the shore slightly to the west to enjoy the lake. Hoses could run downslope in or near that path or even much farther to the west if access needs to remain open for human access and cartop boat launching. A temporary floating dock/walkway (estimated at 5 ft wide by 40 ft long) will be placed along the shore wherever the hoses reach the lake to allow for ease of personnel access on and off the treatment barge and to facilitate the chemical resupply process. A small support boat may be docked there as well. At the end of each day the application barge will be anchored offshore. This dock will be removed following demobilization of the application barge.

The likely launching site for the barge, located on Turtleback Lane, is a parcel on the southern end of the lake containing a cranberry bog. As in 2010, the trailer truck transporting the barge would drive around the cranberry bog on a 12 ft wide road before arriving at the lake. There is a small cabin/tool shed in the middle of a grassy area which leaves the barge with 11.5 ft of space to be moved toward the lake. Mobilization and

Figure 5. Access Point A, Potential Chemical Storage and Barge Filling Area

Figure 6. Access Point B, Potential Barge Launching Area

demobilization of the application barge would require temporary alteration of the bordering vegetated wetland and bank adjacent to pond, but this is a minimally vegetated, sandy area. All disturbed areas will be stabilized with erosion controls and/or re-vegetated as necessary after treatment is complete. We would envision a work corridor of shoreline activity of approximately 25 ft wide x 25 ft deep. The limits of the work area would be clearly delineated in the field by stakes and will be established as a line of staked haybales during launching and barge retrieval.

4.0 Ecological Impact

There are many possible ecological impacts from application of aluminum compounds to lakes, but realization of those impacts is a function of dose, area, timing, and other details of treatment; current treatment technology and strategies can minimize negative impacts.

4.1 Water Quality

Application of ALUM alone will lower the pH of water once the buffering capacity, which is low in most Cape Cod lakes, is exhausted. Application of SOAL will raise the pH once buffering capacity has been diminished. Adding the two compounds simultaneously at a predetermined ratio can adjust the pH as desired. If the pH is within the targeted range, which is 6 to 8 SU, a 2:1 ratio of ALUM to SOAL by volume will maintain that pH. A slight increase in the ratio will lower the pH while a slight decrease will raise it. Monitoring during treatment will help the applicator know whether or not to adjust the ratio. Keeping the pH between 6 and 8 SU minimizes the amount of toxic forms of aluminum and has prevented toxicity to aquatic organisms for over two decades in dozens of treated New England lakes. Later effects on pH or aluminum toxicity are virtually unheard of; lab experiments have found ways to release some aluminum from compounds that form during treatment, but no such release has ever been observed in the field.

The intended effect on water quality is to reduce the concentration of phosphorus in the water column, thereby limiting algal growth. Phosphorus is not eliminated, and productivity can still be substantial, but the shift in the ratio of nitrogen to phosphorus, which is increased by phosphorus inactivation, favors algae other than cyanobacteria, most of which are far more edible by zooplankton. The mechanism whereby cyanobacteria grow at the sediment-water interface is also suppressed; oxygen may indeed still be low at the sediment-water interface, but phosphorus bound to aluminum is not released and growths are minimized. The result is higher water clarity. Most treated lakes achieve clarity of at least 5 m. Hamblin Pond, treated in 1995 and 2015, has Secchi disk transparency that routinely exceeds 6 m and has reached 10 m. Lakes that serve as alewife nurseries or otherwise have very dense populations of small fish that eat zooplankton may have lower clarity, as there are few zooplankton in summer to consume what algae do grow, but even those lakes have avoided cyanobacteria blooms when the aluminum dose is adequate.

Reduced production of non-edible algae lowers the amount of oxygen-demanding organic matter and usually improves oxygen content to a small degree, but it will not usually prevent anoxia near the sediment-water interface in stratified lakes. Aluminum treatment has minimal impact on nitrogen concentrations and will not prevent iron or manganese from being released from sediments exposed to anoxia.

4.2 Algae

As described above, the lower concentration of available phosphorus and increase in the N to P ratio tend to reduce algal biomass and favor algae other than cyanobacteria. Virtually all aluminum treatments on Cape Cod have reduced cyanobacteria abundance, but in some cases, Mystic Lake included, the suppression of cyanobacteria has not been as strong as desired. Lovell's Pond is another case where cyanobacteria are sometimes abundant enough to trigger warnings even after treatment. In all such cases, either the dose applied or the area treated was too small. For Mystic Lake, the dose was limited by permit out of concern for mussels which were decimated the year before treatment and showed no adverse effects in a comprehensive study when aluminum treatment was later allowed. It is also likely that the treatment area of Mystic Lake was smaller than it should have been. Both issues are expected to be rectified by the proposed 2024 treatment.

4.3 Aquatic Vascular Plants

As of 2009, vegetation in Mystic Lake was observed at depths <6 m and was not abundant at depths >3 m. The plant species most commonly identified was American wild celery (*Vallisneria americana*). Among the aquatic plant species identified in the survey were: waterweed (*Elodea species*), broadleaf pondweed (*Potamogeton amplifolius*), claspingleaf pondweed (*Potamogeton perfoliatus*), fern leaf pondweed (*Potamogeton robbinsii*), and stonewort (*Nitella sp.*). In addition to the submerged macrophyte species above, filamentous algae mats were found primarily in the northeastern cove of Mystic Lake at approximately 8 m depth. Several invasive riparian species have been found along the shoreline of Mystic Lake, particularly European grey willow (*Salix cinerea*), common reed (*Phragmites communis*), and purple loosestrife (*Lythrum salicaria*). Control efforts for these invasive species have been conducted with varied success.

In 2010 hydrilla (*Hydrilla verticillata*) was found in Mystic Lake, mostly as isolated patches but around much of the lake. Physical control methods limited the spread but were eventually found to be inadequate to control this species and herbicides were applied. Hydrilla may still be present but is not a dominant and has not expanded to the extent observed in other lakes, particularly farther south.

The aluminum treatment occurs at depths greater than those at which plants grow in Mystic Lake and is not expected to have any significant impact on vascular plants. Water of greater clarity can be expected to allow growth of rooted plants at greater depths, but growths beyond 6 m are exceedingly rare in Cape Cod ponds. Some floc may drift into shallower areas but has not been observed to have any impact on plants in other treated ponds.

4.4 Zooplankton

Treatment in some lakes with substantial zooplankton populations has reduced zooplankton in the year of treatment where most of the lake is treated with a high enough dose to create a dense floc; zooplankton are physically removed by the floc, not eliminated by any toxicity that has been demonstrated. Recovery from resting stages the following year is normally observed. Some depression of zooplankton by this mechanism was observed during the second treatment of Hamblin Pond, with later recovery documented.

Zooplankton in Mystic Lake are small and sparse during the summer as a consequence of intense feeding by juvenile alewife, which can filter feed and remove most zooplankton larger than about 0.3 mm long. Zooplankton abundance peaks in winter or late spring and was found to include larger forms, most notably *Daphnia*, which are strong filter feeders that can control many types of algae. However, *Daphnia* are virtually absent after the start of June and do not recover until well after the alewife juveniles leave the lake in late summer or early autumn. Treatment anytime between June and October would be expected to have no significant effect on zooplankton in Mystic Lake by virtue of temporal separation of the treatment and substantial zooplankton populations in that waterbody.

4.5 Benthic Invertebrate Communities

Mystic Lake supports a variety of invertebrate species, many being larval forms of insects we know better as flying adults (e.g., dragonflies, damselflies, many midges, some mayflies). Three species of protected odonates (dragonflies/damselflies) inhabit emergent and submerged aquatic vegetation in the riparian and littoral zones. These and most other insect larvae inhabit shallow peripheral areas that would be unaffected by aluminum treatment in any physical way, and any chemical interaction would be temporary and is not expected to be lethal. Where such invertebrates prefer more organic substrate and might be expected to be found in deeper water, the lack of oxygen will preclude substantial populations of most. The main exceptions are midgeflies of the family Chironomidae and Oligochaete worms, both known for tolerance to low oxygen. Settling of aluminum floc can smother these organisms, and hatches of adults are likely to be lowered for one to three years after treatment. This was noted in the second treatment of Hamblin Pond in 2015 and a published paper documented related effects in Lake Morey, VT back in the 1980s and 1990s. This may temporarily affect fish growth when the treatment area is large, and for the proposed Mystic Lake treatment about half the lake could be affected. Recovery has usually involved a more desirable suite of invertebrates, so any temporary impacts could be considered to be offset by longer term benefits, but some impact is possible.

Mussels and snails are perhaps the best-known benthic invertebrates in lakes and represent an important component of the aquatic ecosystem. Mystic Lake and its riparian and littoral zone is host to three state-listed species of mussels and four additional species of mussels that were very abundant prior to 2009. The original permit application for aluminum treatment of Mystic Lake was denied because of concerns over possible impact to mussels. However, a major die off occurred in 2009 and with some additional mortality in 2010 prior to treatment. While the cause was never conclusively proven, the die off coincided with a bloom of *Planktothrix*, a cyanobacterium that can produce nerve toxins. Over 90% of all mussels in Mystic Lake were killed and mortality was also observed in Middle Pond in the path of the Mystic Lake water flowing into that pond, up to a point where dilution was adequate. Oxygen and pH problems were ruled out. Some live mussels in Mystic Lake were found to be lethargic or even paralyzed, with soft tissue protruding from shells, but recovered when moved to well water. All indications point to the cyanobacteria bloom as the cause.

A study by Biodrawversity determined that the aluminum treatment in 2010 caused no mortality to mussels, even in shallower areas intentionally subjected to direct treatment and floc accumulation, and that behavioral modifications were minimal. Follow up monitoring determined that the mussel community was about 70% recovered about a decade later. No adverse impacts are expected from the proposed aluminum treatment,

and the original treatment is credited with allowing recovery of the mussel community. Note that some cyanobacteria issues have been noted for Mystic Lake since the original treatment, but no *Planktothrix* has been detected in any sample of which we are aware.

4.6 Fish Communities

Mystic Lake supports a warmwater fishery community and seasonal runs of anadromous herring, mostly alewife but possibly including blueback herring. The herring run is through outlet structures on Middle Pond with access to Mystic Pond via the small surface water connection at the southeastern end of the lake. Adult herring reaching Middle Pond are tracked by volunteer counters at a weir downstream and runs have been highly variable. However, as herring are very fecund and survival is largely density related, the juvenile population is believed to be large in most years. Suitable summer habitat for trout is very limited, as the surface waters are too warm and the bottom waters too low in oxygen.

After fishkills during the 1995 treatment of Hamblin Pond and in 2000 in a Connecticut Lake, laboratory evaluation of aluminum toxicity lead to the current approach of maintaining a pH between 6 and 8 SU and limiting the aluminum dose at any point in time to about 5 mg/L. This has prevented all significant fish mortality during aluminum treatments for over two decades in New England lake treatments. Reduced growth of yellow perch after treatment of Lake Morey in VT was possibly related to sublethal toxicity by aluminum but was more likely a function of reduced zooplankton and/or benthic invertebrate food resources for a couple of years after treatment.

It is not possible to claim no impact whatsoever on fish from aluminum treatment, but the potential to improve conditions is far greater than any threat to fish populations. Mortality is largely avoidable by proper treatment protocols and any sublethal effects are temporary.

4.7 Reptiles and Amphibians

Mystic Lake supports reptile and amphibian populations, although no detailed evaluation of those resources is known. Virtually all reptiles and amphibians occupy peripheral habitats and are not likely to be affected by any aluminum treatment.

4.8 Birds

Mystic Lake is frequented by various water-dependent birds, including gulls, herons, kingfishers, and ducks. There may be some temporary disturbance by noise and barge movement, but no significant direct impact from treatment is expected. Indirect adverse impact through alteration of habitat or food resources is also not expected. No impacts on bird populations have been documented from other treatments.

4.9 Humans

Aluminum has been implicated in various neurological diseases by correlation but not as cause and effect. Even if there was a documented relationship between aluminum and human health, aluminum does not

remain in the water after treatment long enough to be a threat to recreational users or even through consumption. During application it is recommended that those partaking in recreational activities (swimming, fishing, boating, etc.) be kept out of the application area. This is more related to physical safety than any chemical effect but is a wise precaution. Treated lakes suffer no long-term recreational impairment as a result of the treatment, and increased clarity represents an improvement in nearly all cases. There are no documented cases of human illness from contact with treated waters. Fishing and boating should be directed away from the treatment area to prevent possible interference with the operation of the application barge or the small monitoring boats. There should be signs posted at the access points (and otherwise as needed), informing users of the schedule and location of treatment activities.

4.10 Wetland Resource Area Impacts

The proposed activity will temporarily affect shoreline wetland resources due to barge mobilization/demobilization and installation/removal of the temporary dock. There will be extremely localized effects due to the trimming of vegetation, mostly in the buffer zone. While there will be activities temporarily affecting the water column of the lake there will be no significant alteration of the lake bottom or land under water from the perspective of the interests of the WPA. Since the Town has not selected the firm that will be applying the alum yet, we do not have precise numbers regarding size or docking anchoring mechanism, number of boats, etc., but have sufficient experience from previous lake treatment to provide representative estimates of the amount of temporary impacts to the following wetland resources:

- Buffer Zone to Mystic Lake – About 300 square feet could be impacted. We estimate the potential disturbance due to mobilization with the existing ramp to be effective 12 ft by 25 feet. Some vegetation may need to be cleared and any disturbance to soil will be counteracted. Limits of work could be established through installation of haybales and/or silt fence but this may not be necessary.
- Land Under Water – About 200 square feet will be temporarily impacted. This would accommodate the installation of a temporary dock, 5 feet wide by 40 feet. The primary effects would be the installation of the dock pilings (spuds) in sandy substrate and shading. The treatment area, 77 acres or 3.3 million square feet, far exceeds the WPA threshold of 5000 square feet that can be altered without obtaining limited project status. However, the presumption of impact to the interests of the WPA can be overcome and the 5000 square foot threshold can be exceeded. The area to be treated experiences anoxia and is therefore not suitable as fish or wildlife habitat. Mussels do not routinely inhabit this area and have been shown from past studies in Mystic Lake to not be adversely impacted by aluminum treatment. Based on the recommendation of the DEP, however, the Town of Barnstable has decided to apply as an Ecological Restoration Limited Project, which allows impact over a greater area of Land Under Water to gain an overall benefit to the interests of the WPA.

5.0 Compliance

The proposed project has been designed to enhance the capacity of Mystic Lake to provide a wide variety of interests from recreation to wildlife habitat. The following sections describe compliance with state and local wetlands laws.

5.1 Massachusetts Wetlands Protection Act

Work may be performed within the following resources areas or will be performed within the buffer zone to these resource areas:

- 310 CMR 10.54 Bank (adjacent to Mystic Lake)
- 310 CMR 10.55 Bordering Vegetated Wetlands
- 310 CMR 10.56 Land Under Water Bodies (Mystic Lake)
- 310 CMR 10.57 Bordering Land Subject to Flooding (FEMA Flood Zone)

Treatment will occur over approximately 77 acres of Land Under Water. Other resource impacts will be due to the access needed to get the boat and aluminum products to the lake. No direct impact to BVW or Bordering Land Subject to Flooding are anticipated. Bank resources will be impacted mainly by barge launching, which if not possible from an existing boat launch area, would occur from a sandy parcel at the southern end of the lake as in 2010. The size of more recently built treatment barges may or may not allow use of an existing boat ramp, depending on what firm is selected to perform the application.

This project meets the standards for an Ecological Restoration Limited Project. The relation of this project to the interests of the Wetlands Protection Act are as follows:

- Protection of public and private water supply – Benefit (water quality improvement)
- Protection of groundwater supply – Neutral (no significant interaction)
- Flood control – Neutral (no significant interaction)
- Storm damage prevention – Neutral (no significant interaction)
- Prevention of pollution – Benefit (water quality enhancement)
- Protection of land containing shellfish – Possible Benefit (water quality enhancement, better food resources, less toxicity threat from cyanobacteria); any potential detriments from direct aluminum toxicity are easily avoided by proper treatment procedures, and a detailed study from the 2010 treatment found no negative impacts on mussels in Mystic Lake
- Protection of fisheries – Possible Benefit (water quality enhancement in the lake, better food resources) but possible temporary detriment from any smothering of benthic invertebrates in the treatment zone. Any potential detriments from direct aluminum toxicity to fish are easily avoided by proper treatment procedures

- Protection of wildlife habitat – Benefit (water quality enhancement); no direct detriments are expected

Note that any expected detriments are temporary and not expected to extend beyond the two-year period for recovery allowable under the Wetlands Protection Act regulations.

5.2 Barnstable Wetlands Protection Bylaw (Chapter 237)

As relates to special interests detailed in the Barnstable Wetlands Protection Bylaw (Chapter 237), the following additional interests are noted:

- Erosion and sedimentation control – Neutral (no significant interaction)
- Recreation – Benefit (water quality improvement)
- Public trust rights in trustlands – Neutral (no significant interaction)
- Aesthetics – Benefit (water quality improvement)
- Agricultural and aquacultural values – Neutral (no significant interaction)
- Historical values – Benefit (water quality improvement)

In addition, the following town regulations were reviewed for compliance:

- **Chapter 703 – Private Docks and Piers**: If the dock or pier is comprised of a "…work float, kept at a mooring, that receives a permit from the Harbormaster and is not connected with the shore, is not a float subject to these regulations." A Section 10 Harbormaster's Permit could be obtained as described in Section 3.4 for the temporary dock and mooring (anchoring) of the barge. Based on consultation with Town staff, however, Chapter 91 filing will not be required. Public access will be kept open to the extent possible during treatment and the temporary dock will be offset to one side of the landing.
- **Chapter 704 – Regulation Governing Activity in the 100 ft. Buffer Zone**: This regulation requires an undisturbed buffer zone 50 ft. in width to be provided between wetland resource areas and the limit of site disturbance. Any anticipated impacts are temporary. Work off Race Lane is proposed within areas where there are already existing boat ramps/access points. There may be about 300 SF of alteration within bank and buffer zone of the pond on the parcel associated with 455 Turleback Road in order to bring the barge to the pond. Relief from this town regulation may be needed.

5.3 DEP License to Apply Chemicals

The Town must obtain approval from the DEP in order to apply chemicals to the lake (waters of the Commonwealth) through permit BRP WM04 for this proposed project. This permit is typically obtained by the contractor performing the actual application of the aluminum and involves a simple online process once an Order of Conditions has been issued. The town should have an account with DEP for this filing that the contractor then uses for application. This results in the permit for the work residing with the town rather than contractor, a preference of DEP and a convenience for any possible future work.

5.4 Chapter 91 Waterways

Mystic Lake is designated as a "Great Pond" in Massachusetts, one of eleven such recognized waterbodies in Barnstable. A Great Pond is defined as a pond with greater than 10 acres under natural condition (i.e., without the presence of an outlet dam or impoundment). As the work will result in the need for the installation of a temporary (seasonal) dock to access and service the alum application barge, a Harbormaster Permit could be sought pursuant to M.G.L. Chapter 91, Section 10A (see Section 3.2). The dock would utilize bottom anchors and would be used for only about 2 weeks. The exact size and type of this dock will be available only after the selection of the application vendor, but a representative size of 5 ft. by 40 ft. can be used for planning purposes. Based on consultation with Town staff, Chapter 91 filing will not be required.

5.5 MEPA

The method of phosphorous inactivation proposed for this project is one of the lake management options approved under the Massachusetts Environmental Protection Act (MEPA) process approved in 2004 with the issuance of the Final Generic Environmental Impact Report (FGEIR). Pursuant to the FGEIR Certificate issued on March 19, 2004, projects implemented in accordance with the performance guidelines in the FGEIR and the *Practical Guide to Lake and Pond Management in Massachusetts* were determined to not require individual MEPA review. This approach has been confirmed through similar approaches successfully taken in multiple aluminum treatments in Barnstable and elsewhere on Cape Cod. A new Practical Guide to Lake Management is in preparation and will supercede the FGEIR where inconsistencies have been noted, but very little will change with regard to phosphorus inactivation with aluminum. This has become an accepted practice in Massachusetts with no major concerns expressed by most state environmental agencies when treatments are conducted in compliance with established protocols.

5.6 MESA

Mystic Lake, specifically its riparian and littoral zone, hosts multiple state-listed species (Table 1) under the Massachusetts Endangered Species Act, administered by the Natural Heritage and Endangered Species Program (NHESP). The mussel community is of primary concern, with three species protected by the State. In addition, there are also three species of protected dragonflies and damselflies which inhabit peripheral areas of the lake. Mystic Lake is located within mapped Priority Habitat according to the latest NHESP mapping as shown in Figure 7. This Notice of Intent must therefore be filed with the NHESP and a decision letter must be received before any action can be taken by the Barnstable Conservation Commission.

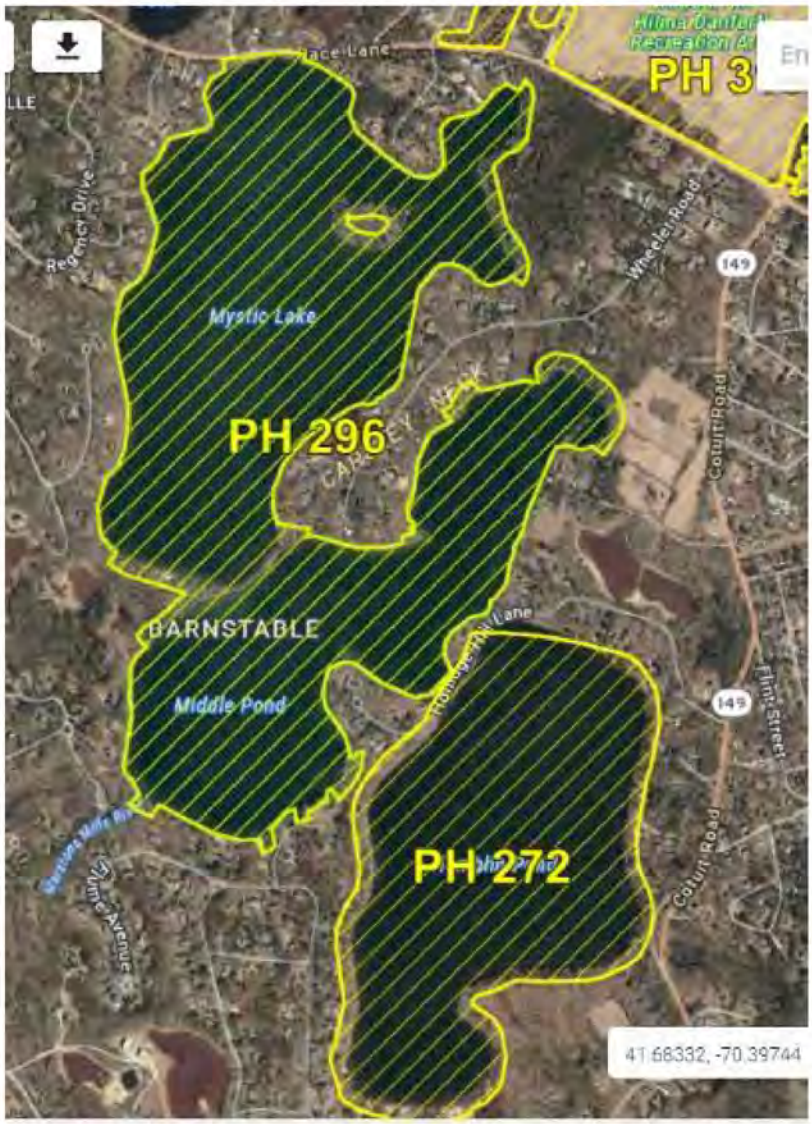
Concerns for the original treatment of Mystic Lake resulted in multiple restrictions and a permit condition for a study of mussel impacts. No adverse effects were found and the restriction on dose is in part the reason why retreatment is now being pursued. The proposed 2024 treatment will not contravene any restriction imposed in 2010, so approval should be granted for the treatment as proposed, but authority for that decision as pertains to MESA resides with NHESP, not the Town of Barnstable Conservation Commission.

Table 1 Rare Species of Mystic Lake

Scientific Name	Common Name	Status
Anax longipes	Comet Darner	SC
Enallagma laterale	New England Bluet	SC
Enallagma recurvatum	Pine Barrens Bluet	T
Alasmidonta undulata	Triangle Floater	SC*
Ligumia nasuta	Eastern Pond Mussel	SC
Leptodea ochracea	Tidewater Mucket	SC

* SC = species of special concern, T = threatened (NHESP).

Figure 7. NHESP Mapped Habitat



6.0 Proposed Monitoring Plan

There are three distinct phases to the proposed monitoring plan for Mystic Lake.

- **Pre-treatment testing and activities** to assess conditions to set a baseline and to support any pre-implementation preparations or controls that may be necessary.
- **Treatment monitoring** during the actual implementation phase to assess compliance with acceptable water chemistry and facilitate any adjustments necessary to maintain compliance.
- **Post-treatment monitoring** to confirm the results and assess any impacts.

6.1 Pre-treatment Testing and Preparatory Activities

Pre-treatment testing and preparatory activities will consist of the following actions. There is a substantial database for water quality in Mystic Lake, so the main focus of the pre-treatment monitoring is on establishing that conditions are suitable for treatment and confirming planned treatment procedures such as the ratio of ALUM to SOAL.

- Testing within two weeks prior to the start of treatment for water clarity, temperature, oxygen, pH, alkalinity, conductivity total nitrogen, total and dissolved phosphorus, dissolved aluminum and chlorophyll-a pigment over a profile of the water column (1 m intervals for field measures, 3 depths for lab measures) at three locations (Figure 4).
- Establish necessary environmental threshold conditions for implementation activities including water temperature (>40°F) and wind speed (<20 mph).
- Any other additional activities identified by the Barnstable Conservation Commission and NHESP

6.2 Treatment Monitoring

Water quality and environmental conditions monitoring during the implementation phase of the alum treatment will consist of the following activities.

- During the implementation phase, pH and conductivity will be measured in the target application area and at a non-treatment reference area prior to the start of treatment, again in the middle of the day, and at the end of treatment on that day. The established monitoring stations will be used to the extent practical. More frequent measurements shall be made if there is any visual evidence of adverse reaction from biota (e.g., fishkills or behavioral changes). Alkalinity will be assessed at top, middle and bottom depths if the pH is outside the range of 6-8 SU more than 100 m from the barge for more than 10 minutes after treatment.
- Treatment will cease if the pH is measured outside the range of 6.0 to 8.0 SU >100 m from the barge for >10 minutes after treatment, until the pH returns to that range. The ratio of alum to aluminate may be adjusted as needed to keep or move the pH within the acceptable range.

- Treatment will not proceed if water temperature falls below 40°F or wind speed exceeds 20 mph.
- During the implementation phase, a daily visual inspection of the potential floc drift zone shall be conducted. If discernible floc layer accumulation is occurring more than 100 feet outside the target application area, the application will be modified to ensure that floc is being kept within the target application area.
- During the implementation phase, a daily visual inspection of the treatment area and downwind to shore will be conducted, either first thing in the morning or after treatment is completed each day, for distressed or dead organisms. Treatment will cease if there is observed mortality of fish in excess of 100 fish or 50 fish of any one species on a given day until the cause can be determined and eliminated. MA DFW and MA DMF will be informed in the case of any fishkill.
- Any other additional activities identified by the Barnstable Conservation Commission and NHESP.

6.3 Post-Treatment Monitoring

Following successful completion of the implementation, the water quality in Mystic Lake will be monitored monthly between May and October for two years following treatment. If the treatment is in spring 2024, this would extend through October 2025, while if treatment occurs in autumn 2024, monitoring will occur through October 2026. Post-treatment water quality monitoring will consist of the following activities:

- Water quality will be monitored as in the pre-treatment phase, including water clarity, temperature, oxygen, pH, alkalinity, conductivity, total nitrogen, total and dissolved phosphorus, dissolved aluminum and chlorophyll-a pigment over a profile of the water column (1 m intervals for field measures, 3 depths for lab measures) at three locations (Figure 4). Aluminum measures may be terminated after levels return to background concentrations.
- Any other additional activities identified by the Barnstable Conservation Commission and NHESP.

A final report shall be filed with the Barnstable Conservation Commission within three months of the completion of treatment describing the implementation and providing all related data with discussion of results. This report will be updated within 3 months of completion of the monitoring program.

7.0 Possible Special Conditions

Orders of Conditions may include special conditions to govern specific projects and the new Practical Guide to Lake Management in Massachusetts will endeavor to supply suggested conditions. While that manual is still in development and review and some adjustment based on local conditions and Town concerns is to be expected, example Special Conditions for phosphorus inactivation may include:

1. P inactivation shall be in accordance with the approved NOI and OOC, as well as the License to Apply Chemicals, and will be guided by best management practices and supporting information for this technique.
2. Applicant shall submit the following information to the conservation commission as part of any P inactivation program prior to implementation:
   a. Products to be applied to bind P and the quantities of each.
   b. A list of all project participants with contact information.
   c. Dates of expected application.
   d. Map of location of any staging area(s).
3. Monitoring will be conducted prior to treatment to establish the concentration of P and proposed P binder (aluminum) in the water column, including at a minimum near surface and near bottom locations within the treatment area. Monitoring will also include alkalinity and pH, dissolved oxygen, water clarity, and nutrients.
4. During treatment, pH will be assessed at least before and after treatment on each day, plus at least one assessment during treatment, with results used to adjust treatment as necessary to avoid impacts on biota. A daily survey of the treatment area and any downwind area will be conducted to detect any distressed or dead organisms.
5. Appropriate measures will be taken to minimize the chance of any product, fuel, or related spills and ensure that adequate spill control devices or techniques are available.
6. The conservation commission shall be notified immediately of any leakage of contaminants and spills or leaks must be cleaned up immediately with waste materials disposed of properly.
7. The conservation commission and MassWildlife will be notified immediately if a fish kill occurs. A fish kill is defined as 100 dead fish of any species or 50 dead fish of any one species detected within 24 hours of any treatment.
8. Treatment will not occur on any day when weather conditions prevent accurate delivery of the P binder to the target area. This usually translates into days with wind in excess of 20 mph.
9. Following treatment, the pre-treatment monitoring will be conducted within a month of treatment and monthly between the months of May and October for two years following treatment.
10. A summary report of treatment and all monitoring data will be supplied to the conservation commission at the conclusion of post-treatment monitoring.

8.0 References and Relevant Reports

Biodrawversity. 2010. Freshwater Mussel Survey in Mystic Lake (Barnstable, Massachusetts) to Assess the Magnitude of a Lake-wide Mussel Kill. Report prepared for the Massachusetts Natural Heritage and Endangered Species Program, Westborough, MA. Biodrawversity, Amherst, MA.

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Wagner, K.J, D. Meringolo, D.F. Mitchell, E. Moran and S. Smith. 2017. Aluminum treatments to control internal phosphorus loading in lakes on Cape Cod, Massachusetts. Lake and Reservoir Management 33:171-186.

Water Resource Services (WRS). 2011. Internal Phosphorus Load Inactivation in Mystic Lake, Barnstable, Massachusetts. WRS and ACT, Wilbraham and Sutton, MA.

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