PARE PROJECT NO. 17177.00

NOTICE OF INTENT

pursuant to

The Regulations of the Massachusetts Wetlands Protection Act
and the
Nahant Wetlands Protection Bylaw and Regulations

Northeastern University Marine Science Center
Seawater System Upgrades
Nahant, Massachusetts

Prepared For:

Northeastern University
360 Huntington Avenue
Boston, MA 02115

June 2022

Engineers | Scientists | Planners

PARECORP.COM

PARE CORPORATION

June 29, 2022

Ms. Kristen Kent, Chair
Nahant Conservation Commission
Nahant Town Hall
334 Nahant Road
Nahant, MA 01908

Re: **Notice of Intent**
Northeastern University Marine Science Center
Seawater System Upgrades
Pare Project No. 17177.00

Dear Ms. Kent and Members of the Conservation Commission:

On behalf of Northeastern University (NU) and pursuant to the Regulations of the Massachusetts Wetlands Protection Act 310 CMR 10.00 and Nahant Wetlands Protection Bylaw and Regulations, Pare Corporation (Pare) is submitting the attached Notice of Intent for your review. Enclosed are the following:

- 7 copies of a Notice of Intent and Supporting Documentation;
- 2 copies of the Stormwater Management Report prepared by Nitsch Engineering;
- 7 full size sets of the Project Plans, prepared by Jones Architecture, Inc;
- 1 WPA filing fee in the amount of $787.50 made payable to the Town of Nahant;
- 1 Bylaw filing fee in the amount of $775.00 made payable to the Town of Nahant.

Copies of the DEP Filing Fee Transmittal Form and the filing fee check ($762.50) submitted to the Commonwealth of Massachusetts are included in Section 1 of this Notice of Intent.

A complete copy of this NOI is also being provided in electronic (.pdf) format.

In accordance with the Regulations, all abutters within 100 feet of the property boundary are being notified by certified mail, return receipt requested. Proof of mailing will be provided at the public hearing.

The proposed work includes replacing the existing seawater intake lines, pump house, and discharge system with new intake and discharge lines and a new pump house. The project includes unavoidable work within Land Under the Ocean, Land Containing Shellfish, and temporary work within Land Subject to Costal Storm Flowage. Unavoidable work is also proposed within buffer zones to Bordering Vegetated Wetlands, Coastal Bank, and Land Subject to Coastal Storm Flowage (regulated under the local bylaw).

We trust that the enclosed is sufficient for the Conservation Commission to issue Orders of Conditions allowing the project to proceed.

Thank you very much for your consideration in this matter. If you have any questions, please feel free to contact us.

Sincerely,
Pare Corporation

Sarah Pierce
Senior Environmental Scientist

SJP

cc: DEP Northeast Regional Office via certified mail
Division of Marine Fisheries, North Shore Office DMF.EnvReview-North@mass.gov
Northeastern University

TABLE OF CONTENTS

Administrative Documentation

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

Nahant
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):

430 Nahant Road — a. Street Address
Nahant — b. City/Town
01908 — c. Zip Code

Latitude and Longitude:
42.416713 — d. Latitude
-70.906807 — e. Longitude

Map 1B — f. Assessors Map/Plat Number
Lot 1 — g. Parcel /Lot Number

2. Applicant:

Paul — a. First Name
McAndrew — b. Last Name
Northeastern University — c. Organization
360 Huntington Avenue — d. Street Address
Boston — e. City/Town
MA — f. State
02115-5000 — g. Zip Code
617-869-9970 — h. Phone Number
i. Fax Number
p.mcandrew@northeastern.edu — j. Email Address

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

Gilbert — a. First Name
Delgado — b. Last Name
Northeastern University — c. Organization
360 Huntington Avenue — d. Street Address
Boston — e. City/Town
MA — f. State
02115-5000 — g. Zip Code
857-507-0450 — h. Phone Number
i. Fax Number
g.delgado@northeastern.edu — j. Email address

4. Representative (if any):

Sarah — a. First Name
Pierce — b. Last Name
Pare Corporation — c. Company
8 Blackstone Valley Place — d. Street Address
Lincoln — e. City/Town
RI — f. State
02865 — g. Zip Code
401-334-4100 — h. Phone Number
401-334-4108 — i. Fax Number
spierce@parecorp.com — j. Email address

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

$1,550.00 — a. Total Fee Paid
$762.50 — b. State Fee Paid
$787.50 — c. City/Town Fee Paid

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A. General Information (continued)

6. General Project Description:

Seawater System replacement including new pumphouse and associated improvements

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: Seawater system replacement

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)

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)
Essex County	
c. Book	**d. Page Number**
5344	142

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.

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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	1. linear feet	2. linear feet
b. ☐ Bordering Vegetated Wetland	1. square feet	2. square feet
c. ☐ Land Under Waterbodies and Waterways	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	2. square feet
	3. cubic feet of flood storage lost	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.

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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	810± (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)

	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	810± (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	305 permanent (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

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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

   Phone: (508) 389-6360

   10/1/2021 MassGIS
   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

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see http://www.mass.gov/eea/agencies/dfg/dfw/natural-heritage/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.

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

(c) ☐ MESA filing fee (fee information available at http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_fee_schedule.htm). 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, http://www.mass.gov/dfwele/dfw/nhesp/regulatory_review/mesa/mesa_exemptions.htm; 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 - Cohasset 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@state.ma.us

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: DMF.EnvReview-North@state.ma.us

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.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

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Provided by MassDEP:

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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

Nahant
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.

Nahant Seawater Pumphouse
a. Plan Title

Jones Architecture, Inc
b. Prepared By

William Maher
c. Signed and Stamped by

November 22, 2021
d. Final Revision Date

As noted
e. Scale

f. Additional Plan or Document Title

g. Date

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

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

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

8. ☒ 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
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Nahant
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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: 11.22.21

3. Signature of Property Owner (if different) — 4. Date: 11/22/2021

5. Signature of Representative (if any) — 6. Date: 11/23/21

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.

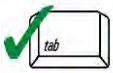
The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.

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:

430 Nahant Road a. Street Address	Nahant b. City/Town
 c. Check number	$762.50 d. Fee amount

2. Applicant Mailing Address:

Paul a. First Name		McAndrew b. Last Name
Northeastern University c. Organization		
360 Huntington Avenue d. Mailing Address		
Boston e. City/Town	MA f. State	02115-5000 g. Zip Code
617-869-9970 h. Phone Number	 i. Fax Number	p.mcandrew@northeastern.edu j. Email Address

3. Property Owner (if different):

Gilbert a. First Name		Delgado b. Last Name
Northeastern University c. Organization		
360 Huntington Avenue d. Mailing Address		
Boston e. City/Town	MA f. State	02115-5000 g. Zip Code
857-507-0450 h. Phone Number	 i. Fax Number	g.delgado@northeastern.edu 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
Category 3.b: Each building (for development) including site	1	$1,050.00	$1,050.00
Category 2J: Any other activity (seawater system)	1	$500.00	$500.00

Step 5/Total Project Fee: $1,550.00

Step 6/Fee Payments:

Total Project Fee:	$1,550.00 (a. Total Fee from Step 5)
State share of filing Fee:	$762.50 (b. 1/2 Total Fee **less $**12.50)
City/Town share of filling Fee:	$787.50 (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.)

Town of Nahant Wetlands Protection Bylaw
Notice of Intent Application Fee Calculation

Northeastern University Seawater System Upgrades

Activity Category	Number of Activities	Individual Activity Fee	Subtotal Activity Fee
Category 3.b. Each building (for development) including Site	1	$525.00	$525.00
Category 2.j. Any Other Activity (Seawater System)	1	$250.00	$250.00
TOTAL PROJECT FEE			**$775.00**

10554

PARE CORPORATION
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865

5-7515/110

DATE June 28, 2022

PAY TO THE ORDER OF Commonwealth of Massachusetts $ 762.50

PARE ENG. CORP. 762 DOLS 50 CTS DOLLARS

TWO SIGNATURES REQUIRED OVER $15,000

Santander
Santander Bank, N.A.

FOR NOI - State Share

Collette Gagnon

⑈010554⑈ ⑆011075150⑆ 451000446 55⑈

Details on back. Security Features

10553

PARE CORPORATION
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865

5-7515/110

DATE June 28, 2022

PAY TO THE ORDER OF Town of Nahant $ 775.00

PARE ENG. CORP. 775 DOLS 00 CTS DOLLARS

TWO SIGNATURES REQUIRED OVER $15,000

Santander
Santander Bank, N.A.

FOR NOI - Town Bylaw

Collette Gagnon

⑈010553⑈ ⑆011075150⑆ 451000446 55⑈

Details on back. Security Features

10552

PARE CORPORATION
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865

5-7515/110

DATE June 28, 2022

PAY TO THE ORDER OF Town of Nahant $ 787.50

PARE ENG. CORP. 787 DOLS 50 CTS DOLLARS

TWO SIGNATURES REQUIRED OVER $15,000

Santander
Santander Bank, N.A.

FOR NOI - Town Share

Collette Gagnon

⑈010552⑈ ⑆011075150⑆ 451000446 55⑈

Details on back. Security Features

Abutter Notification Information

AFFIDAVIT OF SERVICE

I, Sarah Pierce, hereby state that on June 29, 2022 I gave Notification to Abutters in compliance with the second paragraph of the Massachusetts General Laws, Chapter 131, Section 40, the DEP Guide to Abutter Notification, and the Town of Nahant Wetlands Protection Bylaw in connection with the following matter:

> A Notice of Intent application filed under the Massachusetts Wetlands Protection Act and the Nahant Wetlands Protection Bylaw with the Nahant Conservation Commission by Northeastern University on June 29, 2022 to upgrade the existing seawater system at the Marine Science Center for the property located at 430 Nahant Road Nahant, Massachusetts (Parcel 1B-0-1).

The form of notification and the list of abutters to whom it was given and their addresses are attached to this Affidavit of Service.

Signature

6/29/22

Date

Notification to Abutters Under the Massachusetts Wetlands Protection Act

June 29, 2022

Dear Abutter,

In accordance with the second paragraph of Massachusetts General Laws, Chapter 131, Section 40 and the Nahant Wetlands Bylaw you are hereby notified of the following:

The applicant, the Northeastern University Marine Science Center, has filed a Notice of Intent seeking permission to remove, fill, dredge, or alter, an area subject to protection under the Wetlands Protection Act (General Laws Chapter 131, Section 40). The intent of the project is to replace the University's flow-through ambient seawater system. Said area includes Parcel 0 Lot 1 located on Nahant Assessor's Map 1B.

Copies of the Notice of Intent may be examined at the Nahant Town Hall 8:00 AM and 4:00 PM, Monday through Wednesday, 8:00 AM to 7:00 PM on Thursdays, and 8:00 AM to 12:30pm on Friday, or at other times by appointment. To schedule an appointment to examine the Notice of Intent or for information on the date, time and place of the public hearing, please contact Ms. Kristen Kent, at (781) 581-0088.

Electronic copies of the Notice of Intent may be obtained by calling the applicant's representative, Pare Corporation, at (508) 543-1755 between the hours of 8:00 AM and 4:45 PM, Monday through Friday.

Please note that notice of the public hearing, including date, time, and place, will be posted in the Town Hall not less than forty-eight (48) hours in advance. Said notice will be published in The Lynn Daily Item not less than five (5) days in advance.

You may contact the Nahant Conservation Commission at (781) 581-0088, or the Northeast Regional Office of the Massachusetts Department of Environmental Protection at 978-694-3200, for more information about this application or the Massachusetts Wetlands Protection Act.

100 foot Abutters List Report - 1B-0-1

Nahant, MA
June 27, 2022

Subject Property:

Parcel Number: 1B-0-1
CAMA Number: 1B-0-1
Property Address: 430 NAHANT RD

Mailing Address: NORTHEASTERN UNIVERSITY
EDWARDS MARINE SCIENCE LAB
360 HUNTINGTON AVENUE
BOSTON, MA 02115

Abutters:

Parcel Number: 1A-0-4A
CAMA Number: 1A-0-4A
Property Address: 24 SWALLOW CAVE RD

Mailing Address: SOMMER, MELANIE S & LEWIS, MON
SWALLOW CAVE NOMINEE TRUST
BEACON TRUST COMPANY 11
KEEWAYDIN DR, STE 100
SALEM, NH 03079

Parcel Number: 1A-0-7
CAMA Number: 1A-0-7
Property Address: SWALLOW CAVE RD

Mailing Address: LEWIS, MONICA & SOMMER, MELANI
SWALLOW CAVE BAY NOMINEE TRUST
BEACON TRUST COMPANY 11
KEEWAYDIN DR, STE 100
SALEM, NH 03079

Parcel Number: 1C-0-1
CAMA Number: 1C-0-1
Property Address: 1 EAST POINT

Mailing Address: TOWN OF NAHANT HENRY CABOT
LODGE PARK
EAST POINT
NAHANT, MA 01908

Parcel Number: 2A-0-12
CAMA Number: 2A-0-12
Property Address: NAHANT RD

Mailing Address: TOWN OF NAHANT LODGE GRANT
TRAFFIC ISLAND
NAHANT ROAD
NAHANT, MA 01908

Parcel Number: 2A-0-18
CAMA Number: 2A-0-18
Property Address: 38 SWALLOW CAVE RD

Mailing Address: MCILVEEN JR, ROBERT J
38 SWALLOW CAVE RD
NAHANT, MA 01908

Parcel Number: 2A-0-18A
CAMA Number: 2A-0-18A
Property Address: NAHANT RD

Mailing Address: OWNERS UNKNOWN
NAHANT RD
NAHANT, MA 01908

Parcel Number: 2A-0-9
CAMA Number: 2A-0-9
Property Address: 36 SWALLOW CAVE RD

Mailing Address: PASINSKI, MARIE & PASINSKI, ROGER
36 SWALLOW CAVE RD
NAHANT, MA 01908

Approved by Board of Assessors June 27, 2022
David P. Hunt
Kathryn Marie Sneeber
[signature]

Prepared by Sheila K. Hambleton, Town Assessor 6/27/22

1B-O-1
mailing Labels

LEWIS, MONICA & SOMMER, M
SWALLOW CAVE BAY NOMINEE
BEACON TRUST COMPANY
11 KEEWAYDIN DR, STE 100
SALEM, NH 03079

MCILVEEN JR, ROBERT J
38 SWALLOW CAVE RD
NAHANT, MA 01908

OWNERS UNKNOWN
NAHANT RD
NAHANT, MA 01908

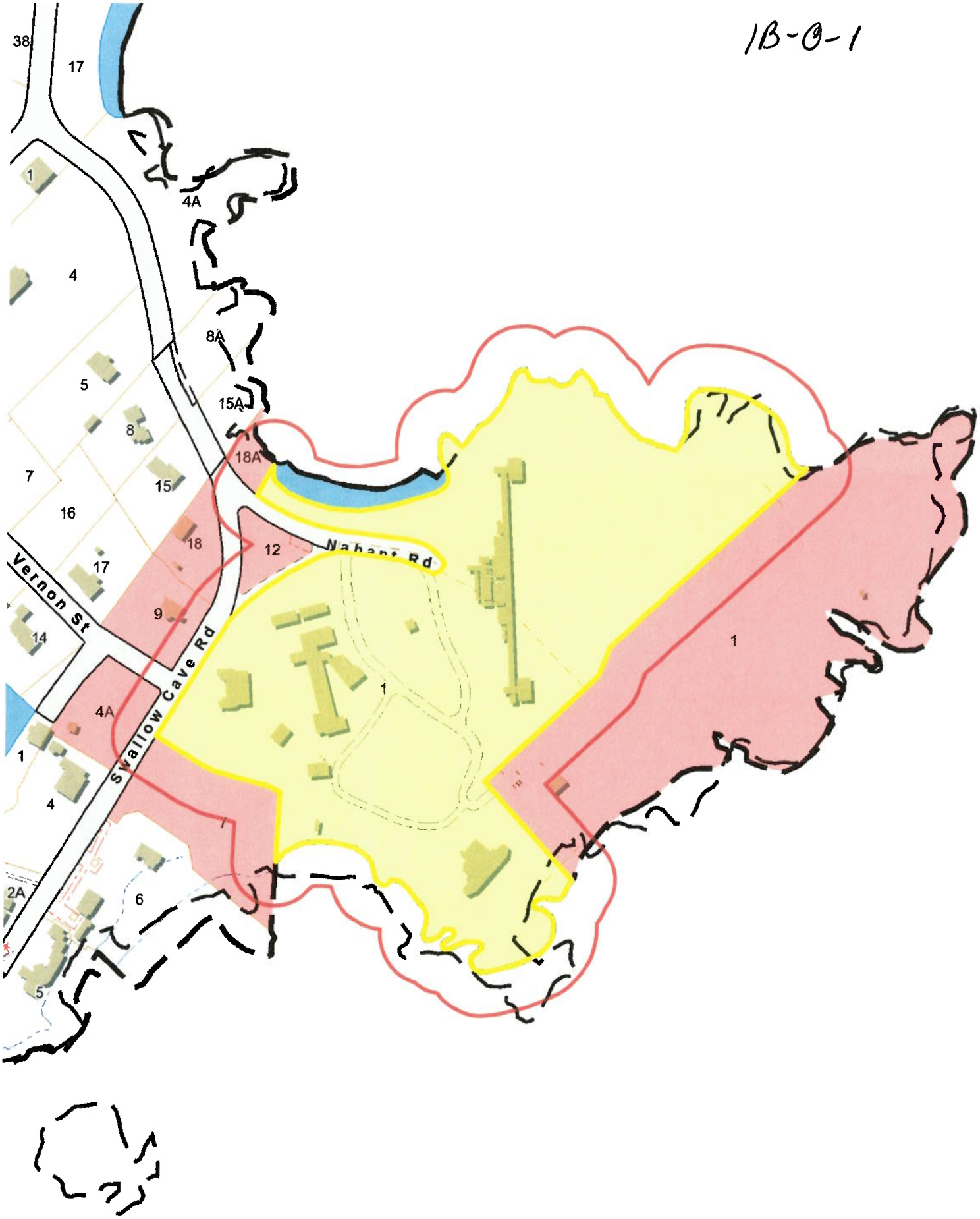
PASINSKI, MARIE &
PASINSKI, ROGER
36 SWALLOW CAVE RD
NAHANT, MA 01908

SOMMER, MELANIE S & LEWIS
SWALLOW CAVE NOMINEE TRUS
BEACON TRUST COMPANY
11 KEEWAYDIN DR, STE 100
SALEM, NH 03079

TOWN OF NAHANT
HENRY CABOT LODGE PARK
EAST POINT
NAHANT, MA 01908

TOWN OF NAHANT
LODGE GRANT TRAFFIC ISLAN
NAHANT ROAD
NAHANT, MA 01908

1B-0-1


38
17
1
4A
4
8A
5
15A
8
18A
7
15
16
18
12
Nahant Rd
Vernon St
17
9
14
Swallow Cave Rd
4A
1
4
2A
6
5
1
1

1B	0	1	1 of 2	GOVERNMENT
Map	Parcel	Lot	CARD Front	Town of Nahant

	Total Card /	Total Parcel
APPRAISED:	6,644,700/	6,895,800
USE VALUE:	6,644,700/	6,895,800
ASSESSED:	6,644,700/	6,895,800

PROPERTY LOCATION

No	Alt No	Direction/Street/City
430		NAHANT RD, NAHANT

OWNERSHIP

Unit #:

Owner 1:	NORTHEASTERN UNIVERSITY
Owner 2:	EDWARDS MARINE SCIENCE LAB
Owner 3:	
Street 1:	360 HUNTINGTON AVENUE
Street 2:	
Twn/City:	BOSTON
St/Prov:	MA
Cntry	
Own Occ:	Y
Postal:	02115
Type:	

PREVIOUS OWNER

Owner 1:	united states governmnet -
Owner 2:	-
Street 1:	
Twn/City:	
St/Prov:	
Cntry	
Postal:	

NARRATIVE DESCRIPTION

This parcel contains 20.421 ACRES of land mainly classified as COLL with a SCHOOL Building built about 1988, having primarily CLAPBOARD Exterior and 14544 Square Feet, with 1 Unit, 0 Bath, 0 3/4 Bath, 5 HalfBaths, 0 Rooms, and 0 Bdrm.

OTHER ASSESSMENTS

Code	Descrip/No	Amount	Com. Int

PROPERTY FACTORS

Item	Code	Description	%	Item	Code	Description
Z	NR	NAT RES	100	water	1	TYPCL
o				Sewer		
n				Electri		
Census:	2011			Exmpt		
Flood Haz:	C					
D				Topo		
s				Street		
t				Gas:		

IN PROCESS APPRAISAL SUMMARY

Use Code	Land Size	Building Value	Yard Items	Land Value	Total Value
942	20.421	1,688,800	204,100	4,751,800	6,644,700
Total Card	20.421	1,688,800	204,100	4,751,800	6,644,700
Total Parcel	20.421	1,939,900	204,100	4,751,800	6,895,800

Source: Market Adj Cost | Total Value per SQ unit /Card: 456.87 | /Parcel: 440.23

Legal Description

Entered Lot Size	
Total Land:	
Land Unit Type:	

User Acct	
GIS Ref	
GIS Ref	
Insp Date	02/10/22

Patriot Properties Inc.

PREVIOUS ASSESSMENT

Parcel ID: 1B-0-1

Tax Yr	Use	Cat	Bldg Value	Yrd Items	Land Size	Land Value	Total Value	Asses'd Value	Notes	Date
2022	942	FV	1,763,600	204100	20.42	3,772,500	5,740,200	5,740,200	Year End	9/16/2021
2022	942	NC	1,763,600	204100	20.42	3,772,500	5,740,200	5,740,200	Year End Roll	8/20/2021
2021	942	FV	1,763,600	204100	20.42	3,421,300	5,389,000	5,389,000	Year End Roll	10/1/2020
2021	942	NC	1,763,600	204100	20.42	3,421,300	5,389,000	5,389,000	Year End Roll	9/2/2020
2020	942	PTCH	1,763,100	204100	20.42	3,421,300	5,388,500	5,388,500	patch	3/5/2020
2020	942	FV	1,763,100	204100	20.42	3,421,300	5,388,500	5,388,500	Year End	9/18/2019
2020	942	NC	1,763,100	204100	20.42	3,421,300	5,388,500	5,388,500	Year End Roll	9/9/2019
2019	942	FV	1,763,100	194100	20.42	3,421,300	5,378,500	5,378,500	Year End Roll	9/4/2018

!528!

PRINT

Date	Time
06/27/22	14:02:35

LAST REV

Date	Time
04/14/22	12:33:59
apro	

SALES INFORMATION

TAX DISTRICT | PAT ACCT. 528

Grantor	Legal Ref	Type	Date	Sale Code	Sale Price	V	Tst	Verif	Notes
	05344 0142		3/4/1966			Yes	No		

BUILDING PERMITS

Date	Number	Descrip	Amount	C/O	Last Visit	Fed Code	F. Descrip	Comment
7/22/2021	E-21-00073	UNKNOWN		C				Temporary generato
7/19/2021	C-21-00018	OTHER	6,525	C				Install temporary
1/20/2021	E-21-00009	UNKNOWN		C				Electrical for 2 n
1/20/2021	E-21-00010	UNKNOWN		C				Install 13 Cat6 da
12/14/2020	P-20-00068	EDUCATIO		C				
7/30/2020	E-20-00051	ELECTRIC		C				Install 35 dual da
6/18/2020	E-20-00037	ELECTRIC		C				Installing 35 Secu
12/17/2018	E-18-00096	ELECTRIC		C				Remove existing fi
10/10/2018	C-18-00015	EXISTING	50,000	C				Install new Fiber
1/11/2018	P-18-00002	PLUMBING		C				

ACTIVITY INFORMATION

Date	Result	By	Name
2/10/2022	PERMIT VISIT	197	PATRIOT
2/16/2018	PERMIT VISIT	336	PATRIOT
2/1/2017	INSPECTED	197	PATRIOT
12/28/2016	INFO AT DOOR	197	PATRIOT
2/25/2015	PERMIT VISIT	336	PATRIOT
1/17/2014	MEASURED	197	PATRIOT
2/21/2013	MEAS+INSPCTD	336	PATRIOT
1/4/2010	PERMIT VISIT	122	PATRIOT
1/15/2008	PERMIT VISIT	197	PATRIOT

Sign: VERIFICATION OF VISIT NOT DATA __/__/__

USER DEFINED

Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
ASR Map:	
Fact Dist:	
Reval Dist:	
Year:	
LandReason:	
BldReason:	
CivilDistrict:	
Ratio:	

LAND SECTION (First 7 lines only)

Use Code	Description	LUC Fact	No of Units	Depth / PriceUnits	Unit Type	Land Type	LT Factor	Base Value	Unit Price	Adj	Neigh	Neigh Influ	Neigh Mod	Infl 1	%	Infl 2	%	Infl 3	%	Appraised Value	Alt Class	%	Spec Land	J Code	Fact	Use Value	Notes
942	COLL		30000		SQUARE FE	SITE		0	112.	0.53	OE	1.00								1,791,989						1,792,000	
942	COLL		19.7321		ACRES	EXCESS		0	150,000.	1.00	OE	1.00								2,959,815						2,959,800	
942	COLL		250		FRONT FEE	EXPAN		0	0.	0.00	OE	1.00															

Total AC/HA:	20.42081	Total SF/SM:	889531	Parcel LUC:	942	COLL	Prime NB Desc	OCEAN EX	Total: 4,751,804	Spl Credit	Total: 4,751,800

EXTERIOR INFORMATION

Type:	58 - SCHOOL		
Sty Ht:	1 - 1		
(Liv) Units:	1	Total:	2
Foundation:	6 - SLAB		
Frame:	1 - WOOD		
Prime Wall:	2 - CLAPBOARD		
Sec Wall:	21 - CONC BLO	40	%
Roof Struct:	1 - GABLE		
Roof Cover:	9 - METAL		
Color:	grey		
View / Desir:			

BATH FEATURES

Full Bath		Rating:	
A Bath:		Rating:	
3/4 Bath:		Rating:	
A 3QBth		Rating:	
1/2 Bath:	5	Rating:	GOOD
A HBth:		Rating:	
OthrFix:	26	Rating:	GOOD

OTHER FEATURES

Kits:		Rating:	
A Kits:		Rating:	
Frpl:		Rating:	
WSFlue:		Rating:	

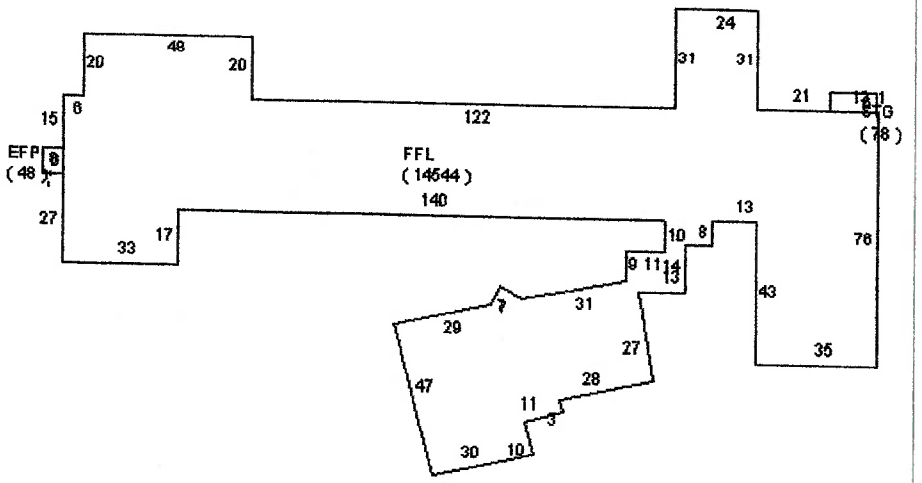
COMMENTS

NORTHEASTERN UNIVERSITY

TUDOR" ICE HOUSE" ON PREMISES

LAB/OF.

SKETCH



GENERAL INFORMATION

Grade:	C - AVERAGE		
Year Blt:	1988	Eff Yr Blt:	
Alt LUC:		Alt %:	
Jurisdict:		Fact:	.
Const Mod:			
Lump Sum Adj:			

CONDO INFORMATION

Location:	
Total Units:	
Floor:	
% Own:	
Name:	

RESIDENTIAL GRID

1st Res Grid	Desc:		# Units	
Level	FY LR DR D K FR RR BR FB HB L O			
Other				
Upper				
Lvl 2				
Lvl 1				
Lower				
Totals	RMs:	BRs:	Baths:	HB 5

REMODELING

Exterior:	
Interior:	
Additions:	
Kitchen:	
Baths:	
Plumbing:	
Electric:	
Heating:	
General:	

RES BREAKDOWN

No Unit	RMS	BRS	FL
Totals			

INTERIOR INFORMATION

Avg Ht/FL:	STD		
Prim Int Wal	1 - DRYWALL		
Sec Int Wall:			%
Partition:	T - TYPICAL		
Prim Floors:	5 - LINO/VINYL		
Sec Floors:	4 - CARPET	10	%
Bsmnt Flr:			
Subfloor:			
Bsmnt Gar:			
Electric:	1 - TYPICAL		
Insulation:	3 - GOOD		
Int vs Ext:	s		
Heat Fuel:	2 - GAS		
Heat Type:	1 - FORCED H/A		
# Heat Sys:	1		
% Heated:	100	% AC:	100
Solar HW:	NO	Central Vac:	NO
% Com Wal		% Sprinkled	100

DEPRECIATION

Phys Cond:	GD - Good	19.	%
Functional:			%
Economic:			%
Special:			%
Override:			%
Total:		19.3	%

CALC SUMMARY

Basic $ / SQ:	125.00
Size Adj.:	0.87891912
Const Adj.:	1.27186000
Adj $ / SQ:	139.733
Other Features:	56683
Grade Factor:	1.00
NBHD Inf:	1.00000000
NBHD Mod:	
LUC Factor:	1.00
Adj Total:	2092680
Depreciation:	403887
Depreciated Total:	1688793

COMPARABLE SALES

Rate	Parcel ID	Typ	Date	Sale Price

WtAv$/SQ:		AvRate:		Ind.Val	
Juris. Factor:			Before Depr:	139.73	
Special Features:	0		Val/Su Net:	115.12	
Final Total:	1688800		Val/Su SzAd	116.12	

SUB AREA

Code	Description	Area - SQ	Rate - AV	Undepr Value
FFL	1ST FLOOR	14,544	139.730	2,032,273
STG	STORAGE	78	10.170	794
EFP	ENCL PORCH	48	61.050	2,930

Net Sketched Area:	14,670			Total:	2,035,997
Size Ad	14544	Gross Area	14670	FinArea	14544

SUB AREA DETAIL

Sub Area	% Usbl	Descrip	% Type	Qu	# Ten

MOBILE HOME

Make: | Model: | Serial #: | Year: | Color:

SPEC FEATURES/YARD ITEMS

Code	Description	A	Y/S	Qty	Size/Dim	Qual	Con	Year	Unit Price	D/S	Dep	LUC	Fact	NB	Fa	Appr Value	JCod	JFact	Juris. Value
MN	PUMP	D	Y	2	1	A	AV	1988	2,000.00	M	0	942				4,000			4,000
MN	BUNKERS	D	Y	1	1	A	GD	1900	50,000.00	M	0	942				50,000			50,000
72	TANK-AG	D	Y	2	20000	A	GD	1988	0.55	T	32.6	942				14,800			14,800
85	PAVING	D	Y	1	5000	A	AV	1988	1.00	T	43.5	942				2,800			2,800
25	GRNHSE-G	D	Y	1	40X28	V	AV	2013	30.00	T	3.2	942				32,500			32,500
MN	bunker	D	Y	2	1	A	AV	1900	50,000.00	M	0	942				100,000			100,000

PARCEL ID

1B-0-1

IMAGE

AssessPro Patriot Properties, Inc

More: N | Total Yard Items: 204,100 | Total Special Featues: | Total: 204,100

1B	0	1	2 of 2	GOVERNMENT
Map	Parcel	Lot	CARD Front	**Town of Nahant**

	Total Card /	Total Parcel
APPRAISED:	251,100/	6,895,800
USE VALUE:	251,100/	6,895,800
ASSESSED:	251,100/	6,895,800

PROPERTY LOCATION

No	Alt No	Direction/Street/City
430		NAHANT RD, NAHANT

OWNERSHIP

Unit #:

Owner 1:	NORTHEASTERN UNIVERSITY
Owner 2:	EDWARDS MARINE SCIENCE LAB
Owner 3:	
Street 1:	360 HUNTINGTON AVENUE
Street 2:	
Twn/City:	BOSTON
St/Prov:	MA
Cntry:	
Own Occ:	Y
Postal:	02115
Type:	

PREVIOUS OWNER

Owner 1:	
Owner 2:	
Street 1:	
Twn/City:	
St/Prov:	
Cntry:	
Postal:	

NARRATIVE DESCRIPTION

This parcel contains 20.421 ACRES of land mainly classified as COLL with a PMP/VLV HS Building built about 2013, having primarily CLAPBOARD Exterior and 1120 Square Feet, with 1 Unit, 0 Bath, 0 3/4 Bath, 0 HalfBath, 0 Rooms, and 0 Bdrm.

OTHER ASSESSMENTS

Code	Descrip/No	Amount	Com. Int

PROPERTY FACTORS

Item	Code	Description	%	Item	Code	Description
Z	NR	NAT RES	100	water	1	TYPCL
o				Sewer		
n				Electri		
Census:	2011			Exmpt		
Flood Haz:	C					
D				Topo		
s				Street		
t				Gas:		

IN PROCESS APPRAISAL SUMMARY

Use Code	Land Size	Building Value	Yard Items	Land Value	Total Value
942	0.000	251,100			251,100
Total Card	0.000	251,100			251,100
Total Parcel	20.421	1,939,900	204,100	4,751,800	6,895,800

Source: Market Adj Cost | Total Value per SQ unit /Card: 224.20 | /Parcel: 440.23

Legal Description

User Acct

GIS Ref

GIS Ref

Entered Lot Size

Total Land:

Land Unit Type:

Insp Date

12/28/16

!528!

PREVIOUS ASSESSMENT

Parcel ID: 1B-0-1

Tax Yr	Use	Cat	Bldg Value	Yrd Items	Land Size	Land Value	Total Value	Asses'd Value	Notes	Date

PRINT

Date	Time
06/27/22	14:02:38

LAST REV

Date	Time
09/28/18	10:54:09
apro	
528	

USER DEFINED

Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
Prior Id # 1:	
Prior Id # 2:	
Prior Id # 3:	
ASR Map:	
Fact Dist:	
Reval Dist:	
Year:	
LandReason:	
BldReason:	
CivilDistrict:	
Ratio:	

SALES INFORMATION

TAX DISTRICT

PAT ACCT.

Grantor	Legal Ref	Type	Date	Sale Code	Sale Price	V	Tst	Verif	Notes

BUILDING PERMITS

Date	Number	Descrip	Amount	C/O	Last Visit	Fed Code	F. Descrip	Comment

ACTIVITY INFORMATION

Date	Result	By	Name
12/28/2016	INFO AT DOOR	197	PATRIOT

Sign: VERIFICATION OF VISIT NOT DATA __/__/__

LAND SECTION (First 7 lines only)

Use Code	Description	LUC Fact	No of Units	Depth / PriceUnits	Unit Type	Land Type	LT Factor	Base Value	Unit Price	Adj	Neigh	Neigh Influ	Neigh Mod	Infl 1	%	Infl 2	%	Infl 3	%	Appraised Value	Alt Class	%	Spec Land	J Code	Fact	Use Value	Notes
942	COLL		0		SQUARE FEEXCESS			0	0.	0.00	OE	1.00															

Total AC/HA:	0.00000	Total SF/SM:	0	Parcel LUC:	942	COLL	Prime NB Desc	OCEAN EX	Total:		Spl Credit		Total:	

EXTERIOR INFORMATION

Type:	55 - PMP/VLV HS
Sty Ht:	1 - 1
(Liv) Units:	1 Total: 2
Foundation:	9 - CRAWL SP
Frame:	2 - STEEL
Prime Wall:	2 - CLAPBOARD
Sec Wall:	%
Roof Struct:	1 - GABLE
Roof Cover:	9 - METAL
Color:	GREEN
View / Desir:	

GENERAL INFORMATION

Grade:	B - GOOD		
Year Blt:	2013	Eff Yr Blt:	
Alt LUC:		Alt %:	
Jurisdict:		Fact:	.
Const Mod:			
Lump Sum Adj:			

INTERIOR INFORMATION

Avg Ht/FL:	STD		
Prim Int Wal	5 - MINIMUM		
Sec Int Wall:		%	
Partition:			
Prim Floors:	12 - CONCRETE		
Sec Floors:		%	
Bsmnt Flr:			
Subfloor:			
Bsmnt Gar:			
Electric:	3 - TYPICAL		
Insulation:	2 - TYPICAL		
Int vs Ext:	S		
Heat Fuel:	5 - NONE		
Heat Type:	8 - NONE		
# Heat Sys:	0		
% Heated:	0	% AC:	
Solar HW:	NO	Central Vac:	NO
% Com Wal		% Sprinkled	

BATH FEATURES

Full Bath		Rating:	
A Bath:		Rating:	
3/4 Bath:		Rating:	
A 3QBth		Rating:	
1/2 Bath:		Rating:	
A HBth:		Rating:	
OthrFix:		Rating:	

OTHER FEATURES

Kits:		Rating:	
A Kits:		Rating:	
Frpl:		Rating:	
WSFlue:		Rating:	

CONDO INFORMATION

Location:	
Total Units:	
Floor:	
% Own:	
Name:	

DEPRECIATION

Phys Cond:	AV - Average	3.2	%
Functional:			%
Economic:			%
Special:			%
Override:			%
	Total:	3.2	%

CALC SUMMARY

Basic $ / SQ:	130.00
Size Adj.:	1.60000002
Const Adj.:	0.86467254
Adj $ / SQ:	179.852
Other Features:	-1120
Grade Factor:	1.30
NBHD Inf:	1.00000000
NBHD Mod:	
LUC Factor:	1.00
Adj Total:	259407
Depreciation:	8301
Depreciated Total:	251106

COMMENTS

NORTHEASTERN UNIVERSITY

TUDOR" ICE HOUSE" ON PREMISES

LAB/OF.

RESIDENTIAL GRID

1st Res Grid	Desc:	# Units

Level	FY	LR	DR	D	K	FR	RR	BR	FB	HB	L	O
Other												
Upper												
Lvl 2												
Lvl 1												
Lower												

Totals	RMs:	BRs:	Baths:	HB

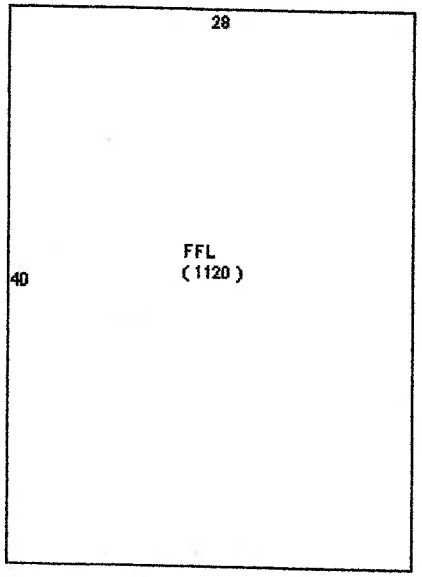
REMODELING

Exterior:	
Interior:	
Additions:	
Kitchen:	
Baths:	
Plumbing:	
Electric:	
Heating:	
General:	

RES BREAKDOWN

No Unit	RMS	BRS	FL
Totals			

SKETCH



COMPARABLE SALES

Rate	Parcel ID	Typ	Date	Sale Price

WtAv$/SQ:		AvRate:		Ind.Val	
Juris. Factor:			Before Depr:	232.91	
Special Features:	0		Val/Su Net:	224.20	
Final Total:	251100		Val/Su SzAd	224.20	

SUB AREA

Code	Description	Area - SQ	Rate - AV	Undepr Value
FFL	1ST FLOOR	1,120	179.850	201,434

Net Sketched Area:	1,120	Total:	201,434
Size Ad	1120	Gross Area	1120	FinArea	1120
---	---	---	---	---	---

SUB AREA DETAIL

Sub Area	% Usbl	Descrip	% Type	Qu	# Ten

IMAGE

AssessPro Patriot Properties, Inc

MOBILE HOME

Make: | Model: | Serial #: | Year: | Color:

SPEC FEATURES/YARD ITEMS

PARCEL ID 1B-0-1

Code	Description	A	Y/S	Qty	Size/Dim	Qual	Con	Year	Unit Price	D/S	Dep	LUC	Fact	NB Fa	Appr Value	JCod	JFact	Juris. Value

More: N | Total Yard Items: | Total Special Featues: | Total:

Figures

MASS GIS

SITE LOCATION MAP

SCALE:1"=2,000'

N
W E
S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 17177.00 NOVEMBER 2021

FIGURE 1

NORTHEASTERN UNIVERSITY
COASTAL SUSTAINABILITY INSTITUTE
NAHANT, MA

MASS GIS

ANNOTATED AERIAL PHOTOGRAPH

SCALE:1"=300'

N
W E
S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 17177.00 NOVEMBER 2021

FIGURE 2

NORTHEASTERN UNIVERSITY
COASTAL SUSTAINABILITY INSTITUTE
NAHANT, MA

National Flood Hazard Layer FIRMette

FEMA

70°54'45"W 42°25'16"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

70°54'8"W 42°24'50"N

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/10/2021 at 10:51 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

SHELLFISH SUITABILITY AREAS

SCALE:1"=1,000'

N
W E
S

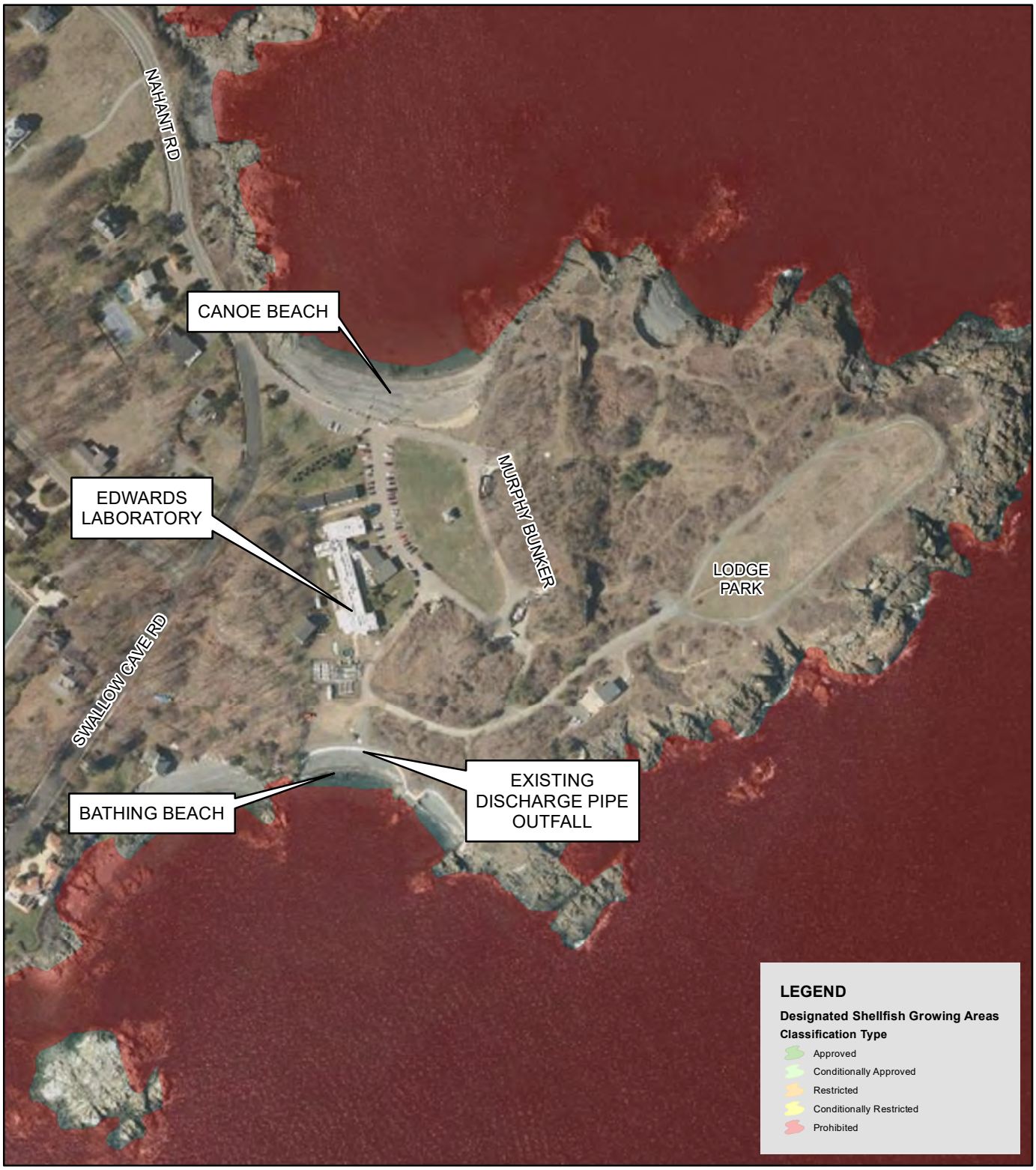
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 17177.00 NOVEMBER 2021

FIGURE 4

NORTHEASTERN UNIVERSITY
COASTAL SUSTAINABILITY INSTITUTE
NAHANT, MA



MASS GIS

DESIGNATED SHELLFISH GROWING AREAS

SCALE:1"=300'

N
W E
S

8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 17177.00 NOVEMBER 2021

FIGURE 5

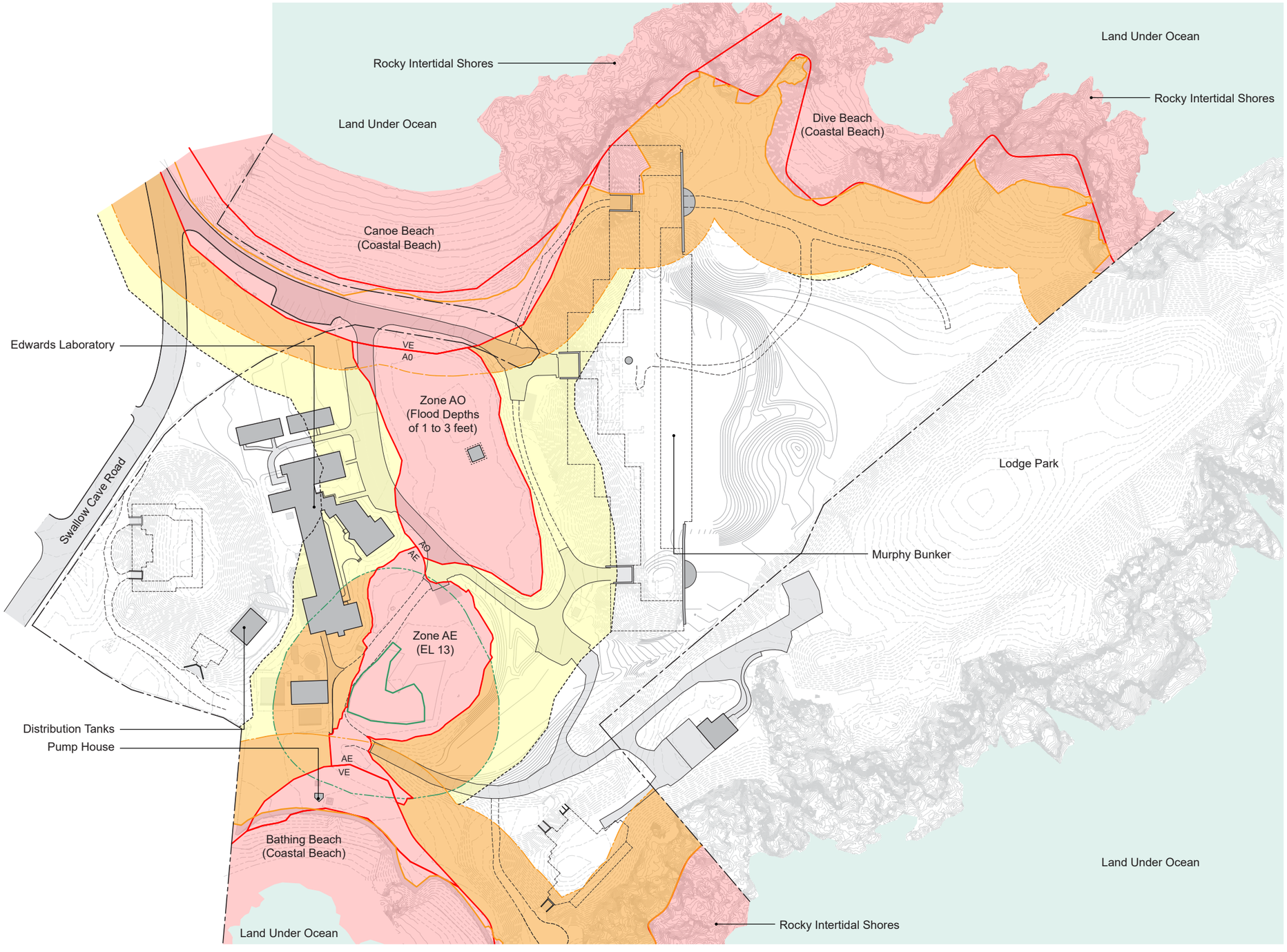
NORTHEASTERN UNIVERSITY
COASTAL SUSTAINABILITY INSTITUTE
NAHANT, MA

LEGEND

- Property Line
- Land Subject to Coastal Storm Flowage FEMA Zones as Noted
- Bordering Vegetated Wetland (BVW)
- 100'
- Coastal Bank
- 100'

Coastal Dune

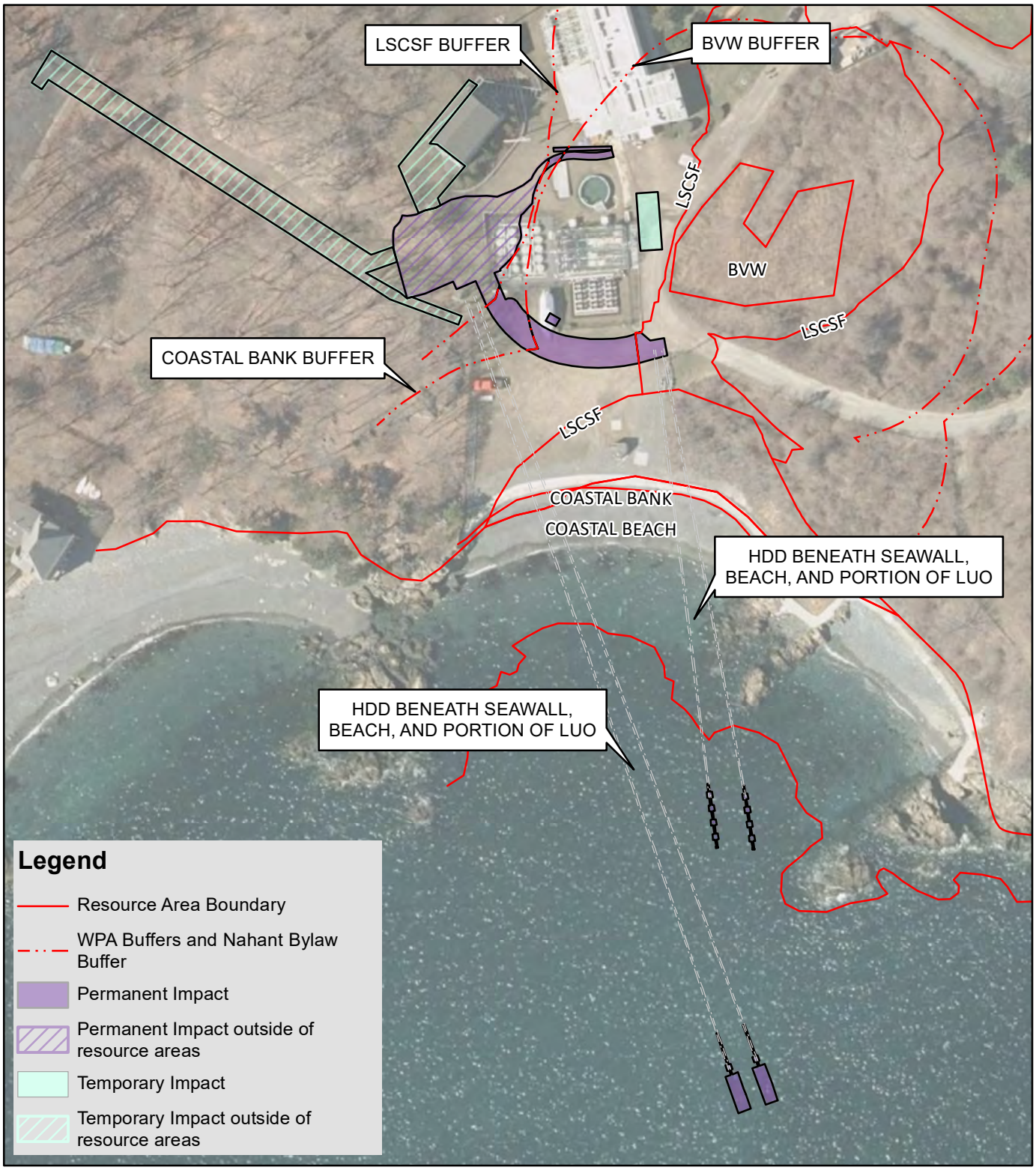
The remaining portions of the man-made, created Coastal Dune are present along the upper portion of Canoe Beach as permitted under DEP File #047-0529. The Coastal Dune has been subject to periodic storm damage following its construction.



- State Wetland/Water Resource Area
  Town Wetland Bylaw Protected
- State Wetland/W
  Town Wetland Bylaw Protected
- Town Wetland Bylaw Protected Areas
  Lands within 100 Feet of any Wetland
- Land Under Ocean

Figure 6

Wetland Resource Areas: Existing Conditions



RESOURCE AREA IMPACTS

SCALE:1"=100'

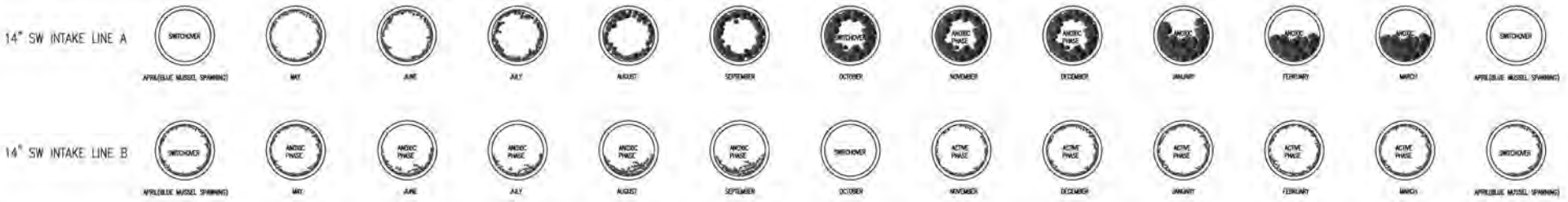
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
(401) 334-4100

10 LINCOLN ROAD, SUITE 210
FOXBORO, MA 02035
(508) 543-1755

PARE PROJECT No. 17177.00 NOVEMBER 2021

FIGURE 7

NORTHEASTERN UNIVERSITY
COASTAL SUSTAINABILITY INSTITUTE
NAHANT, MA



PROGRESSION OF BIOFOULING IN SEAWATER INTAKE PIPES

Project Narrative

I. Introduction

On behalf of the applicant, Northeastern University (NU or University), this Notice of Intent (NOI) is submitted to the Nahant Conservation Commission and Massachusetts Department of Environmental Protection pursuant to the Massachusetts Wetlands Protection Act (WPA - MGL c. 131, s. 40) and Regulations (310 CMR 10.00) and the Nahant Wetlands Protection Bylaw - Article 17 (the Bylaw) and Nahant Wetlands Protection By-law Rules and Regulations (Adopted March 27, 2019). NU proposes to replace several components of its existing, previously permitted, ambient seawater flow through system for the Marine Science Center (MSC). The existing seawater system needs to be replaced because it is undersized for the current research needs of the MSC, experiences shutdowns, and is prone to biofouling. A replacement system is needed to provide a reliable source of fresh seawater for research needs.

The Marine Science Center's proximity to the ocean provides a unique opportunity to utilize seawater for research at the University. Currently, the seawater intake system is comprised of intake pipes located approximately 200 feet into the ocean, a pump house located upgradient from a seawall along the southern edge of the campus, and yard piping that conveys the seawater to storage tanks by the Edwards Laboratory. From there, seawater is piped to various research tanks and ultimately conveyed back to the shore via a pipe outlet in the seawall. The purpose and need of the project is to replace and upgrade the existing seawater intake pipes to accommodate current and future research needs at NU.

The following narrative discusses the site conditions, the proposed project, unavoidable temporary and permanent alterations to resource areas, and project compliance with applicable provisions of the Regulations of the Massachusetts Wetlands Protection Act and the Nahant Wetlands Protection Bylaw. This replacement intake system was designed to avoid and minimize impacts to onsite coastal wetland resource areas to the maximum extent practicable.

II. Project Background

a. Site Background

The Northeastern University Marine Science Center (MSC) is located at East Point in Nahant, Massachusetts at the end of Nahant Road east of Swallow Cave Road. Lodge Park, a public open space owned by the Town of Nahant, is located to the east of the site.

Northeastern acquired the property from the United States government in 1966 for the purpose of creating a marine research and teaching center. Prior to that time the site was operated as a coastal defense site (East Point Military Reservation) during the first and second world wars and, from 1955 to 1962, as a Nike missile base. The Northeastern University Marine Science Institute opened at the site in 1967 and has operated at this location since then. The University repurposed remnant military facilities to create the MSC including the main research building in the northwest portion of the site (the Edwards Laboratory) and an underground bunker in the north-central portion of the site (the Murphy Bunker).

Marine research at the University is supported by a flow-through seawater system of pipes extending from the ocean to a supply building, which provides unfiltered seawater throughout the facility for a variety of research purposes, the main focuses of which are fisheries, genomics, geochemistry, and ecology. The seawater system is the critical life support system for marine life in the research tanks.

The main laboratory buildings (the Edwards Laboratory and associated temporary trailers) contains the principal teaching and research facilities of the MSC. Facilities in it include research laboratories, a classroom, a general use molecular biology laboratory, lab and office space supporting the Ocean Genome Legacy offices, a wet lab with flowing seawater, and a dive locker. The Murphy Bunker, located to the east of the Edwards Laboratory, was originally constructed by the military in the 1940's. The bunker now provides space for research and teaching and includes one large classroom, and laboratories supporting research in underwater robotics, climate change science, and coastal dynamics. The Murphy Bunker also supports touch tanks that are used primarily by the Outreach Program.

b. Permitting Background

In 2009, the intake pipes of the seawater system were replaced and extended approximately 125 feet into the bay to allow free flow through the pipes. NU had observed that the pipes were becoming clogged with sand in the summer months due to their location in shallow water. In April of 2016, emergency leak repairs to the existing pipe were required. Since the 2106 emergency repairs and replacement, NU determined that the existing pipes are undersized and do not accommodate the needs of research activities at the MSC. To address this deficiency, NU needs to replace the existing intake pipes to account for significant

biofouling observed in existing pipes (to be addressed below). As part of a 2012 upgrade to the existing pump house, the Order of Conditions issued by the Nahant Conservation Commission the Nahant specified a maximum flow rate of 1,100 gpm.

In October 2020, a Notice of Intent was filed with the Nahant Conservation Commission (Commission) to address the replacement of the seawater system. The Commission issued an Order of Conditions under the WPA and a denial under the Bylaw.

The replacement project described herein seeks to address the deficiency of the existing seawater system while minimizing work in the LSCSF to the maximum extent practicable. This seawater replacement project complies with both state Regulations and Bylaw regulations, as demonstrated in further sections.

III. Existing Site Conditions

The NU property is located on approximately 20.4 acres of open land with over 3,500 feet of ocean frontage including Canoe Beach to the north and Bathing Beach to the south. These two shelving beaches are composed of coarse sand and cobbles. The remainder of the shoreline is exposed bedrock with numerous tidepools and channels.

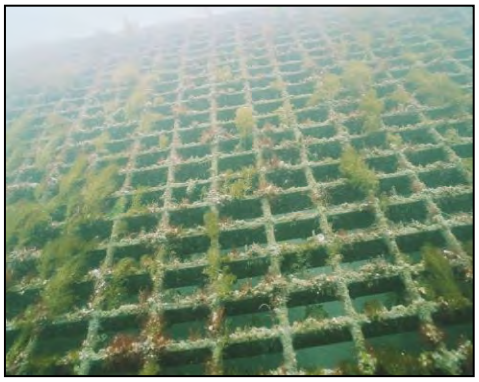
a. Existing Seawater System

The existing seawater system on the MSC campus draws ambient seawater from Bathing Beach Cove and pumps it uphill to two (2) 20,000-gallon storage tanks. From there the seawater is gravity fed to the research facilities at the Edwards Laboratory and Murphy Bunker via an underground PVC piping network. After the seawater flows through the researcher's tanks, it is collected by an underground seawater PVC pipe drainage system and is discharged back into the cove through the existing 15" pipe at the Bathing Beach seawall.

In 2017 CLE Engineering performed a bathymetric and eelgrass survey of Bathing Beach Cove to establish the existing bathymetric conditions in the project area. According to survey documentation prepared by CLE, the sea floor in the vicinity of the intake lines consists of areas of sand and cobbles that are interspersed with localized bedrock outcrops. While no eelgrass was observed, other subtidal vegetation was encountered in the work area including Bladder Wrack, Kelp, and Sea Hair.

Existing Intake System

The existing seawater intake system consists of two (2) 6-inch outside diameter (o.d.) HDPE intake pipes that extend approximately 350' from the seawall bordering Bathing Beach into Bathing Beach Cove south of the site. Installation of the existing intake pipes was completed in 2011 following receipt of approvals from the Commission, the MassDEP Waterways Program, and the US Army Corps of Engineers. The pipes are anchored to the sea floor using 2-foot x 2-foot x 2-foot concrete ballast blocks that are embedded with stainless steel pipe friction clamps that hold the pipes firmly to the ballast blocks. Seawater is drawn into the terminal end of each intake pipe through concrete 4-foot x 4-foot x 2-foot intake boxes located at a water depth of approximately -15 feet Mean Low Water (MLW). The intake boxes each have a 2-inch Fibergrate Screen to prevent large floating debris from being drawn into the intakes.



2" Fibergrate Screen at inlet

The existing intake pipes are prone to biofouling due to their small diameter. Biofouling is a natural phenomenon by which marine organisms rapidly settle and fasten themselves to

substrates (in this case the interior of the intake pipes and structures). Biofouling growth in the intake pipes is encouraged by the constant flow of fresh, food-rich (e.g., phytoplankton) seawater. At the MSC, blue mussels (*Mytilus edulis*) are the biggest biofouling challenge, although other organisms are present as well. With growth rates up to 2-inches in a single season, blue mussels create significant problem for the MSC Seawater System. First and foremost, their "rough" profile creates very high friction loss on the suction side of the seawater intake pumps creating a condition known as pump cavitation, a physical phenomenon that can destroy a robust marine pump in a single season. Second, mussels can quickly occupy the entire inside diameter of the seawater pipe thus restricting the flow of seawater to less than a 25% of the system's design capacity. Because of biofouling in the existing system, the original design flow rate of approximately 550 gallons per minute (gpm) has been reduced to as low as 78 gpm (recorded in January of 2017).

Biofouling by Blue Mussels

To control biofouling in a marine system without the use of chemicals, two seawater intake pipes are typically cycled so that one is active while the other is inactive. Inactivity results in a lack of food and oxygenated seawater that eventually leads to the death of the biofouling organisms. Eventually, anaerobic bacteria will digest the organic matter in the pipe, including the byssal threads that mussels use to attach themselves to the interior wall of the pipe. The pipe can then be backflushed clean of any remaining biofouling debris before being put back into service as the active line.

Existing Pump House

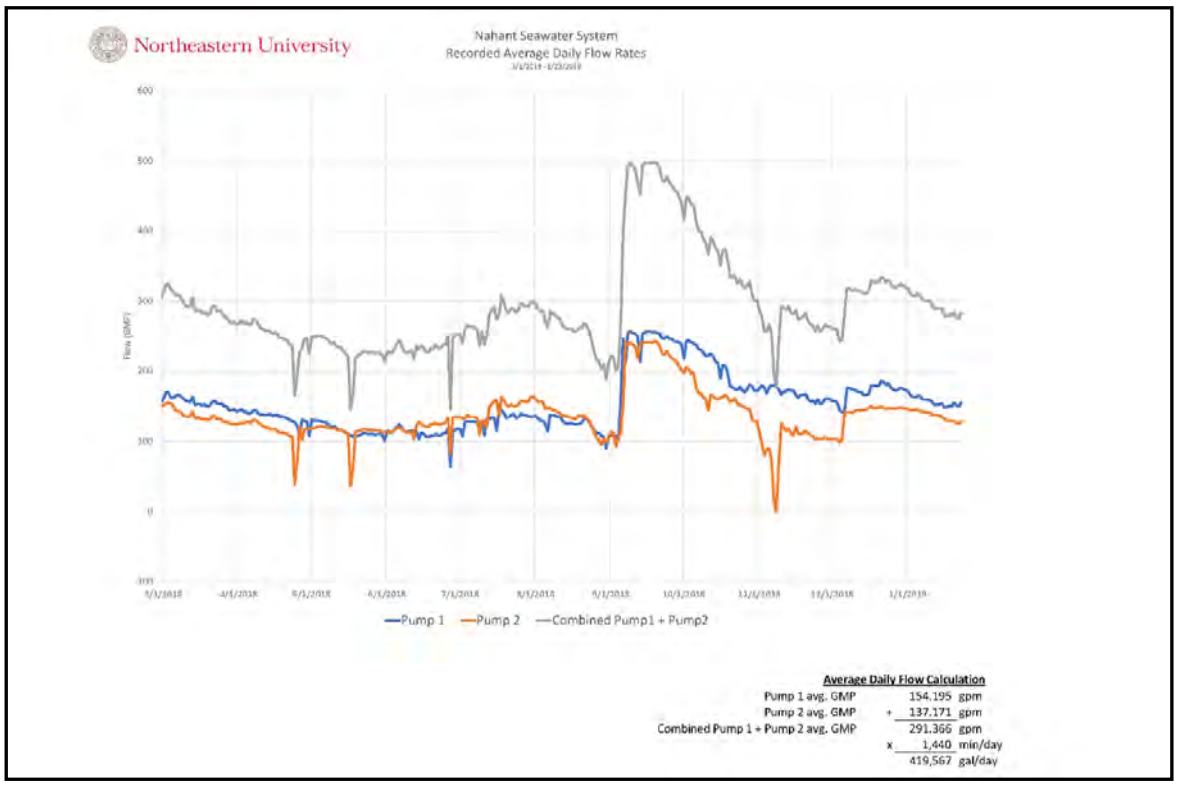
The existing seawater pump house, located just north of the Bathing Beach Seawall, contains two (2) 15 horsepower (hp) seawater pumps that each have a maximum theoretical flow capacity of 550 gpm. The initial intent was to have one seawater pump and one intake line in operation to provide the seawater flow rate necessary to support the MSC's research requirements while the second pump would serve as a backup pump and provide a means of cycling the piping and intake systems between the active and inactive states to control biofouling.

The severe and rapid biofouling of the intake lines has increased the dynamic friction losses as the seawater passes by them, creating a very high vacuum pressure on the suction side of the pump resulting in cavitation, the implosion of gas bubbles at the tip of the pump's impeller. This is a very violent physical reaction that creates rapid wear on the pump's impeller and also results in heavy vibrations that shake and wear other pump components, eventually leading to premature pump failure. This problem is further compounded by ongoing research that requires constant and reliable supply of seawater, needed to support

the marine life in the research tanks. To compensate (unsuccessfully) for the reduced flow rate provided by a single seawater pump the NU Maintenance Staff has been forced to operate both pumps simultaneously to meet the seawater flow rates required by the researchers. This approach has led to even more damaging results because it does not allow the lines to be cycled from active to inactive (anoxic) periods to control the biofouling. Hence both seawater intake pipes are routinely completely clogged with mussels resulting in drastic reductions of seawater flow rates. NU's only option has been to shut down one pump and attempt to relieve the clog by mechanical intervention using a roto-rooter cutting head and high-pressure water cleaning, which provides some temporary seawater flow improvements until the biofouling organisms quickly grow back.

Rooting and Jetting Intake

Based on data collected from March 1, 2018 through January 23, 2019, the average daily flow rate, with both pumps operating, was approximately 291 gpm (419,567 gallons per day - GPD).



Average Daily Seawater Pumping Rates March 1, 2018 to January 23, 2019

Existing Storage and Distribution

Seawater Storage Tank Enclosure

Each seawater pump has a 6-inch HDPE pipe that delivers seawater to the elevated 20,000 gallon storage tanks located on the southwest corner of the campus. To conserve energy and minimize seawater consumption, the seawater pumping system was designed to be a variable flow system with flow rates dependent on actual usage by various research projects. As seawater is fed by gravity from the elevated storage tanks into the various research tanks on the campus, the water level drops in the storage tanks. This change is monitored by a water level sensor that sends a signal to the seawater pump's variable frequency devices (VFD's) that either speed up or slow down the seawater pumping rates depending on demand.

Because of the relatively short retention time of seawater in the storage tanks, settlement of suspended sediments is limited, so the raw ambient seawater remains virtually unchanged before it flows downstream to the research tanks. Moreover, the storage tanks are enclosed within a building thus preventing the seawater from warming from sun exposure. The 12-inch-thick concrete walls of the tanks themselves also serve as good insulators allowing the seawater to retain its desirable ambient temperature. The retention time in the storage tanks varies with demand. At 200 gpm the retention time is 200 minutes (3 hours 20 minutes) and at 500 gpm the retention time is 80 minutes (1 hour 20 minutes).

The flow rates to individual research tanks are based on several factors that include the mass of specimens being held in a specific tank, the minimum turnover rates required to maintain high water quality for marine species, and dynamic water velocities that replicate the natural ocean conditions that particular organisms typically experience. Unlike typical aquaculture systems, MSC research projects do not involve significant animal biomass or unusually high densities; the lower densities represent a more natural condition and minimize unwanted stress upon the specimens being studied. Typically, a minimum turn-over rate of research tank water is approximately one to two times per hour. Thus, if a tank has a 400-gallon capacity the flow rate to that tank will be approximately 7 to 14 gpm while a 1,000 gallon tank would have a flow rate of approximately 16 to 32 gpm. Flow monitoring from March 2018 through January 2019 indicates that the current research at the MSC utilizes an average of 291 gpm. This use is expected to double once the CSI becomes operational.

Existing Discharge

Seawater discharged from the research tanks connect via a gravity flow network of underground PVC pipes that ultimately discharge through the single 15-inch reinforced concrete pipe on the south face of the Bathing Beach Seawall. Before seawater is discharged it comingles with stormwater runoff, a condition that seems to be a relic of the original system installed soon after the University acquired the property in 1967. Depending on the seawater demands of the campus research projects, the velocity in the outfall pipe ranges from approximately 2 to 3 feet per second (ft/sec). During a normal tide cycle the outfall discharge encounters the ambient cove water within a distance of approximately 30 feet at high tide and approximately 110 feet at low tide. The round cobbles on the beach are very dynamic, moving in and out depending upon wave and current actions and can seasonally accumulate to the top of the seawall after a large storm. When the cobbles pile up against the seawall the outfall water typically runs down thru the voids between the cobbles. To keep the outlet open NU periodically discharges a surge of water to displace the cobbles at the outlet. On occasion, typically after large storms, NU will use existing authorization from the Commission to remove the cobbles in front of the outfall pipe with a small excavator working from the top of the seawall.

Existing 15" Discharge Pipe at Seawall

Thermal Effects of Existing Discharge

MSC researchers tracked intake and discharge temperatures as well as ambient water temperatures throughout Bathing Beach Cove to Shag Rocks from March through November 2018. During that period, the average seawater flow rate was 248 gpm and the average temperature differential between ambient seawater at the intakes and seawater discharged onto Bathing Beach was 0.367 degrees Fahrenheit (F). Using these parameters, researchers utilized CORMIX Modeling software (an advanced information system that delivers a comprehensive analysis of regulatory mixing zones, including evaluation of critical ecological impacts) to attempt to model the effects of seawater discharged seawater on the surrounding waters. Using the actual measured flowrates and temperatures the CORMIX program was unable to produce any measurable results based on the negligible thermal effects within the Near Field Region. To create any measurable thermal plume in the waters of Bathing Beach Cove the modelers needed to insert a theoretical flow rate of 1,050 gpm (more than 4 times the observed average flow rate) and an anomalous 5.7° F temperature differential with the ambient Cove seawater temperature, into the CORMIX model. Those values far exceed any intended use of the proposed seawater system. NU has reviewed the data and modeling with DEP and EPA and there appeared to be agreement that the existing seawater system discharges were not adversely impacting the receiving

waters. NU continues to coordinate with those agencies regarding the proposed seawater system and its potential effects.

Since 1985, Dr. Ken Sebens (former MSC Director and now a member of the faculty at Friday Harbor Laboratories) has been monitoring the abundance of lobster (and other species) at three locations around East Point (Dive Beach), and inside and outside of Shag Rocks. Each year, lobster abundance was counted by SCUBA divers along 25 m x 1 m transects, a common approach to sampling of mobile benthic animals. Analysis of these data indicate that lobster abundance has not changed significantly over time at these sites. These data also show that there is considerable variability in lobster abundance over this 33-year period, with boom and bust years for lobsters. But there is no evidence of sustained long-term lobster decline, and no evidence of decline since renovations to the MSC seawater system in 2011.

b. Resource Areas

Coastal and Inland wetland resource areas in the vicinity of the proposed work include Land Under the Ocean (LUO) extending seaward from MLW, Coastal Bank (the seawall), Land Subject to Coastal Storm Flowage (LSCSF), Coastal Beach extending landward from MLW to the seawall, and a small wetland, identified by CLE Engineering, Inc., as a Bordering Vegetated Wetland located just east of the Edwards Laboratory. The BVW consists of a small basin depression dominated by common reed (*Phragmites australis*). The basin was reportedly used in the past as a seawater discharge area and a single 15-inch concrete pipe extends from the southwest corner of the wetland to the existing seawall adjacent to Bathing Beach. Although discharge flows to the wetland have ceased, the 15-inch pipe continues to serve as the discharge location for the seawater system. The 100-foot Buffer Zone associated with the Coastal Bank extends into the upland portion of the site. On the south side of the site CLE Engineering, Inc., classified the Coastal Bank as an area downgradient from the seawall adjacent to Bathing Beach; however, to maintain consistency with previous permit application filings for this site the Coastal Bank is herein presumed to be the seaward face of the seawall. The LUO has a rocky substrate that does not support eelgrass. Per MassGIS, the area is not mapped for shellfish suitability and is therefore not considered significant to the protection of land containing shellfish.

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map for this area (Map Number 25009C0541G, Essex County, MA, map revised July 16, 2014), the site is located entirely within Zone AE (coastal areas with a 1% or greater chance of annual flooding and an additional hazard associated with storm waves). The map indicates that the area in the vicinity of the seawall has a flood elevation of 15 feet. During review of the January ENF, CZM required the use of the FEMA's National Flood Hazard Layer 100-year elevation for this site. The NFHL 100-year elevation is 13 feet (Figure 4).

c. Other Environmental Considerations

According to information obtained from the Massachusetts Geographic Information System (MassGIS), no Potential or Certified Vernal Pools, Estimated Habitat of Rare Wildlife, Priority Habitat of Rare Species, Outstanding Resource Waters, DEP Eelgrass, or Areas of Critical Environmental Concern exists at or in the vicinity of the site. The waters off the beach are not mapped by the Division of Marine Fisheries (DMF) as a shellfish suitability area (Figure 4). According to mapping published by DMF, the shellfish growing area is prohibited, as shown in Figure 5.

IV. Proposed Activity

a. Proposed Seawater System

The proposed seawater system is an essential replacement of the existing system that, as described above, has significant limitations. The replacement seawater system is absolutely critical to sustain the marine life used in the research at the MSC and to support the MSC's current research operations. Following a complete reevaluation of the current and projected seawater research requirements, NU currently proposes a replacement intake system that will operate at 600 gpm, which represents a 75% reduction from the previously planned 2,400 gpm seawater capacity.

Replacement Intake System

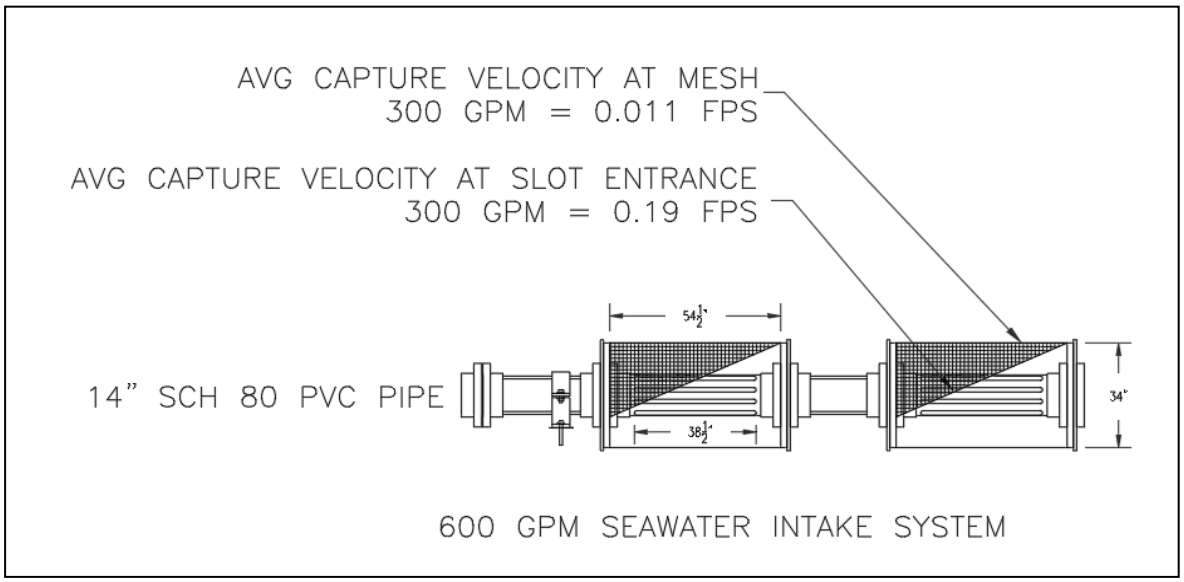
The replacement seawater intake system will consist of two (2) new 14-inch DR15.5 HDPE intake pipes that will extend approximately 410 feet from the seawall into Bathing Beach Cove to a point approximately 135 feet southeast of the existing intake lines. Due to the long pipe length from the pump house to the intake site, the intake pipes are oversized to compensate for the friction losses that result from even a small amount of biofouling growth to avoid the cavitation problems that the existing seawater pumps are experiencing. The new intake lines will be installed using horizontal directional drilling (HDD) installing the pipes beneath the existing seawall and under the beach to a location approximately 250 feet seaward of MLW where they will emerge onto the Cove bottom. This will protect the integrity of the existing stone seawall (regulated as Coastal Bank), avoid alterations to Coastal Beach, minimize alteration of LUO, and minimize construction impacts in buffer zone.

Intake Structure

The intake pipes will be secured to the Cove bottom using a combination of concrete ballast blocks with either helix anchors if the supporting substratum is sand, or stainless steel threaded rods that will be drilled and epoxied into the bedrock.

Depending on their exact location, which may vary slightly from plan due to actual conditions on the ocean floor, the pipes will be secured to the seafloor separately with individual ballast blocks 4-feet long x 3-feet 10-inches wide x 2-feet 9-inches thick (15.33 sf/block). Due to the location of the HDD exit hole, the pipes will only require a total of 2 ballast blocks, totaling approximately 30.6 square feet.

The new seawater intake structures will consist of two (2) Fiberglass Structural Cylinders that will support a ½-inch plastic mesh installed at the terminal end of each intake pipe and will be mounted on two (2) separate precast concrete pads. The pads will measure 27-feet x 10-feet (270 sf each), occupying approximately 540 sf of ocean bottom. The purpose of the ½-inch plastic mesh is to prevent larger suspended material from being drawn into seawater pumping system. The capture velocity at the surface of the plastic mesh is very low so that it does not capture any passing debris such as seaweed or plastic bags. At the interior of the intake system is a series of slots cut into a round pipe. The quantity and open area of the slots is designed to reduce the slot entrance velocity such that small fish and crustaceans that pass thru the ½-inch mesh can avoid being drawn into the seawater intake system by using their "escape velocity" (natural survival reflex that creates an accelerated burst to avoid being captured) to swim away from the intake slot.



Flow Rate gpm	Slot Capture Velocity ft/sec	Slot Capture Velocity @ 2" from Slot ft/sec	Capture Velocity at Mesh ft/sec
600	0.192	0.028	0.011

NU's initial calculation of lobsters **potentially** lost through the operation of the seawater system was based on a flow rate of 2,400 gallons per minute and 43.7 lobster larvae per 1,000 m^3 of seawater (the highest value found in the published literature). Hence, this approach likely overestimates adverse impacts of the system because it assumes that "in season" (May thru October) larval density around the intakes is always at peak, which is highly unlikely. This approach translated into an estimated mortality of 102,927 lobster larvae per year. The published estimated survival rate of a lobster from an egg to market

size is between 0.004% to 0.02%. Using the larger value of 0.02% results in a calculated loss of approximately 21 market sized lobsters per year at the 2,400 gpm seawater flow rate.

At the currently proposed 600 gpm flowrate, losses were calculated to be 25,732 lobster larvae or 5 market sized lobsters per year.

Month	Ambient Temp (F)	Anticipated Flow Rate gpm	Flow Rate ft^3/sec	Total Seawater ft^3/month	Total Seawater m^3/ month	Lobster Larvae Density #/m^3	Lobster Larvae Entrained Per Month
January	41.4	250	0.56	1,443,850	40,891	0.00	0
February	38.8	250	0.56	1,443,850	40,891	0.00	0
March	38.8	250	0.56	1,443,850	40,891	0.00	0
April	43.2	400	0.89	2,310,160	65,425	0.00	0
May	48	600	1.34	3,465,241	98,138	0.04	4289
June	58.1	600	1.34	3,465,241	98,138	0.04	4289
July	65.8	600	1.34	3,465,241	98,138	0.04	4289
August	67.5	600	1.34	3,465,241	98,138	0.04	4289
September	63.9	600	1.34	3,465,241	98,138	0.04	4289
October	57.9	600	1.34	3,465,241	98,138	0.04	4289
November	51.3	400	0.89	2,310,160	65,425	0.00	0
December	46.2	250	0.56	1,443,850	40,891	0.00	0
Yearly Totals				**31,187,166**	**883,239**		**25732**

Note: Lobster Larval Density used in the above calculation was 43.7 larvae/1000m^3 of seawater, the highest density found in the published literature.

Intake System Operations

The proposed alternating intake pipe operations allows NU to manage the biofouling without the use of chemicals by starving the biofouling organisms for oxygen and then promoting anaerobic bacteria to consume the balance of the organic material in the pipe before it is placed back into use prior the start of the new research season.

This replacement system is designed to accommodate and control biofouling so that consistent flows can be provided to the research tanks, during the research season – essentially April to October. A consistent and reliable flow of fresh seawater is needed to support the marine life and produce reliable research data. The research at Nahant is conducted to explore native and natural systems of the region, therefore the system is a flow through system with short resident times to retain natural water quality parameters in the research tanks / microcosms. That is reflected in Table 1 below which shows little difference between discharge and intake parameters.

Table 1. Compiled Water Quality Data

Analyte	Unit	Standard	Reportable Limit	Influent	Effluent	Delta	Influent	Effluent	Delta
				Day 1: April 8, 2019 – Low Tide			***Day 2: April 11, 2019 - Low Tide***		
BOD 5-Day	**mg/L**		2	BRL	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.49	0.46	-0.03	0.49	0.56	0.06
Total Nitrogen	**mg/L**		NA	<1.1	<1.1	-	<1.1	<1.2	0.1
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	6	28	22	BRL	BRL	-
Total Phosphorus	**mg/L**		0.005	0.022	0.024	0.002	0.018	0.024	0.006
Dissolved Oxygen	**mg/L**	? 6.0	1	9.2	9.1	-0.1	9.5	9.5	0
pH	**SU**	6.5-8.5	NA	7.69	7.63	-0.06	7.96	7.98	0.02
				Day 1: April 8, 2019 – Mid Tide			***Day 2: April 11, 2019 - Mid Tide***		
BOD 5-Day	**mg/L**		2	**BRL**	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.42	0.33	-0.09	0.47	0.24	-0.23
Total Nitrogen	**mg/L**		NA	<1.1	<0.93	-0.17	<1.1	<0.84	-0.26
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	8	18	10	3	5	2
Total Phosphorus	**mg/L**		0.005	0.021	0.015	-0.007	0.022	0.016	-0.005
Dissolved Oxygen	**mg/L**	? 6.0	1	9.2	9.2	0	10	10	0
pH	**SU**	6.5-8.5	NA	7.73	7.66	-0.07	8.05	8.04	-0.01
				Day 1: April 8, 2019 – High Tide			***Day 2: April 11, 2019 - High Tide***		
BOD 5-Day	**mg/L**		2	BRL	BRL	-	BRL	BRL	-
TKN	**mg/L**		0.6	BRL	BRL	-	BRL	BRL	-
Ammonia-N	**mg/L**		0.5	BRL	BRL	-	BRL	BRL	-
Nitrate-N/Nitrite-N	**mg/L**		0.01	0.31	0.16	-0.15	0.3	0.14	-0.16
Total Nitrogen	**mg/L**		NA	<0.91	<0.76	-0.15	<0.90	<0.74	-0.16
Oil & Grease Grab	**mg/L**		1	BRL	BRL	-	BRL	BRL	-
TSS	**mg/L**		1.5	6	10	4	BRL	14	+
Total Phosphorus	**mg/L**		0.005	0.02	0.022	0.002	0.022	0.024	0.002
Dissolved Oxygen	**mg/L**	? 6.0	1	9.5	9.5	0	8.9	9	0.1
pH	**SU**	6.5-8.5	NA	7.75	7.85	0.1	7.94	8	0.06

The replacement system is comprised of two 14-inch diameter intake pipes, an "A" line and a "B" line. The flows will be cycled between the two lines. See Figure 8 in Section 3 of the supporting materials - Progression of Biofouling in Seawater intake Pipes. Review of that figure shows that the A Line will approximately be in operation from April to October. During that period blue mussel spat, released in the spring, will be drawn into the pipe and start to grow and foul the pipe. In October, the biofouling will start to interfere with flow

and the intake will be switched to the B Line. Few blue mussel spat are released in the fall and therefore little biofouling will develop in the B Line throughout the later fall, winter, and early spring. Meanwhile in the A Line, with no water flow, the water in the intake will be become anoxic. This will cause die off of mussels and other life in the pipe. During the winter and spring, bacteria in the A Line will decompose the mussel's soft tissues (byssal threads) allowing the shells to release and slough off the sidewall. Before the A Line resumes operation the loose shells will be cleaned out. This system with two properly sized pipes will provide the consistent and reliable flows to the research facilities without resorting to chemical biofouling controls, or interrupting flows to mechanically clean the pipes during the research season.

Proposed Pump House

To accommodate this proposed 600 gpm seawater system, NU proposes to construct a new pump house to the south of the existing storage tank building, outside of the 100-foot buffer zone to LSCSF (a Bylaw resource area). The pump equipment will be housed in the basement level of this new building while the ground level will house the required mechanical/electrical equipment and a dive locker. The finished floor elevation of the proposed dive locker will be located approximately 3-feet 6-inches above the base flood elevation. To accommodate this design, overhead powerlines will be relocated, and a new pole will be installed at the northern edge of the new access road. Utilities to service the new building including gas, sewer, and water will be installed via connections to Swallow Cave Road to the northwest. Additionally, a new generator and transformer will be installed to the northwest of the new pumphouse. The building and utilities will be located entirely outside of all state and local resource areas.

As with the current system, the new seawater pumps will deliver seawater to the existing elevated seawater storage tanks.

To address sea level rise and coastal resiliency concerns the design team has considered flood mitigation and waterproofing from a building siting and material selection standpoint. As the design progresses specialty consultants will advise on the detailing of the building and will specify resilient materials to allow the structure to resist flood loads and protect building infrastructure.

Due to its location away from the main Edwards Lab, the pumphouse will be accessible via a new ADA path as well as a gravel fire access road. The road will connect to the existing access drive and extend west to the southern side of the pumphouse. The new road will be located within a previously disturbed area south of the greenhouse which is currently occupied by grass and sandy gravel that has been compacted by vehicular access. The design approach proposed here intends to comply with the regulations by making the pumphouse universally accessible while minimizing impacts to the floodplain and 100-foot buffer to the greatest extent possible.

Proposed Storage and Distribution

No changes are proposed to the existing seawater storage tanks and distribution lines.

Proposed Discharge

The seawater discharge will be collected in a new effluent collection chamber located northeast of the existing pump house and at the intersection of the existing access road and new access road. From this location the seawater will be discharged through a subsurface system that will extend into Bathing Beach Cove to a location approximately 200 feet from the face of the existing seawall. The discharge system will consist of two (2) 14-inch outside diameter HDPE outfall pipes with a series of offshore flow diffusers to ensure rapid mixing of discharged seawater and the receiving waters. Having two outfall pipes also serves to control the biofouling using a similar approach as the seawater intake system (i.e., by allowing one outfall pipe to be "active" while the other outfall pipe is inactive to produce anoxic conditions). As with the intake pipes, the discharge pipes will be directionally drilled under the seawall and beach and will emerge approximately 50 feet seaward of mean low water. The discharge pipes will be secured to the Cove bottom in the same manner as the seawater intakes by using concrete ballast blocks to prevent pipe movement from waves and currents. The eight concrete ballast blocks will occupy approximately 123 sf of area on the cove bottom. The flow diffusers will consist of flanged reducing tees that can be capped by using PVC blind flanges to control biofouling thru the anoxic process.

Thermal Effects of Proposed Discharge

Utilizing a 3-Port subsea discharge diffuser configuration, NU ran the CORMIX model using a theoretical discharge flow rate of 1050 gpm with temperature differential of +5.7 degrees F relative to the receiving ambient Bathing Beach Cove waters. These values were used because a viable model could not be produced using the real parameters consistent with the proposed system. The results showed an immediate dissipation of the temperature differential between the discharge temperature and the receiving Cove water. Again, the maximum proposed flow rate will be 600 gpm, and the average calculated temperature differential over the 10-month study was 0.367 degree F. Based on these values the proposed seawater discharge will not have an adverse thermal effect on the Cove waters.

Construction Methods

Horizontal Directional Drilling (HDD) consists of three phases: pilot hole, reaming, and pullback. Pilot hole drilling is a critical phase of the project. It determines the ultimate position of the installed pipe. A 7-½ inch diameter drill bit will be powered by a downhole mud motor which uses the pressure and flow from the mud pump to penetrate the rock. A prescribed entry point at a predetermined angle, typically between 12-14 degrees. The entry angle is selected to optimize the drill path while accommodating surface completion requirements. The drill string is then advanced joint by joint by using the pushing, rotation and drilling fluid forces of the drill rig and the downhole mud motor. The mud motor is

manufactured with a 2- degree bend in the housing which allows for the directional control when steering corrections are needed along the proposed drill path. At the completion of each joint, the location of the gyro is obtained by taking a survey of its location which is transmitted to the surface via a wireline, this information is then used to calculate how the bit should be steered for the next length (or joint) of pipe. It is recommended that readings be taken at least every 15 feet. More frequent readings may be required due to changes in subsurface drilling conditions. A computer program is used to continually adjust the drill path based on real- time as-built information that is collected and evaluated each time a survey is taken. Real- time analysis and adjustment of the drill path ensures that the pipe will be placed accurately per the specifications while avoiding subsurface obstructions and responding to changing drilling conditions caused by natural or man-made properties of the subsurface soils. Because the project will be exiting into the ocean, drilling will stop prior to exiting the rock. At what depth and location has yet to be determined, the actual elevation of the rock must be known to determine the stopping point. The drill string will then be extracted from the bore hole and related tooling will be removed so that reaming can commence.

Push Reaming: For this project, this reaming method has been selected to limit the amount of drilling fluid entering the ocean. The reamer is pushed down the hole rather than pulling it back to the drill rig. In general, the final wellbore diameter should be at least 1.5 2 times the outside diameter of the pipe completion material. This is necessary to allow for an annular void for the return of drilling fluids and cuttings and to allow for the bend radius of the completion material. This rule of thumb is subject to adjustments based on subsurface soil conditions. Depending on the size of the desired final wellbore and the subsurface soil conditions. The reaming will take several reaming passes to achieve the required diameter of 24 to 26 inches. The number of intermediate passes will be determined by the hardness of the rock, the harder the rock will require additional passes.

Pushout into Ocean: Once most of the bore hole has been prepared to the required size a centralizing reamer and drill bit will used to drill the last few feet of rock. Once the bit has broken through the rock the process above will be repeated until it has been exited into the ocean sea floor.

A gravity cell (oversized trench box) will be installed at the exit point to confine drilling fluids and prevent release into the water column. The fluids are denser than water and therefore sink to the bottom within the gravity cell.

Pullback: Once the drilled hole is enlarged, the pipe can be pulled back into the reamed hole filled with drilling fluid. The pipe material will be assembled completely on land and then floated out to the exit location. Once in place the pipe will then be filled with sea water and hooked to the reamer and swivel by divers. The swivel is used to prevent rotational torque from spinning the pipe. A reamer is also placed between the pulling head and the drill string to ensure that the hole remains open and to allow additional lubricating and stabilizing drilling fluid to be pumped into the hole during the pullback. The pullback operation continues until the pipe is at the surface at the drill rig.

Wellbore Tracking and Field Adjustments: The path of the pilot bore will be guided by a third-party company called Prime Horizonal from Houston, TX. A gyro tool has been selected at this time which eliminates the need for a coil which is required for a normal magnetic tool.

b. Proposed Stormwater Management

Stormwater management for the increase in impervious surface associated with the new pumphouse will be required at the site. As detailed in the Stormwater Report prepared by Nitsch Engineering, included as Section 14, the proposed stormwater management system includes an infiltration trench system to infiltrate runoff into the ground and control runoff rates.

c. Resource Area Impacts

Due to the nature and location of the work, resource area impacts are unavoidable, but have been minimized to the extent practicable. The proposed pump house building and utility connections are located in uplands, greater than 100 feet from the limit of LSCSF, i.e., outside of all state and locally regulated buffer zones and resource areas, respectively.

Work in resource areas and buffer zones are summarized in Table 2 and Table 3 below. These are quantified separately for WPA and Bylaw because this replacement project is: (1) being reviewed pursuant to both laws, and (2) to avoid confusion by mixing the impacts.

Table 2. Summary of Work in WPA Resource Areas and Buffer Zones

Resource Area / Review Area	Activity	Area (s.f.)	Temporary or permanent
Land Under the Ocean	Seawater Intakes	540	Permanent
	Seawater Discharges	270	Permanent
Total LUO		***810***	
LSCSF	Gravel Drive (portion)	230	Permanent
	Effluent Chamber	75	Permanent
Total LSCSF		305	
100-ft Buffer Zone to BVW and Coastal Bank	Gravel Drive (portion)	1,510	Permanent
	Paved Walkway (portion)	180	Permanent
	Trench Drain (portion)	80	Permanent
	Electrical Transformer	50	Permanent
	HDD operations	600	Temporary
Total WPA BZ		*2,420*	

Table 3. Summary of Work in Bylaw resource Area and Buffer Zones

Resource Area / Review Area	Activity	Area (s.f.)	Temporary or permanent
Land Under the Ocean	Seawater Intakes	540	Permanent
	Seawater Discharges	270	Permanent
Total LUO		***810***	
LSCSF	Gravel Drive (portion)	230	Permanent
	Effluent Chamber	75	Permanent
Total LSCSF		305	
100-ft Buffer Zone to BVW and Coastal Bank	Gravel Drive (portion)	1,510	Permanent
	Paved Walkway (portion)	180	Permanent
	Trench Drain (portion)	80	Permanent
	Electrical Transformer	50	Permanent
	HDD operations	600	Temporary
Total WPA BZ		*2,420*	
100-ft Buffer Zone to LSCSF	Portion of Gravel Access Road	655	Permanent
	Portion of paved walkway	60	Permanent
	Portion of Trench Drain	25	Permanent
	Portion of handicap accessible parking space	60	Permanent
Total Bylaw BZ		*800*	

Using HDD methods to install the pipes avoids altering Coastal Bank and Coastal Beach and minimizes alteration of Land Under the Ocean. Alteration of approximately 810 square feet of LUO is associated with the placement of the intake and outfall pipes, ballast blocks and intake structure pads to secure the pipes. These impacts will be partially offset by removing the anchor blocks along the existing intake lines, which total approximately 175 square feet, resulting in a net change LUO of 635 sf.

As described, impacts to the Coastal Beach and Bank have been avoided entirely by the use of horizontal directional drilling to install the intake and effluent pipes. No impacts to the BVW are required.

A total of 305 square feet of impacts to LSCSF will result from the construction of a gravel access road and effluent chamber, as described in the pumphouse section above. These impacts have been minimized to the extent possible while still fulfilling the goals of the project.

Activity will occur within approximately 2,420 square feet of the 100-foot WPA buffer zone associated with the BVW and coastal bank. Approximately 1,820 square feet are permanent impacts resulting from the construction of the new walkway and trench drain at the southern end of the Edwards Laboratory and the placement of a new gravel fire access road, ADA parking space, and transformer at the pumphouse. The remaining impacts are temporary in nature and will result from HDD activities.

The 2,420 square feet within the 100-foot WPA buffer also fall within the 100' LSCSF local bylaw buffer. An additional 800 square feet of permanent impacts associated with the activities described above will occur within the 100-foot LSCSF buffer only.

d. Agency Review Comments

Three state agencies provided comment letters in response to the Draft Environmental Impact Report (DEIR) and Final Environmental Impact Report (FEIR) regarding the proposed project submitted on behalf of Northeastern University in November of 2019 and March of 2020. The following comments provided by state agencies are transcribed below followed by responses:

Massachusetts Office of Coastal Zone Management (CZM)

"A description of how work to remove the existing and former intake pipes and associated infrastructure from the beach and near shore areas will be conditioned to ensure protection of the resource area during removal should be provided."

The ballasting subcontractor will remove and recover the existing pipes and ballast blocks using a combination of underwater hydraulic saws and a crane. The exposed pipe will be removed completely or until it is 2 feet below the natural sea floor.

"Existing and proposed conditions plans at a reasonable scale that clearly depict the proposed project relative to the regulated resources on the site, including the extent and location of project components and resource areas, should be provided in order to facilitate review of potential resource impacts…..As each resource area has different standards, a clear breakdown of the boundaries of each and the associated impacts from project components is necessary to determine that the project minimizes impacts to each."

A full set of engineering plans is included in this NOI submission as Section 15. Resource area impacts and applicable regulatory compliance are described in sections IV and IIV of the narrative.

"As noted in the study conducted for the Coastal Resiliency Grant Project, the volume of sediment at Canoe Beach is depleted such that minor to moderate storms have caused overwash onto and undermining of Nahant Road in the past. Because predicted sea level rise and more significant and frequent coastal storms could jeopardize the sewer line over time, a more detailed vulnerability analysis that includes an eroded profile assessment

should be conducted before plans to locate the sewer in this roadway are finalized to determine whether the projected lifespan of the sewer line in this location meets the goals of the project and minimizes potential impacts to the adjacent coastal resource areas…Given the vulnerability of the road to moderate and major coastal storms discussed above, NU should reconsider the feasibility of moving the sewer line out of the velocity zone in the future and consider moving forward with the mixed sediment nourishment at Canoe Beach in the short term to reduce impacts from coastal storms to the site."

This comment is not applicable to the seawater system project. Canoe Beach is located on the north side of the property outside of the proposed project limits.

"The proposed project is subject to CZM federal consistency review and must be found to be consistent with CZM's enforceable program policies."

Noted. The proposed project is not anticipated to impact coastal resources other than those addressed above. CZM review is part of the federal permitting process and will be coordinated with the USACE permit application review process.

Massachusetts Division of Marine Fisheries (DMF)

An email dated April 20, 2020 states all DMF comments submitted in response to the DEIR were addressed in the FEIR and the agency has no further comments at this time.

Massachusetts Department of Environmental Protection's (MassDEP)
Surface Water Discharge Permitting Program

Verification of intake velocity. ***"****EPA recommends a standard intake velocity no greater than 0.5 feet per second (fps) to ensure that the majority of aquatic organisms can avoid becoming trapped against intake screens. See, for example, 40 C.F.R. §§ 125.94(c)(2) and (3). The intake velocity has been calculated at 0.011 fps, well below the 0.5 fps standard. MassDEP requests that Northeastern verify the velocity if and when the proposed intake becomes operational. Northeastern has indicated in the FEIR that "[Northeastern] will verify these velocities upon operation of the new system." Northeastern also noted "(i)t may not be technically feasible to measure such low water velocities (0.011 feet per second) in the open ocean environment; however, the University will research and attempt to confirm the velocities. One means to evaluate and determine the velocity at the intake screens is to monitor the flow rate pumped by the seawater pumps with a flow meter. If the seawater flow meter is less than 600 gpm, the intake velocity will be well below the MassDEP limit of 0.5 FPS." MassDEP and EPA will work with Northeastern to ensure that the velocity verification method is acceptable."*

As shown above in Section IV a. the modeled slot inlet velocity is less than 0.5 fps.

Regarding NU's Best Practices for Seawater Use: *"MassDEP reiterates approval of this*

approach and believes that the Best Practices for Seawater Use should continue to be a "living" document that is maintained and updated by the SAC over time. Oversight of research conducted at the facility by the SAC is important and must be considered a priority by Northeastern"."

Noted. NU's Seawater Advisory Committee (SAC) will maintain and update this document as needed.

Temperature of the discharge (emphasis added). "The waters of Bathing Beach Cove are classified by MassDEP as SA. According to the Massachusetts State Water Quality Standards (SWQS), discharges to SA waters "Shall not exceed 85°F nor a maximum daily mean of 80°F and rise in temperature due to a discharge shall not exceed 1.5°F" (314 CMR 4.05(4)(a)(2)). The average temperature differential calculated by Northeastern during March through October 2018 was +0.367°F. Since Northeastern is no longer proposing to use seawater to cool the proposed new CSI building, the temperature differential should be similar to the current conditions and therefore it is not anticipated that the discharge from the flow-through seawater system would violate the Massachusetts SWQS. MassDEP had requested that Northeastern provide more information on sources of temperature increases. Northeastern explained in the FEIR that "researchers may elevate water temperatures by two or three degrees Celsius to represent future predicted increases in sea surface temperatures." The FEIR also explains that "(b)efore seawater is discharged back into the ocean it will pass through an energy recovery heat exchanger that helps to further reduce any temperature differential of the effluent. The energy recovery heat exchanger also significantly reduces the energy consumption of the CSI facility, making it more sustainable and energy friendly." Based on previous information provided to the Agencies as well as this additional new information, ***the Agencies maintain that the proposed discharge would not exceed the Massachusetts State Water Quality Standards for SA waters for temperature****. The FEIR states that "[Northeastern] is also committed to conducting additional temperature sampling CORMIX model runs once the new system is operational." Temperature data and modeling results should be made available to the public on an easily accessible website."*

Modeling. "MassDEP requested in previous comment letters that Northeastern conduct additional temperature sampling and CORMIX model runs if and when the new discharge is operational. As mentioned above, Northeastern has agreed to conduct this additional modeling as well as collect additional temperature data once the new system is operational."

As documented above in section III, monitoring of inlet and discharge temperatures have documented a 0.367 degree difference. Cormix modeling require a minimum temperature differential of 5.7 degrees F to show any thermal effect in the receiving waters. thus, the discharge will not have an effect of ambient temperatures of the receiving waters.

V. Regulatory Compliance

The following section reviews and documents compliance with the WPA and Bylaw.

The WPA Regulations at 310 CMR 10.01(2) state that the purpose of the Regulations is to establish a decision-making process to regulate activities in resource areas to protect the eight interests of the WPA. Similarly the Bylaw was established to regulate activities in resource areas to protect the resource area values (interests) as identified in the Bylaw.

As described in 310 CMR 10.21 the performance standards are established to protect the characteristics of the resource areas and thus identify the level of protection needed to protect the interests of the WPA and that section reads in part:

> *"... The Preamble identifies the interests of M.G.L. c. 131, § 40 to which that resource is or is likely to be significant and describes the characteristics or factors of the resource which are critical to the protection of the interest to which the resource is significant. 310 CMR 10.21 through 10.37 are in the form of performance standards and shall be interpreted to protect those characteristics and resources to the maximum extent permissible under M.G.L. c. 131, § 40.*
>
> *The performance standards are intended to identify the level of protection the issuing authority must impose in order to contribute to the protection of the interests of M.G.L. c. 131, § 40. ..."*

In summary 310 CMR 10.21 means that when a project meets the performance standards it is presumed to adequately protect the applicable interests of the WPA. The materials presented in this NOI are submitted to the Commission to document that the proposed project complies with the Regulations and therefore adequately protects the interests of the WPA.

The Bylaw Regulations do not have a corollary statement to 310 CMR 10.21; however, the only resource area for which performance standards are established is LSCSF, which are presented in Section V. Land Subject to Coastal Storm Flowage. Whereas that section follows the framework of the WPA Regulations with a preamble, presumption and performance standards, one can imply, similar to 310 CMR 10.21, that when a project meets the performance standards in Section V. C. 1-8 that the project is presumed to adequately protect the values associated with LSCSF.

WPA Regulation Review

310 CMR 10.25 – Land Under the Ocean

The project will result in the alteration of approximately 810 square feet of Land Under the Ocean to install the replacement intakes and discharges and will remove approximately 175

square feet of existing ballast block and piping, resulting in a net alteration of 635 square feet of LUO. Performance standards at 310 CMR 10.25(3) through (7) for LUO are discussed below.

310 CMR 10.25 (3) pertains to improvement dredging for navigational purposes and is therefore not applicable to this project.

310 CMR 10.25 (4) pertains to maintenance dredging for navigational purposes and is therefore not applicable to this project.

310 CMR 10.25 (5) *Projects not included in 310 CMR 10.25(3) or (4) which affect nearshore areas of land under the ocean shall not cause adverse effects by altering the bottom topography so as to increase storm damage or erosion of coastal beaches, coastal banks, coastal dunes, or salt marshes.*

The placement of intake and discharge pipes will not cause adverse effects relating to storm damage or erosion of coastal features.

310 CMR 10.25 (6) Projects not included in 310 CMR 10.25(3) which affect land under the ocean shall if water-dependent be designed and constructed, using best available measures, so as to minimize adverse effects, and if non-water-dependent, have no adverse effects, on marine fisheries habitat or wildlife habitat caused by:

(a) alterations in water circulation;

The seawater intake system is water dependent by nature. The existing system takes in and discharges seawater into the bay. The replacement system is designed with the best available measures including a slotted intake structure to reduce intake velocity below 0.5 fps, and a diffuser discharge to maximize rapid mixing with the receiving waters. These design features and the locating of both the intake and discharge pipes into deeper waters will result in no adverse effect to the receiving waters or habitat.

(b) destruction of eelgrass (Zostera marina) or widgeon grass (Rupia maritina) beds;

All proposed work is located outside of any mapped areas of eelgrass or widgeon grass. A dive survey confirmed that these grasses are not present in the project area (see NOI Section 7).

(c) alterations in the distribution of sediment grain size;

The placement of intake and discharge pipes will not have an effect on the distribution of sediment grain size.

(d) changes in water quality, including, but not limited to, other than natural fluctuations in the level of dissolved oxygen, temperature or turbidity, or the addition of pollutants; or

As described in earlier sections, the average change in ambient seawater temperature is anticipated to be approximately 0.367° F, depending on flow and time of year. These changes in temperature were quantified by the CORMIX Model, which determines temperature changes based on parameters of the proposed system. Based on this model, the proposed seawater discharge will not have an adverse thermal effect on the Cove waters. Additionally, in MassDEP's response letter to the FEIR, *"the agencies maintain that the proposed discharge would not exceed the Massachusetts State Water Quality Standards for SA waters for temperature."*

(e) alterations of shallow submerged lands with high densities of polychaetes, mollusks or macrophytic algae.

Based on benthic survey of the proposed project area, it is unlikely that disruption of the benthic community as a result of the project will have long-term or broad-scale impact on seafloor biota.

310 CMR 10.25 (7) Notwithstanding the provisions of 310 CMR 10.25(3) through (6), no project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

According to the current MassGIS data layers for Estimated and Priority Habitat reviewed through the OLIVER data viewer on March 25, 2019, there is no mapped rare species habitat in the project area.

Land Subject to Coastal Storm Flowage

LSCSF is defined at 310 CMR 10.04 as, "… land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater. While the Regulations do not presently include any presumptions of significance or performance standards for LSCSF, it is presumed that LSCSF is significant to the interests of storm damage prevention and flood control.

A summarized above in Table 2, the majority of work in LSCSF is temporary with the work are being restored to pre-construction conditions. The gravel access will be established at existing grade to yield no change in site grades. Because there is no change of topography, the work in LSCSF will have no adverse effect of flood control or storm damage prevention.

Nahant Wetlands Protection Bylaw Regulations Section V, LSCSF

A portion of the proposed work will alter less than 5,000 square feet of Land Subject to Coastal Storm Flowage. In accordance with the Nahant Wetlands Protection Bylaw, the applicant hereby requests a variance to allow work to proceed.

Bylaw Regulations Section V. C. 1 - 8 identify the following performance standards established for work in LSCSF, and those are reviewed below.

1. Reduction in the ability of the land to absorb and contain waters.

As the only impervious surface proposed within LSCSF is an 8-foot x 10-foot effluent collection chamber and a small portion of gravel access road, the proposed work will not reduce the lands ability to absorb and contain waters. The proposed stormwater management system includes infiltration trenches to compensate for any diminished soil absorption within and outside of LSCSF (and LSCSF buffer zone). The Nitsch stormwater report and project plans submitted with the NOI demonstrate that the stormwater infiltration standard is met. Therefore, ability of the landform to absorb stormwater will not be diminished.

2. Reduction in the ability of the land to buffer more inland areas from flooding and wave damage.

The proposed work will not limit the ability of the land to buffer inland areas from flooding and wave damage. The proposed pumphouse is located entirely outside of floodplain and its associated local buffer; therefore, it is protected from flood damage and will not contribute to storm damage.

3. Displacement or diversion of flood waters to other areas.

The proposed impervious surfaces within mapped floodplain are limited to an effluent collection chamber and small portion of a gravel access drive; these features will not increase the horizontal or vertical extent of flooding. Given that the floodplain on the site is coastal floodplain (infinitely large surface area), this small volume of material will not result in a measurable increase in the vertical or horizontal extent of flooding.

4. Damage to other structures or property.

As discussed, because the pumphouse is located outside of mapped floodplain and its associated local buffer, flood waters are not anticipated to be diverted to other structures, causing damage.

5. Pollution of groundwater, surface water, or salt water.

The purpose of the MassDEP Stormwater Management Standards is to control stormwater quantity and quality to avoid flooding and protect the quality of receiving waters. Compliance with the Stormwater Standards is presumed to adequately protect receiving water quality. As demonstrated in the Stormwater Report filed with the NOI, the Standards are met; therefore, the project is presumed to avoid pollution of ground water, surface water and salt water. As a practical matter, the NEU campus uses salt water from the cove for experiments and has a vested interest in protecting the quality of the waters off Nahant and therefore they seek to meet all applicable pollution prevention standards to protect the integrity of salt water used in scientific research.

6. Reduction of the ability of the resource to serve as a wildlife habitat and migration corridor through activities such as, but not limited to the removal of substantial vegetative cover and/or installation of fencing and other structures which prevent wildlife migration across property.

The work area is previously developed and does not provide substantial wildlife habitat or migration corridor. Temporary construction fencing will be installed around active work zones during construction, but no proposed permanent structures will inhibit wildlife migration across the property.

7. An increase in the elevation or velocity of flood waters.

As previously described, the new pumphouse is located outside of the LSCSF and no above grade structures or fill are proposed in the LSCSF that would divert flood flows or concentrate flows leading to increased flood flow velocity.

8. Prevention of the migration of resource areas such as salt marshes due to sea level rise.

The proposed work will not prevent the migration of resource areas due to sea level rise. Due to the lack of salt marsh vegetation and the existing seawall and rocky coastal beach with little to no vegetation in the adjacent Land Under Water, it is unlikely a salt marsh would establish itself in the location, regardless of the proposed project.

VI. Summary

This NOI seeks approval pursuant to the WPA and Bylaw to replace the existing seawater system at the MSC. The seawater system is a critical life support system for the marine life in research tanks and a properly functioning seawater system is needed to support the marine life and produce valid research results. Project elements located in resource areas and buffer zones are limited to the:

- intake and discharge structures (LUO),
- seawater effluent chamber (LSCSF),
- electrical transformer (buffer zone),
- one new utility pole, (buffer zone),
- easterly portion of gravel access drive (buffer zone), and
- easterly portion of walkway (buffer zone).

Temporary construction-period activities are limited to;

- HDD operations (LSCSF & buffer zone), and
- Trenching to extend pipes from HDD entry points to the pump house and effluent chamber.

The temporarily disturbed work zones will be restored to pre-existing grades and the soils will be stabilized to match pre-construction conditions.

As part of this replacement project the university will remove the existing direct laid seawater system intakes pipes and ballast blocks from the Coastal Beach and LUO.

As demonstrated in this NOI and supporting materials this replacement project is designed to avoid and minimize work in resource areas to the maximum extent practicable. Major elements to avoid and minimize resource area impacts include:

- siting the replacement pumphouse outside of all resource areas and buffers zones,
- siting construction access areas and associated support areas outside of resource areas,
- using HDD technology to avoid altering Coastal Bank, Coastal Beach and minimizes unavoidable alteration of LUO.

As described above, the project meets the WPA performance standards established for LUO, as well as the local bylaw performance standards for LSCSF. Therefore, Northeastern University respectfully requests an Order of Conditions authorizing this replacement seawater intake system to proceed with pragmatic conditions appropriate to protect the interests of the Act and the resource area values of the Town Bylaw.

Site Photographs

Photo 1: Existing seawater intake pipes.

Photo 2: Existing seawater effluent pipe at seawall.

Photo 3: Proposed pumphouse location behind existing tanks and left of storage tank building

Photo 4: Example of biofouling that can occur within intake pipes

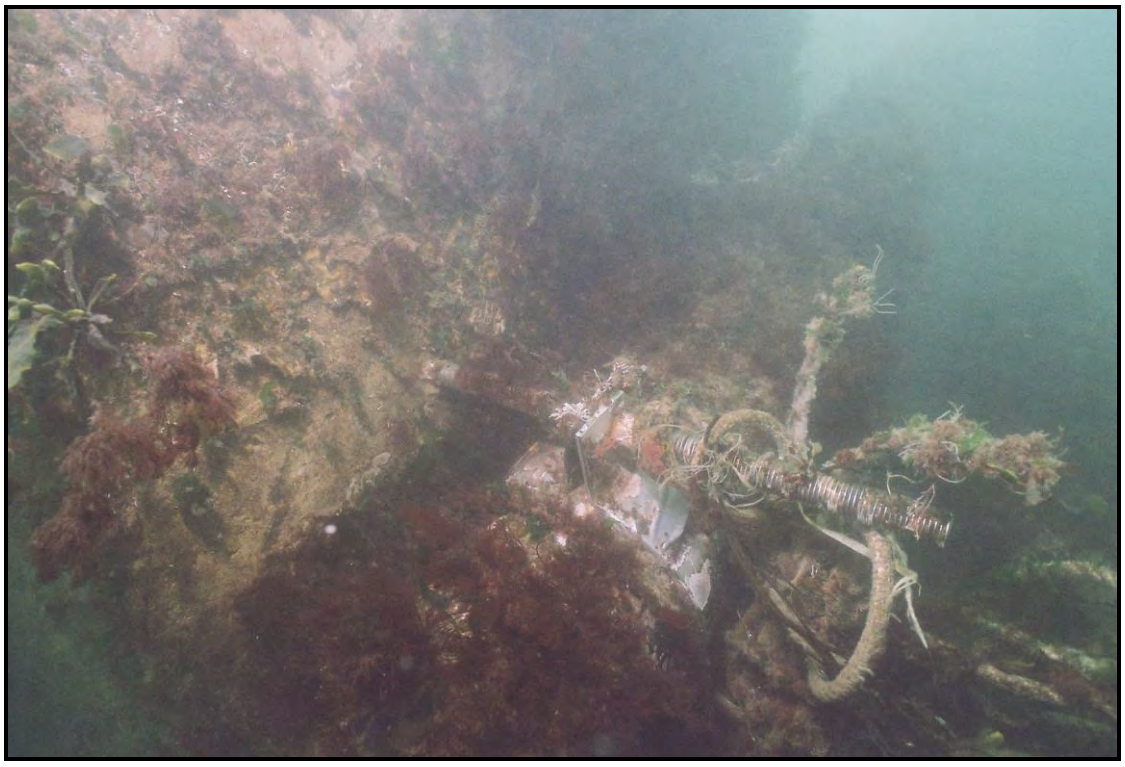


Photo 5: View of intake pipe anchored to concrete ballast block.

Photo 6: View of intake box screen

Wetland Delineation Documentation

SECTION 6

July 31, 2020

Email [JAbramson@payette.com]

Jeffrey Abramson
Payette
290 Congress Street, 5th Floor
Boston, MA 02210

Re: Wetland Resource Area Analysis Report [LEC File #: P\17-313.02.02]
Northeastern University—Coastal Sustainability Institute
430 Nahant Road (Map 1B, Lot 1)
Nahant, Massachusetts

Dear Mr. Abramson:

LEC Environmental Consultants, Inc., (LEC) conducted multiple site evaluations to identify and characterize Wetland Resource Areas protected under the *Massachusetts Wetlands Protection Act* (*WPA*; M.G.L. c. 131, s. 40), its implementing *Regulations* (310 CMR 10.00), and the Town of Nahant *Wetland Protection Bylaw* (Article 17) and associated *Rules and Regulations* located on the above-referenced subject parcel. Protectable Land Under the Ocean, Coastal Beach, Rocky Intertidal Shores, Coastal Bank, Land Subject to Coastal Storm Flowage (LSCSF), Bank (Inland), and Bordering Vegetated Wetlands (BVW) are located on the subject parcel.

The following report provides a description of the Existing Conditions and Wetland Resource Areas, including wetland boundary definitions/determination methodologies, as depicted on the *Wetland Resources Area Plan (Existing Conditions)*, prepared by Nitsch Engineering, Inc., dated July 31, 2020.

Existing Conditions

The 20.4± acre site is located at the easterly terminus of Nahant on East Point (attached). The Northeastern University Marine Science Center is situated within the western portion of the property, accessed off Nahant Road to the northwest. Swallow Cave Road abuts the property to the west, while the Town-owned Lodge Park abuts the property to the east, at the tip of East Point. The Northeastern University Marine Science Center is composed of a main laboratory building (Edwards Laboratory) and several smaller support buildings to the north and south, situated between the West and East (Murphy) Bunkers associated with former Fort Ruckman. Research and educational spaces are currently housed within a portion of the East Bunker. A small parking area, paved access drives, and lawn area containing a former ice house occur east of the main laboratory buildings.

Canoe Beach and Bathing Beach are located north and south, respectively, of the campus buildings. A shoreline protection project was implemented on Canoe Beach following issuance of an Order of Conditions (DEP File #047-0529) on October 6, 2016, involving beach nourishment and creation of an artificial Coastal Dune. Remaining portions of the 3,500± linear feet of ocean frontage are largely characterized as Rocky Intertidal Shores and Coastal Bank. BVW (Freshwater Wetland) is located north of Bathing Beach.

The West and East Bunkers and upland located east of the East Bunker are dominated by invasive species, including Morrow's honeysuckle (*Lonicera morrowii*), multiflora rose (*Rosa multiflora*), and autumn olive (*Elaeagnus umbellata*) shrubs and Asiatic bittersweet (*Celastrus orbiculata*) entanglements. Three (3) distinct stands of invasive Japanese knotweed (*Fallopia japonica*) occur within the eastern portion of the property, while invasive garlic mustard (*Alliaria petiolata*) intermittently occurs on the East Bunker. Invasive Norway maple (*Acer platanoides*) and black locust (*Robinia pseudoacacia*) trees/saplings occur sporadically with mature hardwood tree growth more prevalent on the East Bunker, most notably the west-facing slope. Native vegetation is primarily limited to sporadic black cherry (*Prunus serotina*) and eastern red cedar (*Juniperus virginiana*) along with variably-sized patches of staghorn sumac (*Rhus typhina*) amongst the encroaching invasive species. Non-native crab apple (*Malus* spp.) are also intermittently dispersed throughout, while a cluster of Japanese black pine (*Pinus thunbergii*) trees occur immediately east of the East Bunker. An early successional habitat pocket is located east of the Japanese black pine cluster and occupied by various grasses and scattered autumn olive, multiflora rose, staghorn sumac, and Asiatic bittersweet.

Similar vegetation also encompasses the majority of the West Bunker.

Floodplain Designation

According to the July 16, 2014 FEMA Flood Insurance Rate Map (FIRM) for Essex County (*Community Panels 25009C0542G* and *25009C0541G*) and associated Letters of Map Revisions (LOMR's) dated July 7, 2017 and December 29, 2017, Zone AE and Zone VE extend onto the property. Zone VE are defined as a *Coastal flood zone with velocity hazard (wave action)*, whereas Zone AE are *Special Flood Hazard Areas (SFHAs) Subject to Inundation by the 1% annual chance flood*.

Zones VE (El. 31 & El. 18) occur along the northern shoreline, including portions of Canoe Beach. Zone AO (Depth 3 feet) extends southerly from Zone VE (El. 18) through the central lawn area between the campus buildings and the East Bunker, connecting to Zone AE (El. 13) that extends northerly from Bathing Beach. Zone VE (El. 17) occurs around Bathing Beach, while Zone VE (El. 18) extends around remaining portions of the southerly coastline. Zone VE (El. 27) occurs along the easterly portion of East Point. Remaining (interior) portions of the site are mapped as X, *Areas determined to be outside the 0.2% annual chance flood*.

All Flood Zones are depicted on the *Wetland Resources Area Plan (Existing Conditions)*, prepared by Nitsch Engineering, Inc., dated July 31, 2020.

Natural Heritage and Endangered Species Program Designation

According to the 14th edition of the *Massachusetts Natural Heritage Atlas* (effective August 1, 2017) published by the Natural Heritage & Endangered Species Program (NHESP), the site is not located within *a Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife.* The MassGIS NHESP data layers do not depict any Certified or Potential Vernal Pools on or immediately proximate to the site.

Area of Critical Environmental Concern

The site is not located within an Area of Critical Environmental Concern (ACEC).

Wetland Resource Areas

The following provides the regulatory definitions and descriptions of Land Under the Ocean, Coastal Beach, Rocky Intertidal Shores, (artificial) Coastal Dune, Coastal Bank, LSCSF, and BVW located on-site. Land Under the Ocean, Coastal Beaches, Rocky Intertidal Shores, Coastal Dunes, and Coastal Banks are considered "Coastal Wetlands" under the *WPA Regulations* and the *Bylaw*, while BVW and Bank (Inland) are characterized as an "Inland Wetlands" under the *Act Regulations* and BVW as a "Freshwater Wetlands" under the *Bylaw*.

Additional Resource Areas may be associated with the coastal waters surrounding East Point (e.g., Land Subject to Tidal Action, and/or Land Containing Shellfish).

Land Under the Ocean

According to the *WPA Regulations* at 310 CMR 10.25(2), Land Under the Ocean *means land extending from the mean low water line seaward to the boundary of the municipality's jurisdiction and includes land under estuaries.* The *Bylaw* and *Bylaw Regulations* do not define Land Under the Ocean.

Land Under the Ocean is associated with the coastal waters surrounding East Point, extending below Mean Low Water.

Coastal Beach

According to the *WPA Regulations* at 310 CMR 10.27(2), Coastal Beach *means unconsolidated sediment subject to wave, tidal and coastal storm action which forms the gently sloping shore of a body of salt water and includes tidal flats. Coastal beaches extend from the mean low water line landward to the dune line, coastal bankline or the seaward edge of existing human-made structures, when these structures replace one of the above lines, whichever is closest to the ocean.* The *Bylaw* and *Bylaw Regulations* do not define Coastal Beach.

Coastal Beach is associated with Canoe Beach and Bathing Beach and a small cove ("Dive Beach") northeast of the North Battery (East Bunker). These Coastal Beaches are primarily dominated by mixed

cobble at varying sizes. Canoe Beach also contains mixed sand along with cobble from the approved shoreline protection project.

Rocky Intertidal Shores

According to the *WPA Regulations* at 310 CMR 10.31(2), Rocky Intertidal Shores *means naturally occurring rocky areas, such as bedrock or boulder-strewn areas between the mean high water line and the mean low water line*. The *Bylaw* and *Bylaw Regulations* do not define Rocky-Intertidal Shores.

Outside of the aforementioned Coastal Beaches, the shoreline of East Point is dominated by Rocky Intertidal Shores composed of bedrock, boulders, and tidal pools.

Coastal Dune

Coastal Dunes are defined in the *WPA Regulations* at 310 CMR 10.28(2) as *any natural hill, mound or ridge of sediment landward of a coastal beach deposited by wind action or storm overwash. Coastal dune also means sediment deposited by artificial means and serving the purpose of storm damage prevention or flood control.* The *Bylaw* and *Bylaw Regulations* do not define Coastal Dunes.

The remaining portions of a man-made, artificial Coastal Dune are present along the upper portion of Canoe Beach as permitted under DEP File #047-0529. This artificial Coastal Dune has been subject to periodic storm damage following its construction.

Coastal Bank

Coastal Bank is defined in the *WPA Regulations* at 310 CMR 10.30(2) as *the seaward face or side of any elevated landform, other than a coastal dune, which lies at the landward edge of a Coastal Beach, land subject to tidal action, or other wetland.* DEP's *Wetlands Program Policy 92-1: Coastal Banks* provides guidance on delineating Coastal Banks. The *Bylaw* and *Bylaw Regulations* do not define Coastal Bank.

Nitsch Engineering, in coordination with LEC, established the top of the Coastal Bank extending across the subject parcel in accordance with *Program Policy 92-1* and site-specific field investigations conducted by LEC on July 19 and September 26, 2019. Coastal Bank varies across the property based on the changing topography and Flood Zone elevations. The variable Coastal Bank was primarily established utilizing Figures 2 & 3 of the DEP Policy; specifically:

2) For a coastal bank with a slope greater than or equal to 4:1 the "top of coastal bank" is that point above the 100-year flood elevation where the slope becomes less than 4:1. (see Figure 2)

3) For a coastal bank with a slope greater than or equal to 10:1 but less than 4:1, the top of coastal bank is the 100-year flood elevation. (see Figure 3).

Coastal Bank is present at the landward edge of Canoe Beach where the slope ceases to be 10:1. Northeast of Canoe Beach, the Coastal Bank extends around the northerly portion of the East Bunker, above the Flood Zone VE with a slope greater than 4:1 before becoming coincident with the 100-year Flood Zone elevation when the slope is greater than 10:1, but less than 4:1. Portions of the Coastal Bank

on or abutting the East Bunker are primarily artificial in nature due to the construction of the East Bunker and are stabilized by the vegetation identified above, most notably Asiatic bittersweet.

Northeast of the North Battery, the top of the Coastal Bank extends around a small cove area containing a cobble Coastal Beach. This portion of the Coastal Bank is subject to erosion and is moderately steep with exposed glacial till.

A seawall/revetment extends around the upper portion of Bathing Beach. A Coastal Bank is present directly behind the seawall/revetment as being the "elevated landform" that is protectable.

The remaining Coastal Bank on-site around East Point extends upgradient from the Rocky Intertidal Shore and is primarily composed of bedrock.

Land Subject to Coastal Storm Flowage

LSCSF is defined in the WPA *Regulations* at 310 CMR 10.04 and under the *Bylaw Regulations* as *land subject to any inundation caused by coastal storms up to and including that caused by the 100-year storm, surge of record or storm of record, whichever is greater.*

LSCSF varies across the property in accordance with the FEMA FIRMs and LOMRs as described above and depicted on the *Wetland Resources Area Plan (Existing Conditions)*, prepared by Nitsch Engineering, Inc., dated July 31, 2020. Specifically, Zones VE (El. 31 & El. 18) occur along the northern shoreline, including portions of Canoe Beach. Zone AO (Depth 3 feet) extends southerly from Zone VE (El. 18) through the central lawn area between the campus buildings and the East Bunker, connecting to Zone AE (El. 13) that extends northerly from Bathing Beach. Zone VE (El. 17) occurs around Bathing Beach, while Zone VE (El. 18) extends around remaining portions of the southerly coastline. Zone VE (El. 27) occurs along the easterly portion of East Point.

Bordering Vegetated Wetland

Bordering Vegetated Wetlands (BVW) are defined in the *WPA Regulations* at 310 CMR 10.55(2) as *freshwater wetlands which border on creeks, rivers, streams, ponds, and lakes. In these areas soils are saturated and/or inundated such that they support a predominance of wetland indicator plants.*

BVW under the *Bylaw* and *Bylaw Regulations* is protected as a Freshwater Wetland and defined as *riverine wetlands (including rivers, freshwater banks, streams, creeks; estuaries); marshes; wet meadows; bogs; and swamps that meet at least one of the following requirements:*

1. *Fifty percent or more of the natural vegetative community consists of obligate or facultative wetland plant species, as included or identified in generally accepted scientific or technical publications (such as, the Wetlands Plant List, Northeast Region for the National Wetlands Inventory, U.S. Fish and Wildlife Service).*
2. *The presence of a hydrologic regime that indicates a wet condition in which the soils are annually saturated.*

3. *The presence of hydric soils associated with wetlands as defined in Delineating Bordering Vegetated Wetlands, a publication written and distributed by the MA Department of Environmental Protection, Division of Wetlands and Waterways (1995) or as amended.*
4. *Where the natural vegetative community has been destroyed, as for example by landscaping or agricultural use, or in violation of this by-law, the Commission may determine the area to be a Freshwater Wetland on the basis of annual soil saturation or soil analysis alone or may defer the determination until the natural vegetation has re- grown.*
5. *Further freshwater wetlands are vernal pools; banks; rivers; streams; creeks; reservoirs; lakes; ponds of any size; and quarry pits and motions which may or may not contain any of the above-cited vegetative and hydric requirements.*

On September 26, 2019, LEC demarcated the BVW/Freshwater Wetland boundary. The on-site BVW/Freshwater Wetland boundary was determined through observations of the existing plant communities, using the "fifty percent criteria" of the natural vegetative community to determine dominance of obligate or facultative wetland plant species. The soil characteristics and other indicators of wetland hydrology were also evaluated in accordance with the criteria enumerated within the *WPA Regulations* at 310 CMR 10.55 (2), the Handbook prepared by the Massachusetts Department of Environmental Protection, entitled *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (March 1995), the *Field Indicators for Identifying Hydric Soils in New England-Version 4, May 2017*, and *Bylaw* and *Bylaw Regulations*.

The BVW, demarcated by wetland flags 1-20, borders on a 1-3± foot wide x 1-2± foot deep, linear drainage ditch. Intermittent surficial flow in a southerly direction is evident within the drainage ditch as topography mildly descends. The drainage ditch extends to a headwall and 18-inch reinforced concrete pipe (RCP) that discharges to Bathing Beach. A gravel driveway abuts the BVW to the west, while a paved driveway exists between the BVW and Bathing Beach.

The BVW is dominated by invasive common reed (*Phragmites australis*). The upper limits of the BVW contain Virginia creeper (*Parthenocissus quinquefolia*) and climbing nightshade (*Solanum dulcamara*) along with common reed, before transitioning to a mix of upland vegetation that represent greater than 50% of the natural vegetative community, including, but not limited to Asiatic bittersweet entanglements, Morrow's honeysuckle, blackberry (*Rubus allegheniensis*), staghorn sumac, rugosa rose (*Rosa rugosa*), and Virginia creeper. Concrete debris encased by overgrown vegetation occurs between wetland flags 8-13.

Bank (Inland)

Bank is defined at in the *WPA Regulations* at 310 CMR 10.54(2)(a) as *the portion of land surface which normally abuts and confines a water body. The upper boundary of a bank is the first observable break in the slope or the mean annual flood level, whichever is lower. The lower boundary of a bank is the mean annual low flow level.*

Bank (Inland) is associated with the aforementioned 1-3± foot wide x 1-2± foot deep linear drainage ditch contained within the interior of the BVW. As such, Bank (Inland) was not separately demarcated.

Summary

Protectable Land Under the Ocean, Coastal Beach, Rocky Intertidal Shores, Coastal Dune, Coastal Bank, Land Subject to Coastal Storm Flowage (LSCSF), Bordering Vegetated Wetlands (BVW), and Bank (Inland) are located on the project site. On-site Wetland Resource Area boundaries have been established in accordance with the *Massachusetts Wetlands Protection Act* (WPA; M.G.L. c. 131, s. 40), its implementing *Regulations* (310 CMR 10.00), and the Town of Nahant *Wetland Protection Bylaw* (Article 17), and associated *Rules and Regulations* as depicted on the *Wetland Resources Area Plan (Existing Conditions)*, prepared by Nitsch Engineering, Inc., dated July 31, 2020.

If you have any questions or require additional information, please do not hesitate to contact me at (508) 746-9491 or at bmadden@lecenvironmental.com.

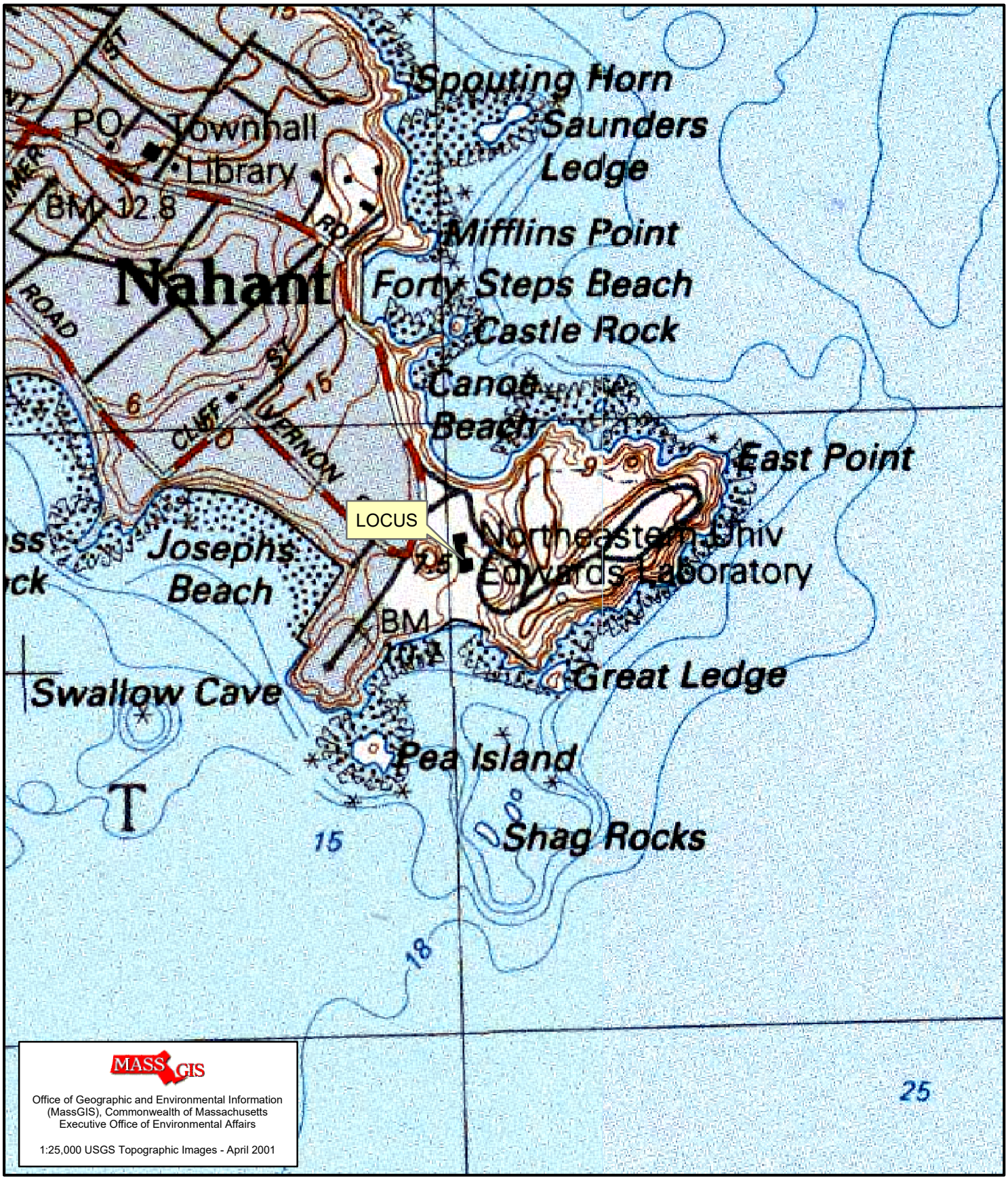
Sincerely,

LEC Environmental Consultants, Inc.

Brian T. Madden
Wildlife Scientist

Attachments

USGS Topographic Map
MassGIS Orthophoto & NHESP Map



LEC
Environmental Consultants, Inc.
Wakefield, MA
781.245.2500
www.lecenvironmental.com

Northeastern University
430 Nahant Road
Nahant, MA

July 31, 2020

N

0 700 Feet

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July 31, 2020

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0 200 Feet

Bathymetric Survey and Eelgrass Survey Report

SECTION 7

cleengineering

15 Creek Road | Marion, Massachusetts 02738
t: 508.748.0937 | 800.668.3220 | f: 508.748.1363

October 26, 2017

Denis Seguin, PLS
Vice President – Land Surveying
Nitsch Engineering
2 Center Plaza, Suite 430
Boston, MA 02108

Re: ***Northeastern University, Marine Sciences Campus, Saltwater Intake Pipe Replacement Bathymetric survey and Eelgrass Video Survey,***

CLE Engineering (CLE) was contracted Nitsch Engineering (Nitsch) to collect bathymetric and geophysical data in support of the proposed saltwater intake pipe replacement project. Data was required to establish the existing bathymetric conditions for the purposes of the structural design. In addition a video survey was done in order to establish the existence/nonexistence of any potential eelgrass beds within the work area. A multi-beam survey system was deployed in order to establish bottom conditions of the approximately 400' x 400' survey area. In addition to the bathymetric data, a sub-bottom profiler (SBP) was deployed to gather imagery of sub-bottom features of the work area, allowing for the mapping of buried obstructions within the depth of interest.

Methods

Bathymetric Multi-beam Survey

The bathymetric survey took place on October 18, 2017, and was performed by Michael Campagnone, P.E. (Massachusetts) and Michael Count, CH. Weather conditions were generally calm with limited calm seas and west winds at 5-10 knots. The survey effort consisted of collecting bathymetric data along pre-determined survey transects. The survey crew utilized a 28' vessel with an integrated survey system consisting of; a Reson 7101 single frequency (240 Khz) multi-beam sounder, CODA F-180 Inertial Positioning System/MRU, Odom Digi-Bar Pro SVP, and a Trimble R-7 RTK level GPS. Corrections were taken from a VRS provided by Keynet. The hydrographic surveys utilized methods and accuracies outlined in the Army Corps of Engineers' November 2013, Hydrographic Surveying Manual (EM 1110-2-1003).

Horizontal positioning was taken from a Trimble R-7 RTK level DGPS. Corrections were received from a Virtual Reference Station (VRS) with data provided by Keynet. Corrections were received via internet and transferred to the GPS via NTRIP software. The Hypack survey program converted the geodetic information into NAD-83 State Plane coordinates for the Massachusetts Mainland zone. The applied geoid was Geoid12b.

Water level information was taken from a benchmark provided by Nitsch. The benchmark is a drill hole in the apron of the existing pump house. The point is known as "DH #53". The control point has an NAVD88 orthometric height of 13.92'. The water level at the time of the survey was recorded with RTK tides in Hypack.

The survey transects were run perpendicular to the shoreline to the dock face with a beam coverage that provided 200% coverage at a beam angle of 45°. The exception being passes taken adjacent to banks were angle limits were increased to the bank side by up to 15° using the beam canting feature in the Reson software. Sound velocity profiles were taken in two locations, at the outset and after surveying, to confirm consistency within the water column throughout the survey area. Bar checks were performed to confirm proper transducer draft calibration.

Data was reduced using the Hysweep editor in Hypack. Sensor data was scrutinized, data outliers were removed. Several filters were applied to the data prior to reviewing the sounding data set including; minimum and maximum depths, beam angle, over/under filter, and the median filter. Once the filters were applied the data was viewed as profiles viewing 5' to 10' matrix swaths, outliers indicated in only one pass were removed after reviewing deleted points. During this review areas of cobble and boulders were noted.

Eelgrass Video Survey

The eelgrass survey was performed on October 18, 2017, by Michael Campagnone, P.E. (Massachusetts) and Michael Count, CH. Weather conditions were generally calm with limited calm seas and west winds at 5-10 knots. The survey effort consisted of collecting video imagery at selected stations in order to determine the conditions. The survey crew utilized a 28' vessel with an integrated survey system consisting of; an underwater camera attached to a weight, and a Trimble R-7 RTK level GPS. Corrections were taken from a VRS provided by Keynet. The camera was deployed from the stern of the vessel. At each station the weight was lowered to the bottom and allowed to settle long enough for disturbed sediments to clear, and a quality still image be developed.

Results

Bathymetric Multi-beam Survey

The reduced bathymetric data has been presented on the attached project plans. Cleaned data was reduced to the project datum NAVD88. Data reduction using the matrix program in Hypack produced two data sets, 10' x 10' mcentermost value and 1'x1' minimum value. Soundings shown on the plan are based on the 10' centermost value and contours are based on the 1' minimum value.

cleengineering

From USACE Manual;

In theory, there is no need to reduce the size of the collected multibeam dataset. The entire "raw" database could be used for project or dredging condition assessment, volume computations, etc. However, these large datasets are thinned for a number of reasons, such as: (1) plotting in plan view without sounding overlap, (2) dredge volume computations, (3) channel clearance strike plots, (4) controlling channel depth reports, (5) 3D visualization models, or (6) simply to reduce the data down to a manageable storage size. There are a number of methods for reducing (or thinning) the size of large, edited multibeam datasets. For basic terrain visualization requirements (i.e. non-navigation uses), various thinning routines have been developed that can reduce datasets by 95% or more; typically selecting representative depths based on gradient changes over large areas.

Each bin (or cell) will likely contain multiple depths, depending on the density of the multibeam data and the number of overlapping passes made over the area. It is not uncommon for a 3- x 3-ft cell to have 50 or more depths if multiple passes were made over a suspected shoal area. Thus, an established method is needed to represent the depth within this bin. Presently, common selection options include: (1) a shot depth nearest to the bin center, (2) an average depth (placed at bin center), (3) a median depth, or (4) a minimum depth.

a. Dredge measurement and payment surveys. The average or median depth within a bin is recommended for dredge payment surveys. These representative depths are subsequently used in TIN volume computations.
b. General plan drawings. The shot depth nearest the cell center is recommended to be shown as the representative depth on plan drawings, including those used for plans and specifications or project condition reports. Obviously additional thinning will be required to plot 3- x 3-ft bin depth data on a 1 in = 100-ft plan—only every 8 or 10 bin depths could be displayed at this scale.
c. Minimum depths. Minimum depths may be selected for channel condition reports, shoal or strike detection, or some dredge clearance purposes. Special caution must be exercised in using minimum depths in that the dataset will be significantly biased.
d. Figure 6-26 is an example of the representative depth options that can be selected from binned multibeam data on a navigation project.

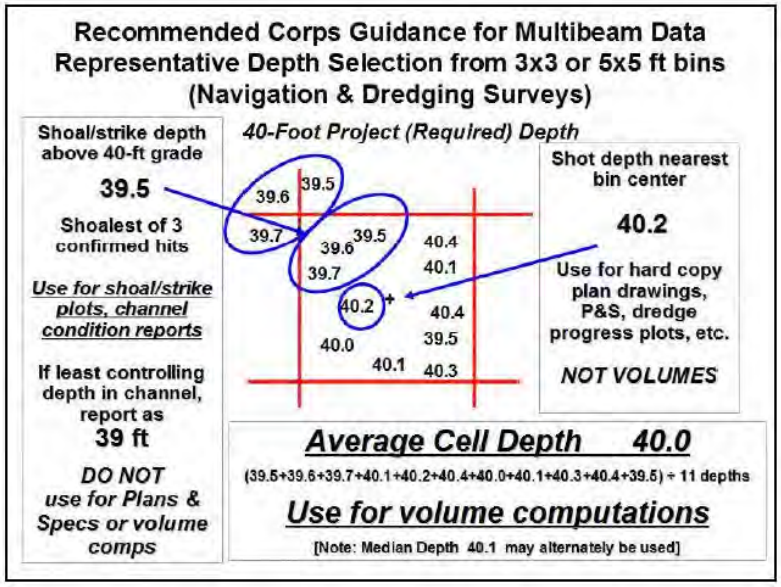


Fig. 1: USACE M-beam Data Reduction

At the heart of the USACE discussion is what the intent of use is for the data set. In the case of this survey the centermost value was used to show the data in plan view as this data set is not biased, the minimum value with a small bin size was selected for the contours in order establish the variability in the work area, capture existing structures, and provide a workable surface for design. It should be noted that the 1'x1' average value data set may also be of value if the intent is to remove the existing rocks for the purpose of installing the new intake pipe.

Eelgrass Video Survey

No evidence of eelgrass was encountered within the work area. Eight Stations were selected and videos taken to confirm the nonexistence of eelgrass beds in the area. Still images from the survey are included on sheet 2 of 2, along with station locations shown in plan view. While no eelgrass bed was encountered, some subaquatic vegetation was encountered in the work area including; Bladder Wrack, Kelp, and Sea Hair.

Fig. 2 Sample Still Images

If you have any questions or need further information, I can be reached in the office at 800-668-3220 or via email at mcampagnone@cleengineering.com.

Sincerely;
CLE Engineering, Inc.

Michael Campagnone, P.E.

Michael Campagnone
Project Manager

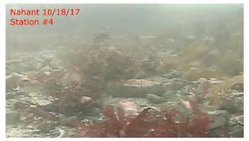
STATION 0

STATION 1

STATION 2

STATION 3

STATION 4

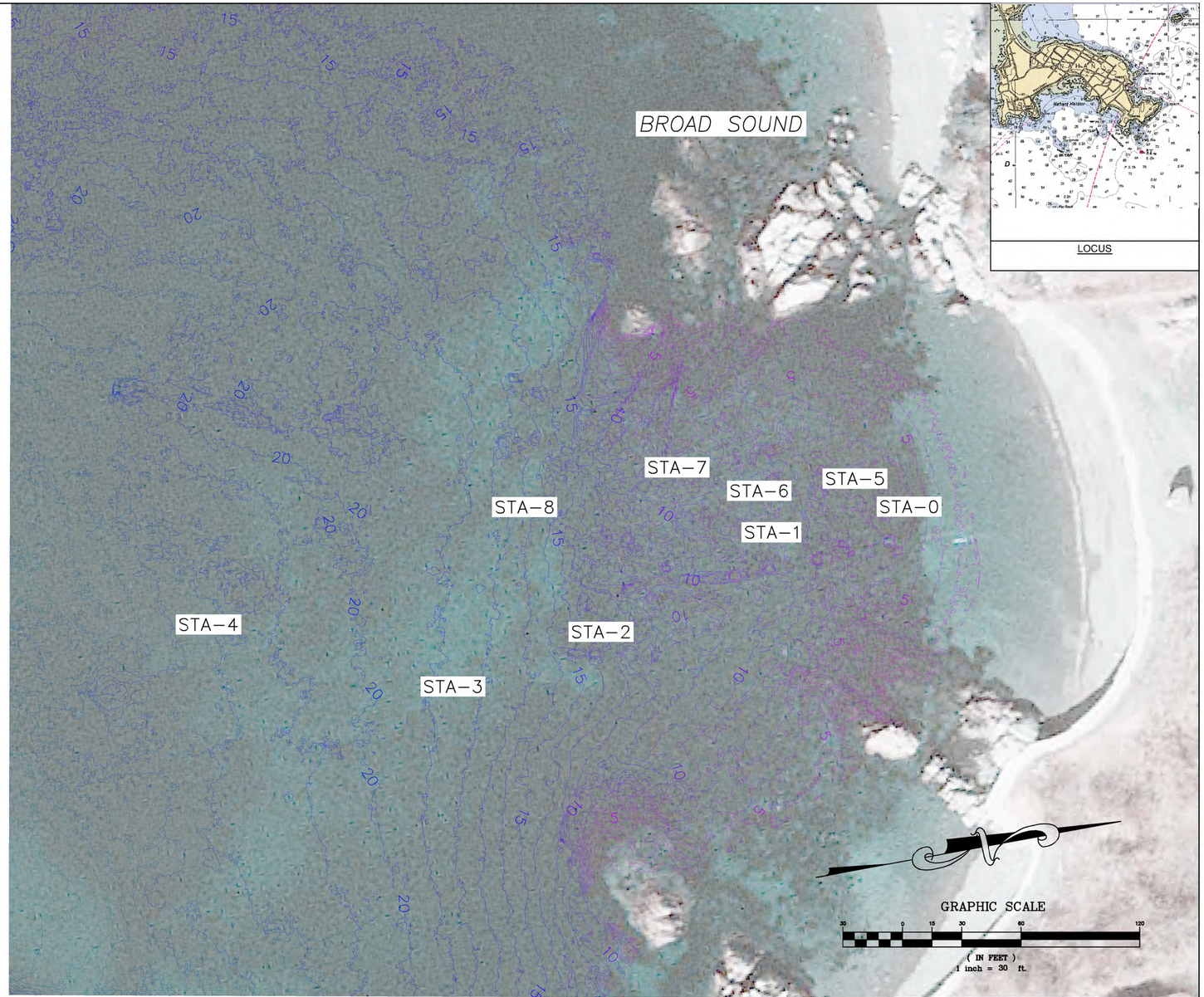


STATION 5

STATION 6

STATION 7

STATION 8



LOCUS

NOTES:
1. THE DATA SHOWN ON THIS PLAN WAS GATHERED ON OCTOBER 18, 2017.
2. SOUNDINGS ARE IN FEET AND TENTHS AND REFER TO DEPTHS BELOW THE VERTICAL REFERENCE PLANE. THE VERTICAL REFERENCE PLANE FOR THIS PROJECT IS NAVD88.
3. THE DATUM IS DEFINED RELATIVE TO THE PRIMARY BENCHMARK, DH FOUND IN APRON OF PUMP-HOUSE. ELEVATION PROVIDED BY D.SEGUIN OF NITSCH ENGINEERING. ELEVATION = 13.92 NAVD88 (GEOID 12B).
4. SOUNDINGS SHOWN AS NEGATIVE ARE ABOVE THE REFERENCE PLANE.
5. COORDINATES ARE BASED ON NAD 83 STATE PLANE MASSACHUSETTS MAINLAND.
6. BENCHMARK / RTK TIDES: TIDES ARE RECORDED USING RTK TIDES IN HYPACK. ELEVATIONS FROM ELLIPSOID TO ORTHOMETRIC NAVD88 USE GEOID 12B.'
7. RTK CORRECTIONS: RTK CORRECTIONS FOR THIS SURVEY PROVIDED BY KEYNET - VRS.
8. THE SOUNDING INFORMATION SHOWN ON THIS PLAN REPRESENTS THE CENTERMOST SOUNDINGS OBTAINED FROM HYDROGRAPHIC SURVEYS CONDUCTED DURING OCTOBER 18, 2017.
9. THE SOUNDING INFORMATION DEPICTED ON THIS PLAN SHOULD NOT BE USED FOR THE DETERMINATION OF VOLUMES. VOLUMES ARE TO BE DETERMINED FROM A SEPARATE AVERAGE VALUE DATA SET.
10. CONTOUR DATA GENERATED FROM THE 1' X 1' MINIMUM VALUE DATA SET.
11. SHORELINE, BRIDGES, PIERS, ETC. ARE SCALED FROM ORTHOIMAGERY. ORTHOIMAGERY AND SCALED DATA IS APPROXIMATE UNLESS OTHERWISE NOTED AND SHOULD BE USED AS A GENERAL REFERENCE ONLY.
12. THE INFORMATION DEPICTED ON THIS PLAN REPRESENTS THE RESULTS OF SURVEYS MADE ON THE DATES SHOWN, AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS AT THAT TIME. INTERPOLATED INFORMATION FROM BETWEEN SOUNDING RUNS IS NOT GUARANTEED. SHOALS, OBSTRUCTIONS OR OTHER DIFFERING CONDITIONS MAY EXIST BETWEEN THESE RUNS. CONSULT WITH CLE ENGINEERING FOR MORE DETAILED INFORMATION.
13. POSSESSION AND USE OF THE MATERIAL CONTAINED ON THESE DRAWINGS IS GRANTED ONLY IN CONNECTION WITH ITS USE AS IT RELATES TO THE TITLED PROJECT, ANY OTHER USE, REPRODUCTION OR DISCLOSURE OF THE INFORMATION CONTAINED HEREON IS EXPRESSLY PROHIBITED WITHOUT THE WRITTEN CONSENT OF CLE ENGINEERING INC.

DATUM OFFSETS

MLLW	NAVD88	
12.1	6.9	HAT 12/5/17
9.81	4.56	MHHW
9.37	4.12	MHW
5.25	0	NAVD88
0.34	-4.91	MLW
0.0	-5.25	MLLW

OFFSETS TAKEN FROM VDATUM 3.6
42.4157 N, 70.9079 W

PROJECT:
NORTHEASTERN UNIVERSITY, MARINE SCIENCES CAMPUS
SALTWATER INTAKE PIPE REPLACEMENT

CLIENT:
NORTHEASTERN UNIVERSITY

cleengineering
15 Creek Road | Marion, Massachusetts 02738
t: 508.748.0937 | www.cleengineering.com

EELGRASS SURVEY

SHEET 2 OF 2

SCALE: 1"=30'	CHECKED BY: SN	DATE 10-23-17	DRAWING No. COMP.CODE 17227.100
DRAWN BY: MEC			

REVISION No.	DATE	COMMENT

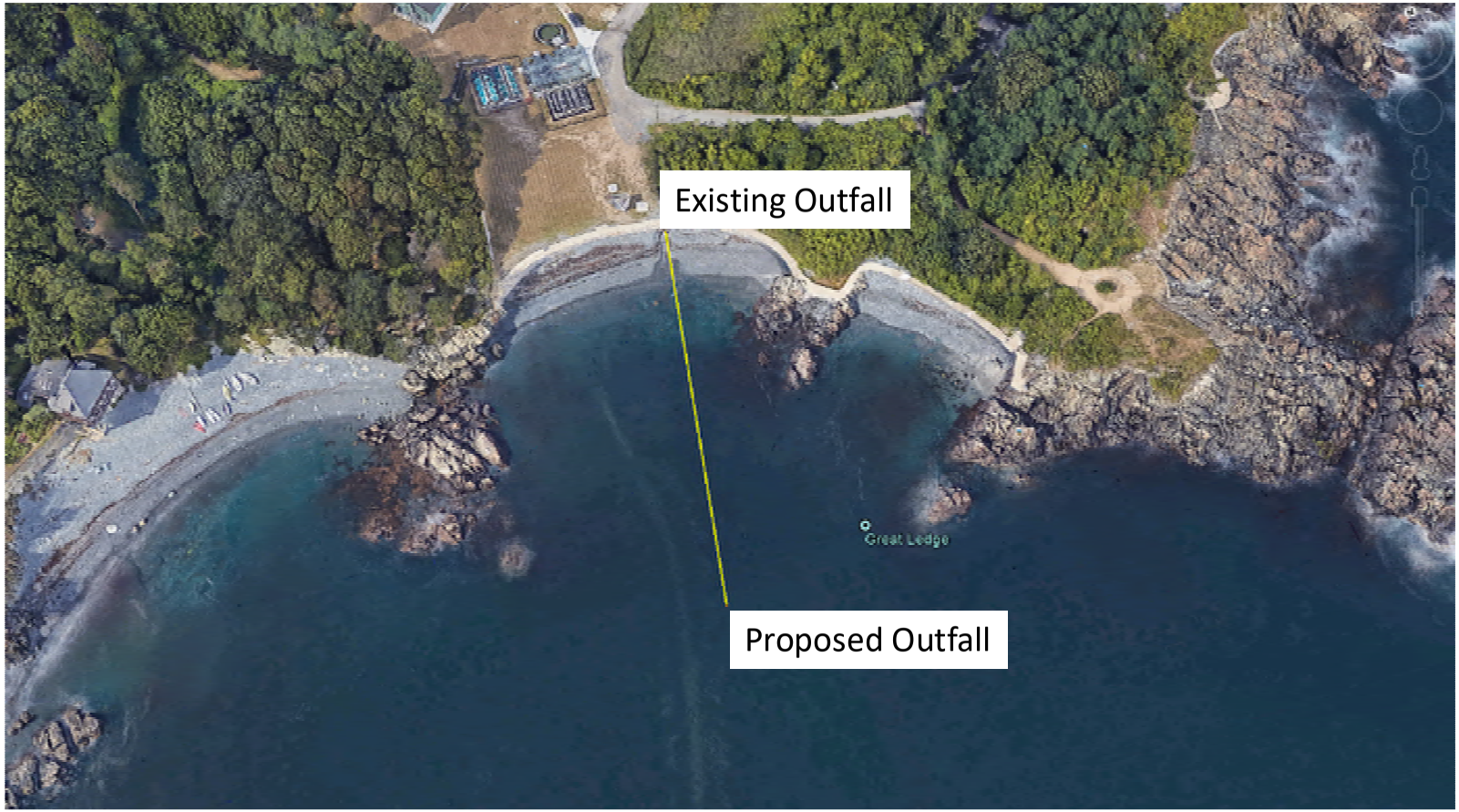
CORMIX Modeling

Proposed Seawater Intake Upgrade

Data Tracking Update

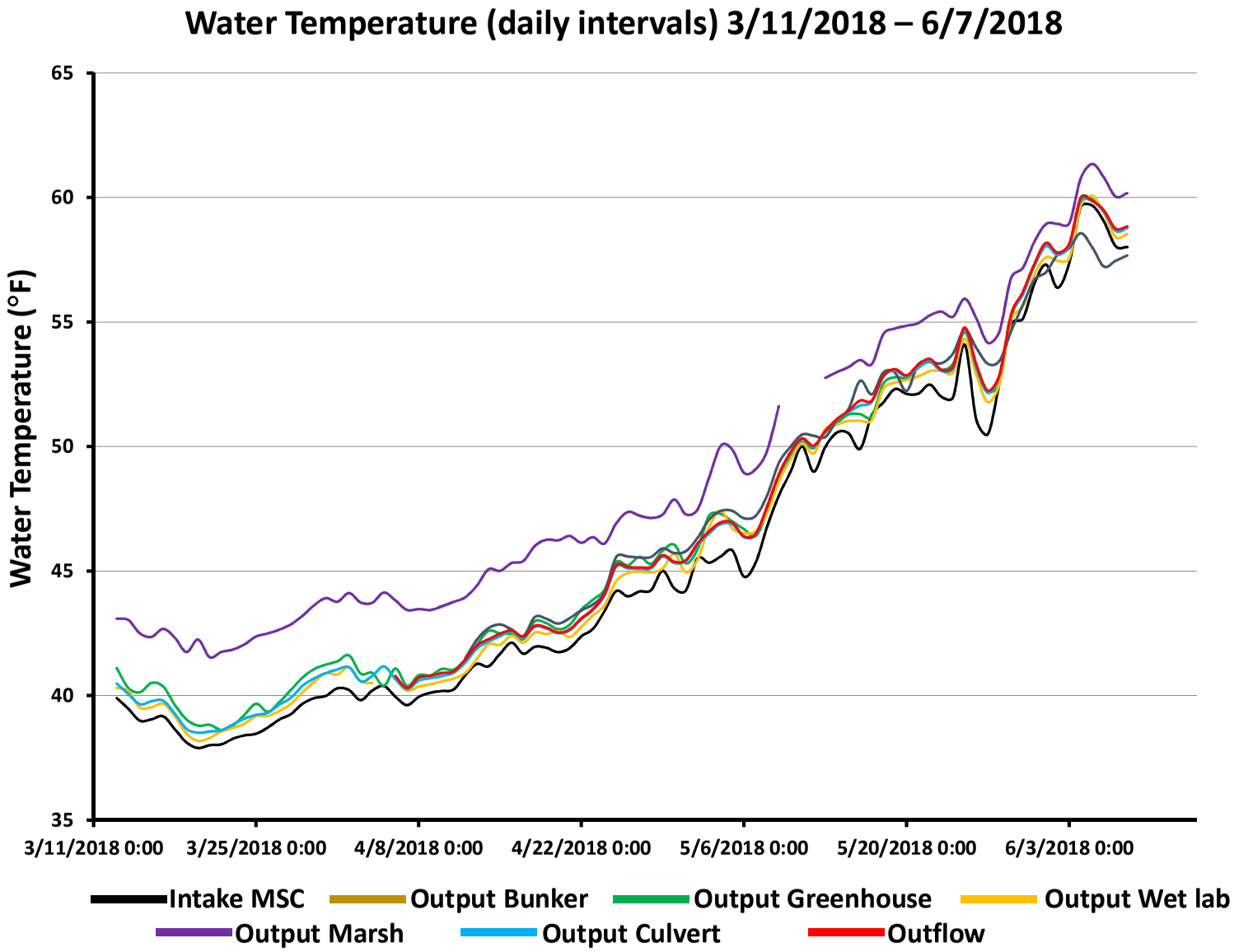
Summer 2018

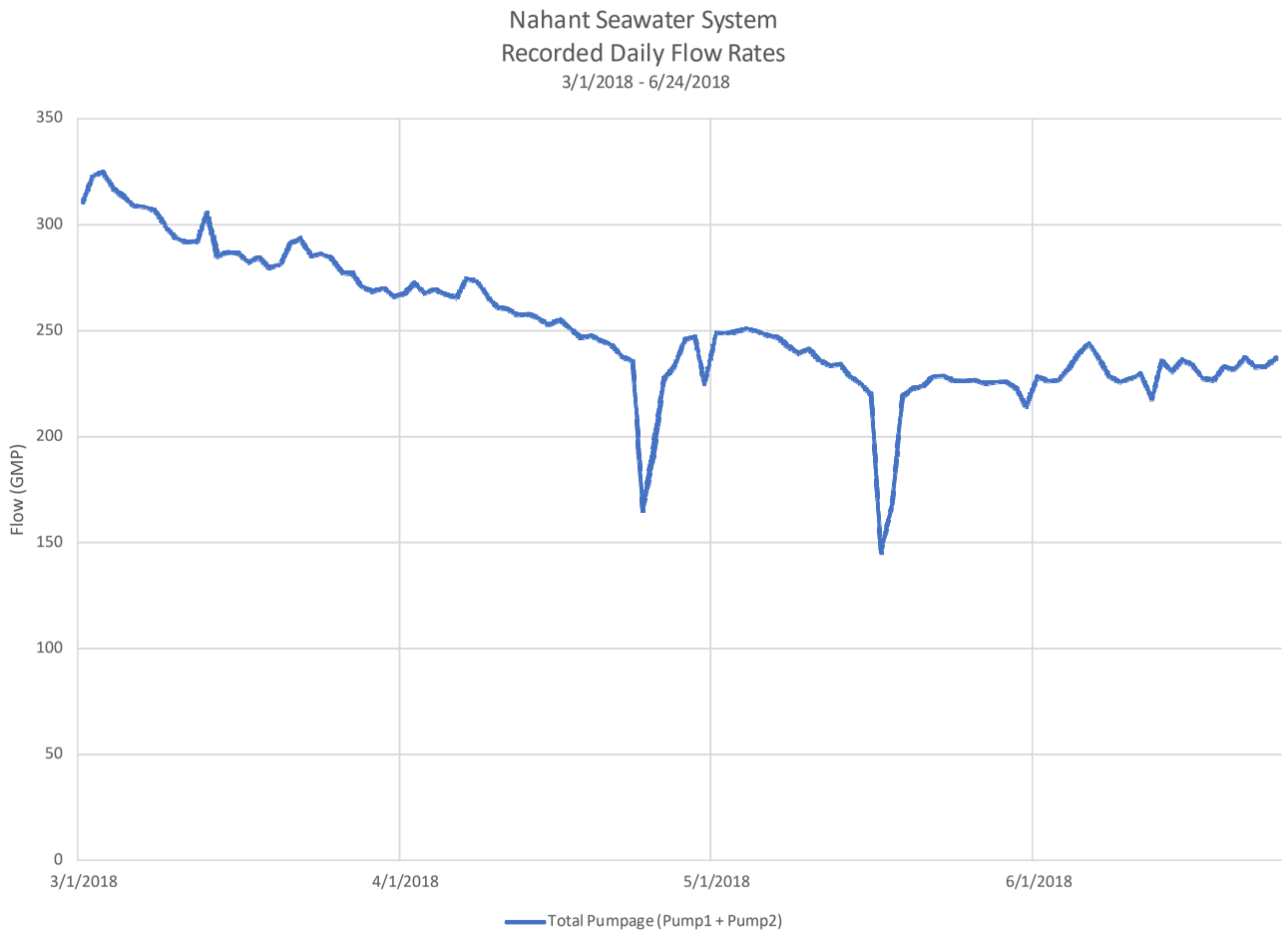
Outfall Location



Existing Conditions Data Collection

- Ambient Temperature taken at inlet of submerged intake pipe
- Flow Rate calculated from pump monitoring data
- Outflow temperature derived from 6 monitoring locations
- Data collected from March 1, 2018 to present Date
- Data collection to continue moving forward


Water Temperature (daily intervals) 3/11/2018 – 6/7/2018
Water Temperature (°F)
65
60
55
50
45
40
35
3/11/2018 0:00
3/25/2018 0:00
4/8/2018 0:00
4/22/2018 0:00
5/6/2018 0:00
5/20/2018 0:00
6/3/2018 0:00
Intake MSC
Output Bunker
Output Greenhouse
Output Wet lab
Output Marsh
Output Culvert
Outflow


Nahant Seawater System
Recorded Daily Flow Rates
3/1/2018 - 6/24/2018
Flow (GMP)
350
300
250
200
150
100
50
0
3/1/2018
4/1/2018
5/1/2018
6/1/2018
Total Pumpage (Pump1 + Pump2)

Existing Conditions Data Analysis

- Recorded 3/1/18 to 6/24/18
  - Average flow rate = 248 GPM (mean) 252 (median)
  - Average temp delta = 0.367 deg F

- Using these parameters, the CORMIX modeling program was unable to produce results based on the negligible effects within the Near Field Region.

Delta T Modeling Exercises

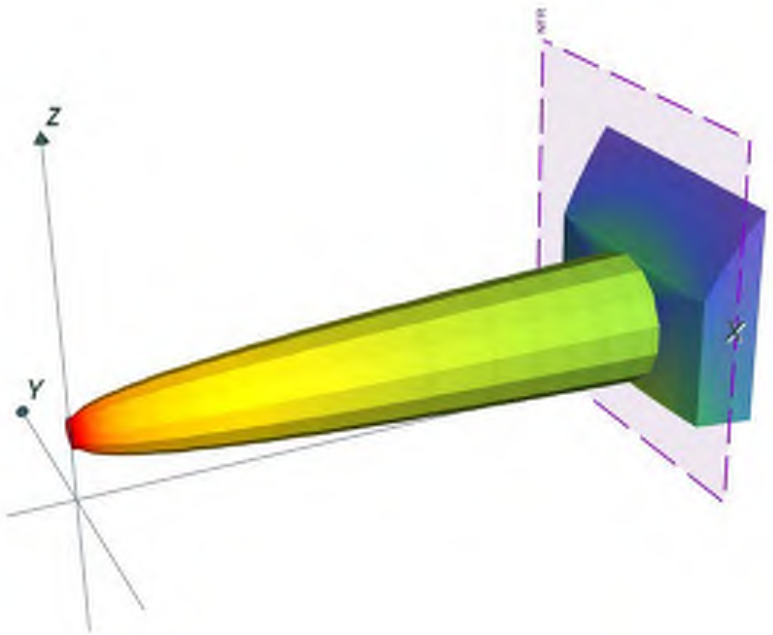
Theoretical Worst Case Scenario

Using max recorded flow rate and max delta T (not simultaneous)

- Recorded:
  - Max hourly temp delta = 5.734 deg F (Recorded 5/1/18)
  - Max instant flow rate = 450 GPM (Recorded 3/15/18)

  Using these parameters, the CORMIX modeling program was also unable to produce results based on the negligible effects within the Near Field Region.

- Assumed for Modeling:
  - Flow rate = 1050 GPM (2.3x recorded instantaneous max flow rate)
    - This is the smallest allowable flow rate to produce the required 3.76 fps minimum CORMIX flow velocity
  - Single 16” ID outfall at proposed location
    - NOT at the seawall
  - Historical Average Ambient Temp
    - 43.4 deg F



Discharge Excess (°F)

0.010 0.017 0.029 0.049 0.084 0.144 0.245 0.417 0.711 1.212 2.066 3.521 6.000

MEASURED_1050GPM_5.734degF

Flow Class: H2 Origin: Ambient Bottom

CORMIX1 Simulation Length units in meters

Distortion Scale: Y:X = 35 Z:X = 35

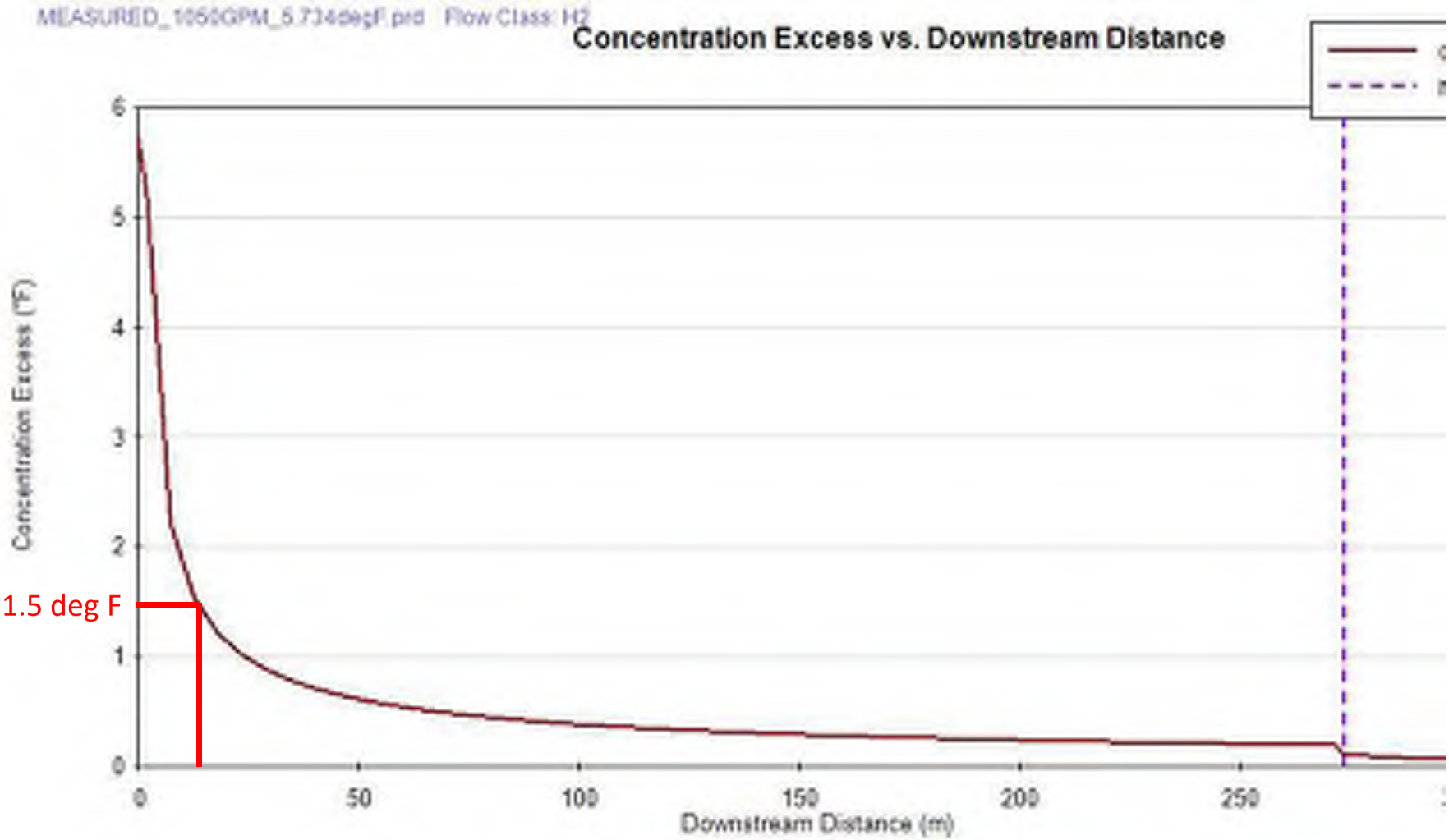
Visualization up to X = 300 m (out of ROI X = 300 m)

Plume Centerline

End of Near Field Region (NFR)

Cormix Module Boundary (MOD)

The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.



The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

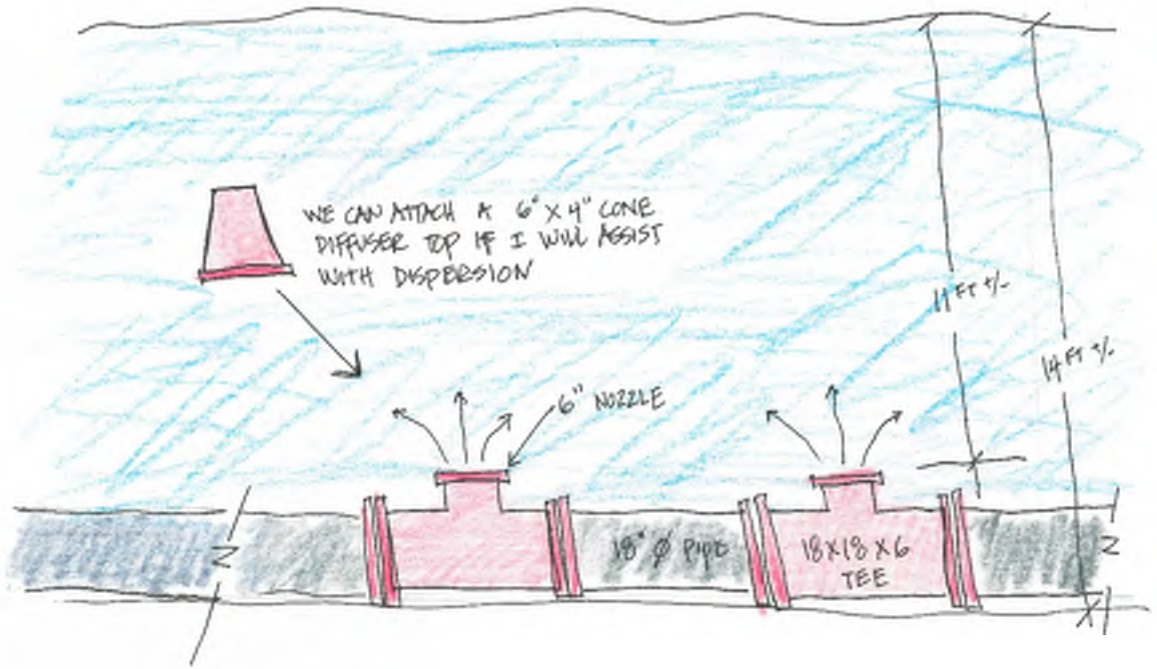
Proposed Configuration

- Submerged 3-port conical diffuser configuration
- Models run for 600, 1200, 1800 and 2400 GPM flow rates
- Proposed Delta T parameters determined by consulting seawater engineer based on current research load and input from researchers regarding future demand.

Summary of Results:

- Negligible effects illustrated in every configuration (< 0.1 deg F Delta T at diffuser nozzle)
- In comparison to EPA water quality standards for this area (max 1.5 deg F.)

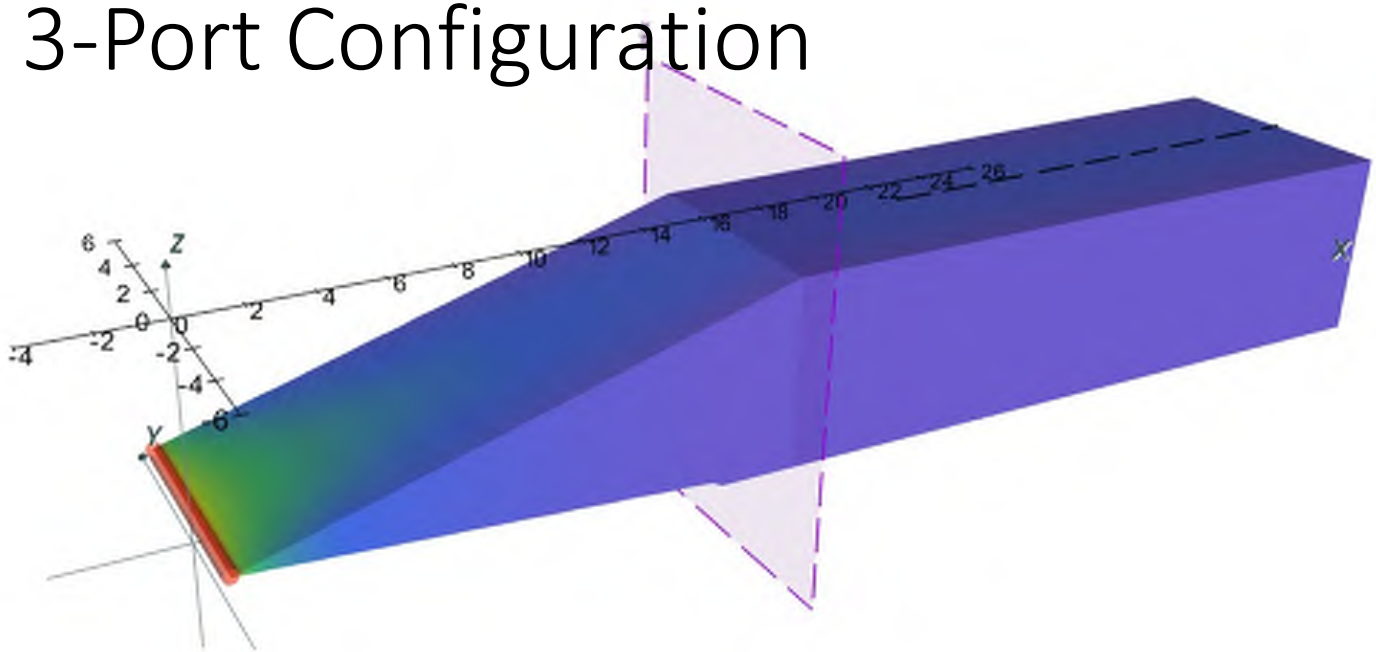
Outfall Concept



Future Proposed – Worst Case Scenario @ 600, 1200, 1800 and 2400GPM Projections

Month	Ambient Temp (F) °F	Total Flow Rate gpm	Delta From Ambient °F
January	41.4	600	4.0
February	38.8	600	4.5
March	38.8	600	4.5
April	43.2	600	3.6
May	48	600	2.7
June	58.1	600	0.7
July	65.8	600	-0.9
August	67.5	600	-1.2
September	63.9	600	-0.5
October	57.9	600	0.7
November	51.3	600	2.0
December	46.2	600	3.0

600 GPM 3-Port Configuration



Discharge Excess (°F)

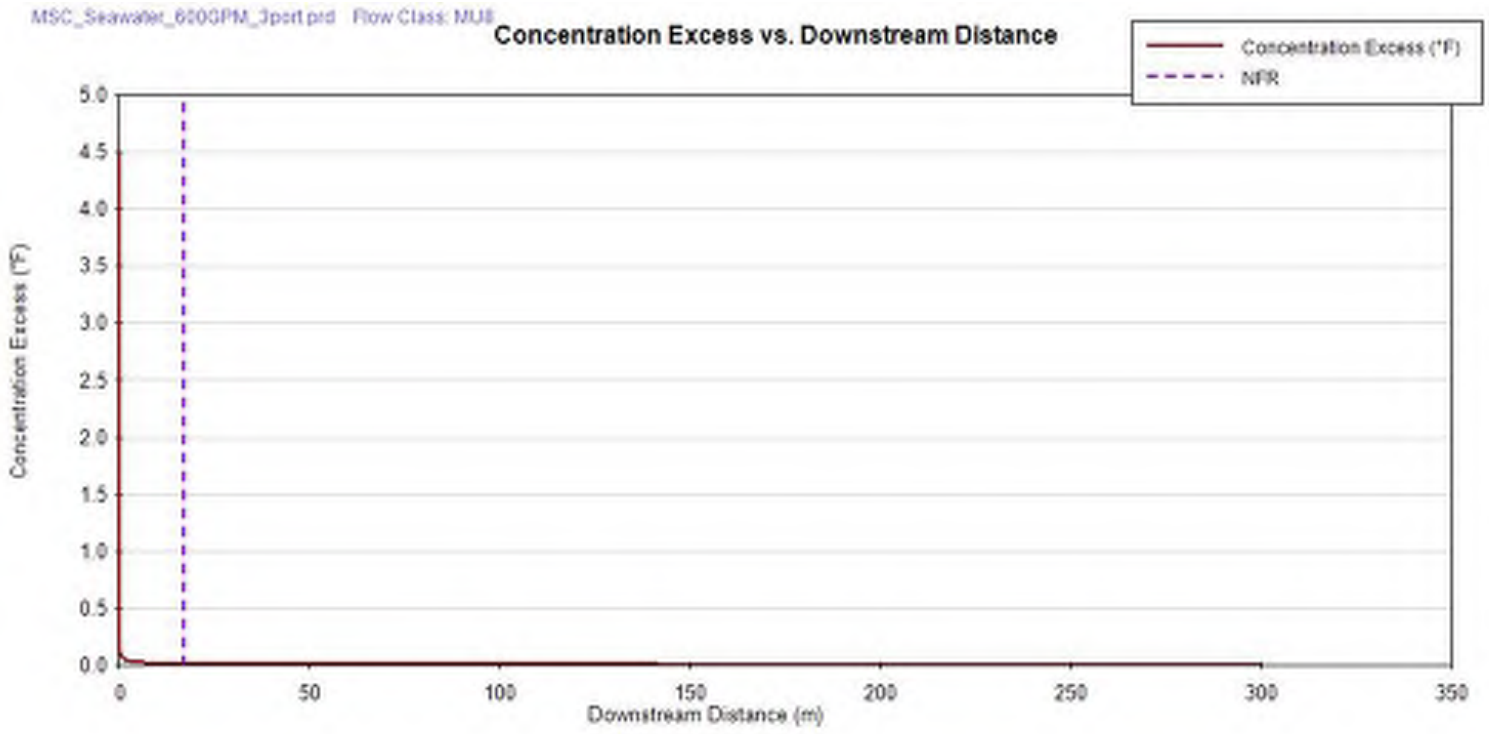
0.0100 0.0197 0.0389 0.0766 0.1511 0.2979 0.5872 1.1577 2.2825 4.5000

MSC_Seawater_600GPM_3port
Flow Class: MU8 Origin: Ambient Bottom
CORMIX2 Simulation Length units in meters
Distortion Scale: Y:X = 1 Z:X = 1.8
Visualization up to X = 40 m (out of ROI X = 300 m)

Plume Centerline
End of Near Field Region (NFR)
Cormix Module Boundary (MOD)

The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

600 GPM 3-Port Configuration

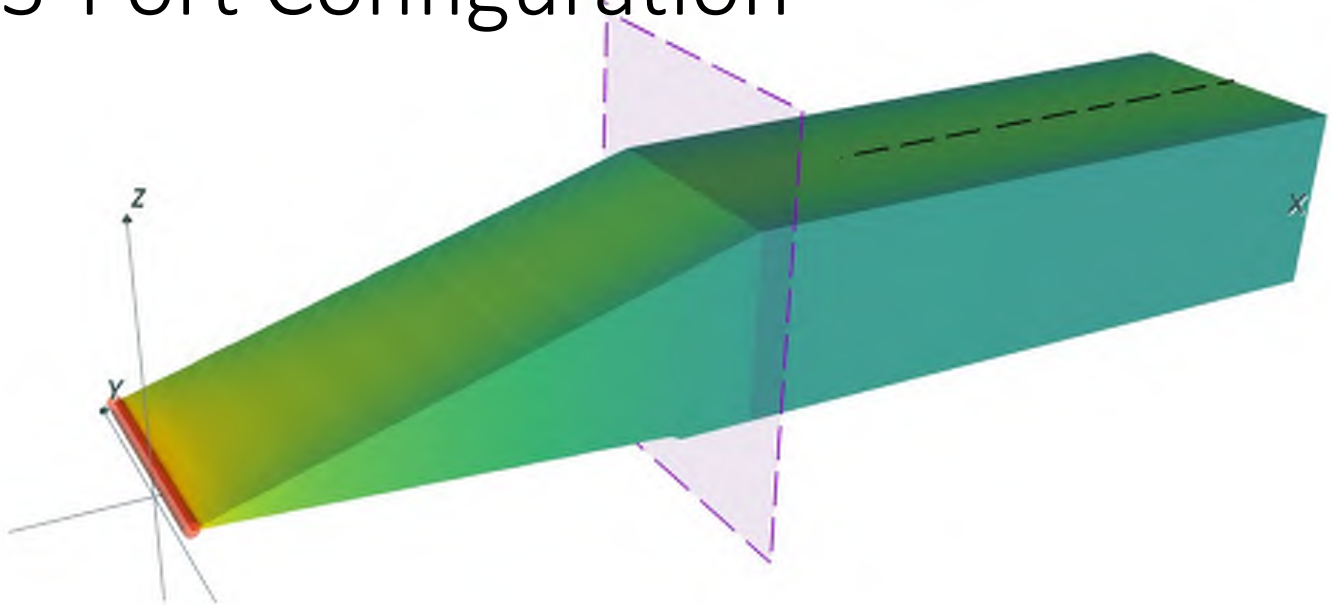


The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

Modeled Scenario

Month	Ambient Temp (F) °F	Total Flow Rate gpm	Delta From Ambient °F
January	41.4	1,200	2.0
February	38.8	1,200	2.3
March	38.8	1,200	2.3
April	43.2	1,200	1.8
May	48	1,200	1.3
June	58.1	1,200	0.3
July	65.8	1,200	-0.4
August	67.5	1,200	-0.6
September	63.9	1,200	-0.3
October	57.9	1,200	0.4
November	51.3	1,200	1.0
December	46.2	1,200	1.5

1200 GPM 3-Port Configuration



Discharge Excess (°F)

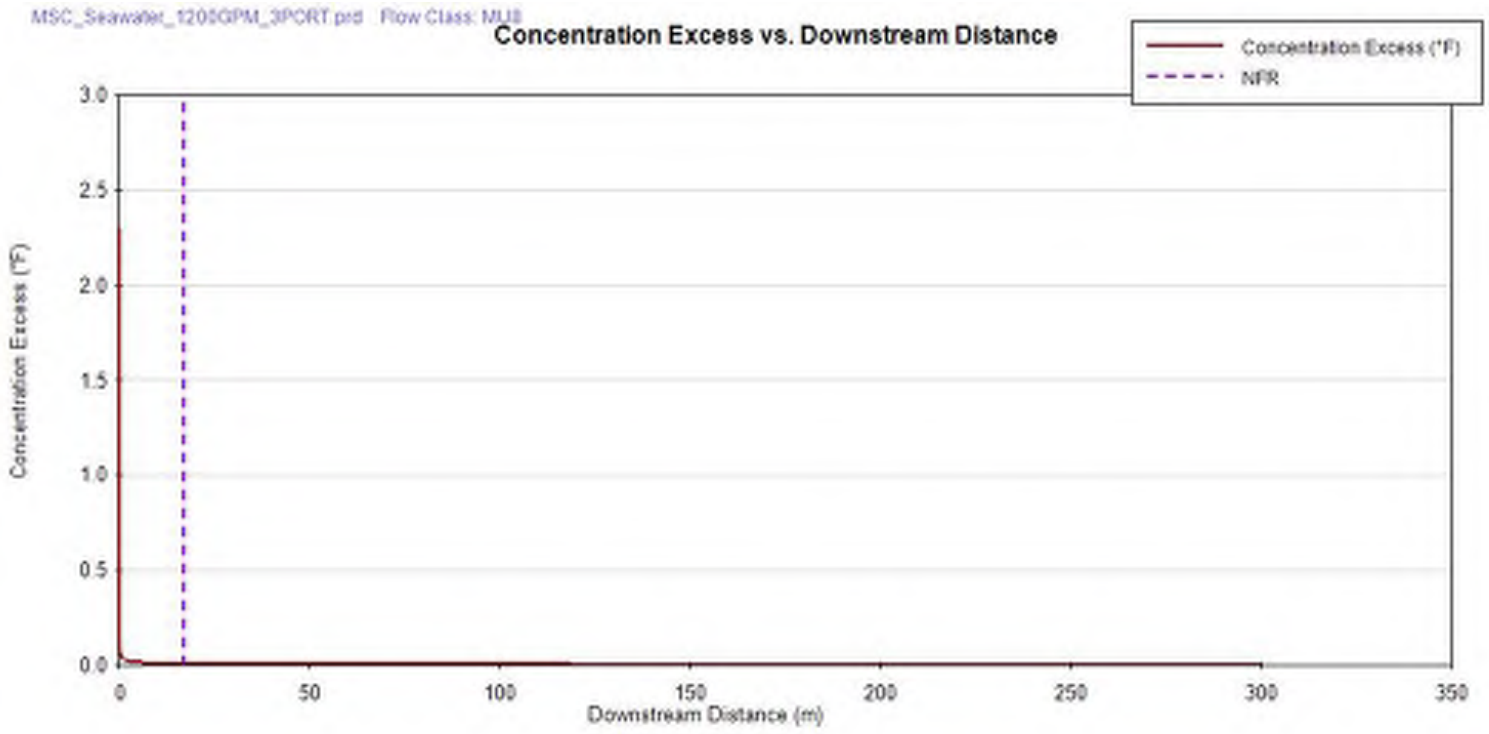
0.0010 0.0020 0.0041 0.0084 0.0169 0.0344 0.0698 0.1416 0.2873 0.5829 1.1828 2.4000

MSC_Seawater_1200GPM_3PORT
Flow Class: MU8 Origin: Ambient Bottom
CORMIX2 Simulation Length units in meters
Distortion Scale: Y:X = 1 Z:X = 1.8
Visualization up to X = 40 m (out of ROI X = 300 m)

Plume Centerline
End of Near Field Region (NFR)
Cormix Module Boundary (MOD)

The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

1200 GPM 3-Port Configuration



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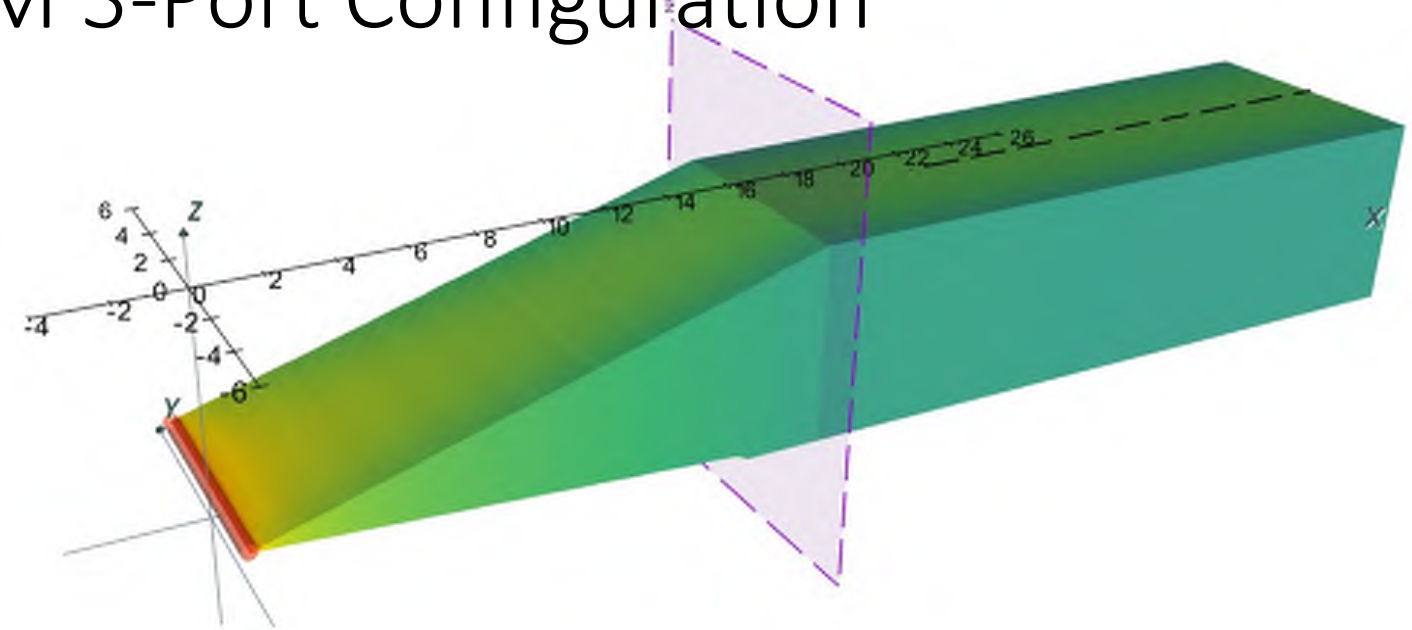
Modeled Scenario

Month	Ambient Temp (F) °F	Total Flow Rate gpm	Delta From Ambient °F
January	41.4	1,800	1.3
February	38.8	1,800	1.5
March	38.8	1,800	1.5
April	43.2	1,800	1.2
May	48	1,800	0.9
June	58.1	1,800	0.2
July	65.8	1,800	-0.3
August	67.5	1,800	-0.4
September	63.9	1,800	-0.2
October	57.9	1,800	0.2
November	51.3	1,800	0.7
December	46.2	1,800	1.0

1800 GPM 3-Port Configuration



Discharge Excess (°F)

0.0010 0.0025 0.0063 0.0159 0.0400 0.1006 0.2530 0.6362 1.6000

MSC_Seawater_1800GPM_3PORT

Flow Class: MU8 Origin: Ambient Bottom

CORMIX2 Simulation Length units in meters

Distortion Scale: Y:X = 1 Z:X = 1.8

Visualization up to X = 40 m (out of ROI X = 300 m)

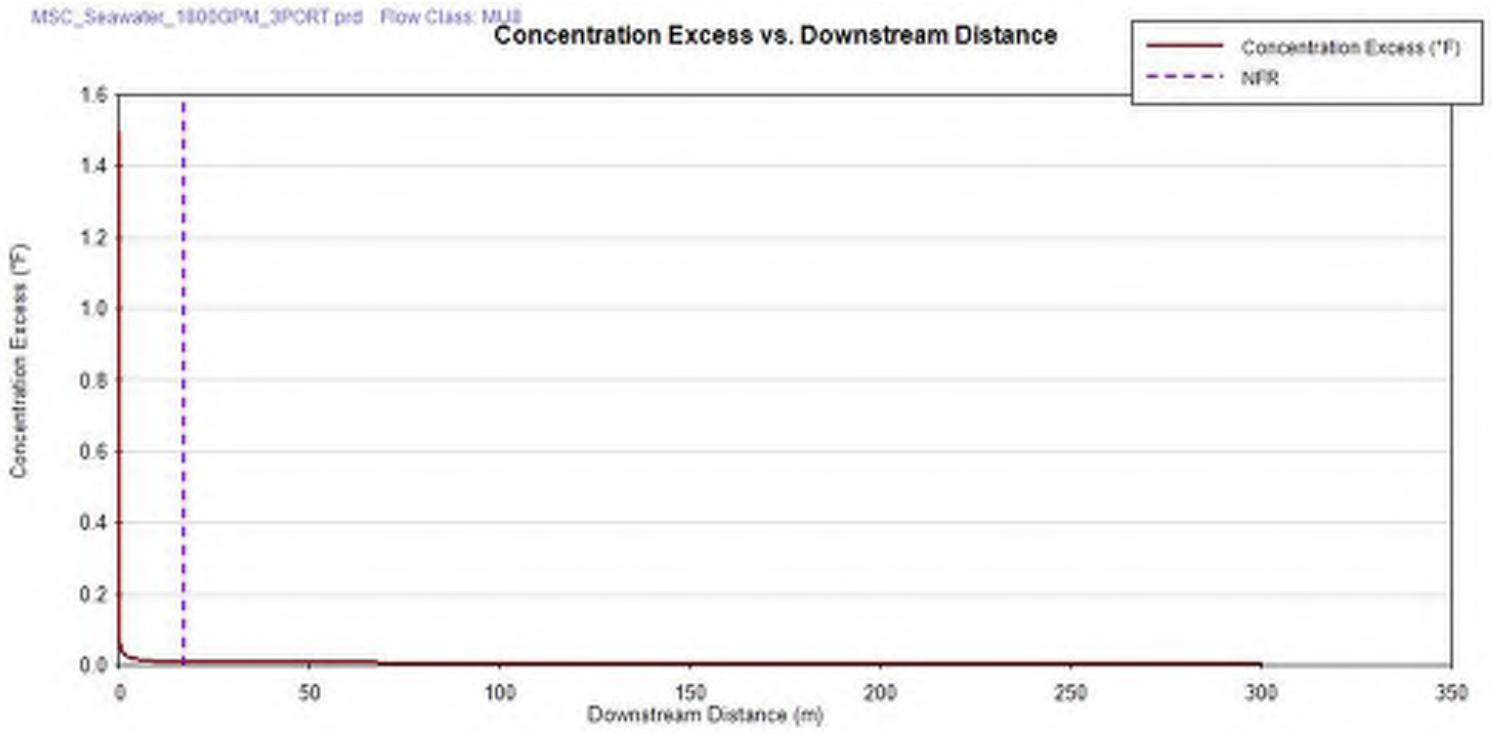
Plume Centerline

End of Near Field Region (NFR)

Cormix Module Boundary (MOD)

The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

1800 GPM 3-Port Configuration

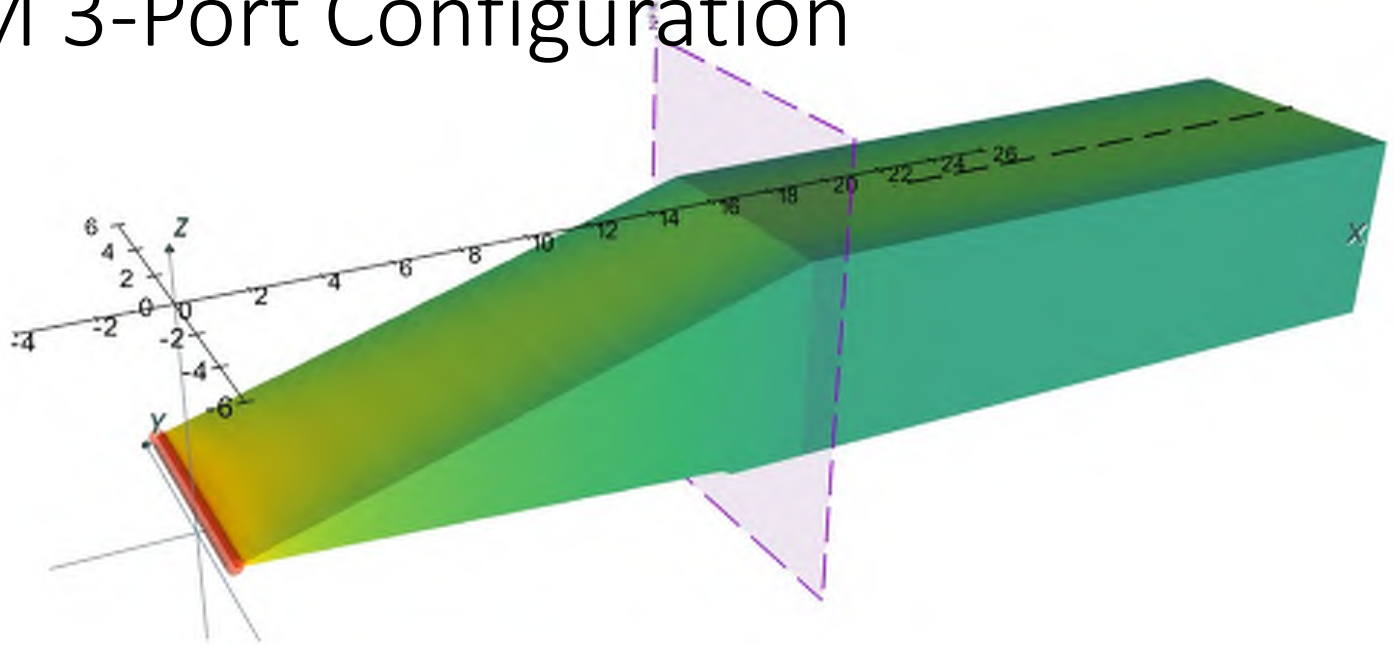


The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

Modeled Scenario

Month	Ambient Temp (F) °F	Total Flow Rate gpm	Delta From Ambient °F
January	41.4	2,400	1.0
February	38.8	2,400	1.1
March	38.8	2,400	1.1
April	43.2	2,400	0.9
May	48	2,400	0.7
June	58.1	2,400	0.2
July	65.8	2,400	-0.2
August	67.5	2,400	-0.3
September	63.9	2,400	-0.1
October	57.9	2,400	0.2
November	51.3	2,400	0.5
December	46.2	2,400	0.8

2400 GPM 3-Port Configuration



Discharge Excess (°F)

0.0010 0.0019 0.0036 0.0069 0.0132 0.0251 0.0478 0.0911 0.1735 0.3306 0.6299 1.2000

MSC_Seawater_2400GPM_3PORT

Flow Class: MU8 Origin: Ambient Bottom

CORMIX2 Simulation Length units in meters

Distortion Scale: Y:X = 1 Z:X = 1.8

Visualization up to X = 40 m (out of ROI X = 300 m)

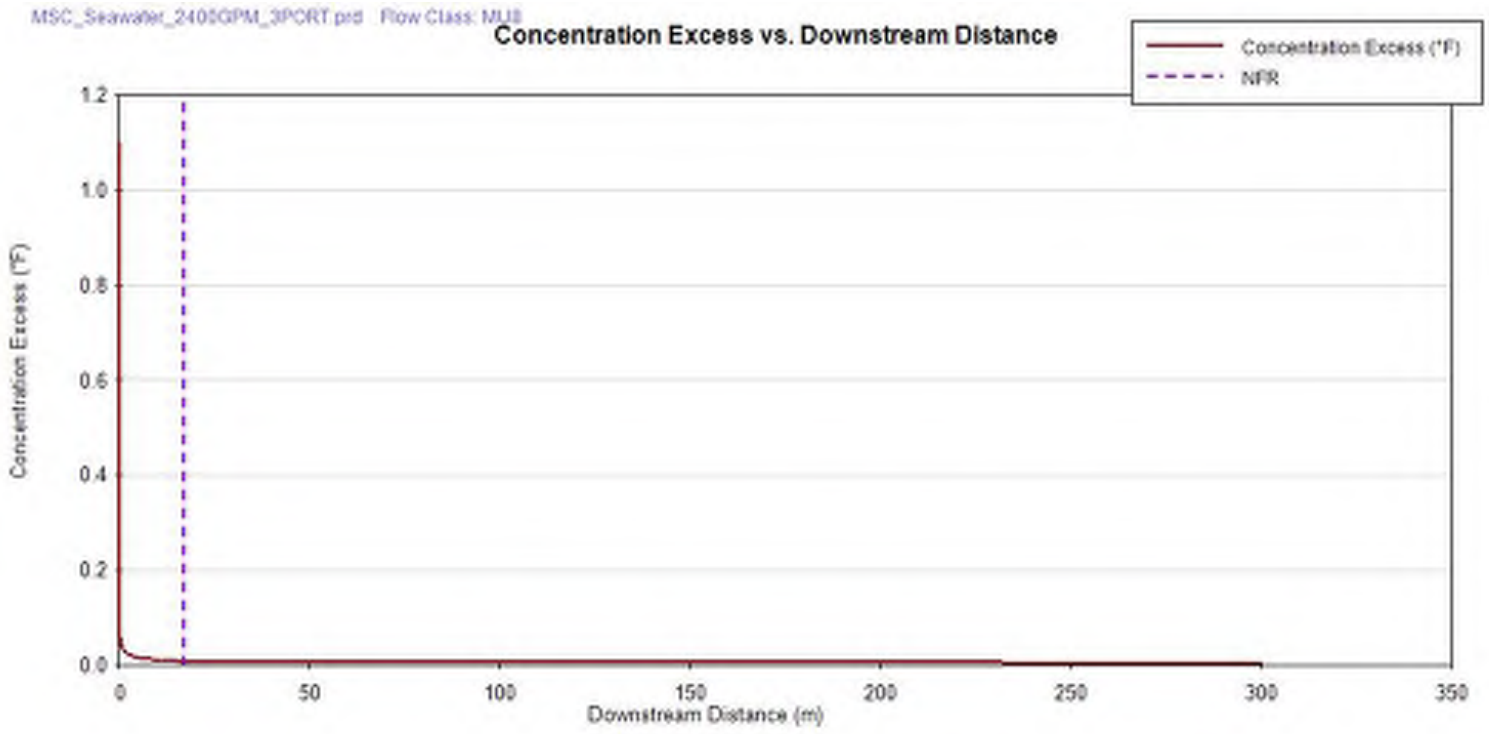
Plume Centerline

End of Near Field Region (NFR)

Cormix Module Boundary (MOD)

The data recorded during our 10 month study could not register any measurable temperature plumes in the DEP / Industry Standard software (CORMIX). For the purposes of modeling, the maximum recorded flow rate of 450 GPM needed to be multiplied by a minimum of 2.3 times, to 1050 GMP in order to register on the model. Similarly, the temperature differential (delta T) was increased from the calculated average of 0.367 degrees F to the maximum instantiations recorded delta T of 5.734 degrees F in order to produce any measureable results in the model. It is also important to note, that the max flow of 450 GPM, and the max delta T were mutually exclusive data points, and never occurred simultaneously.

2400 GPM 3-Port Configuration



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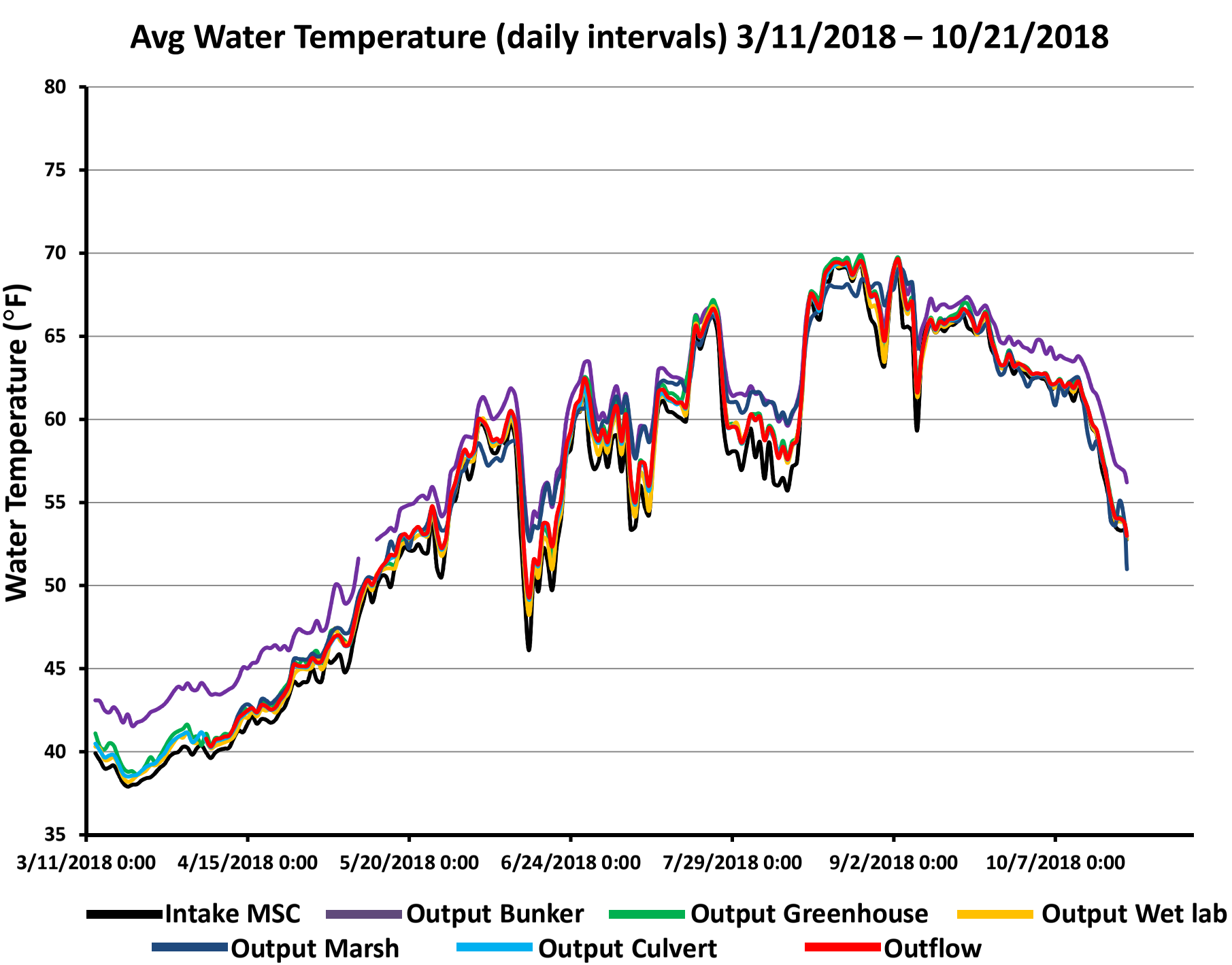
Existing Intake and Discharge Temperature Data

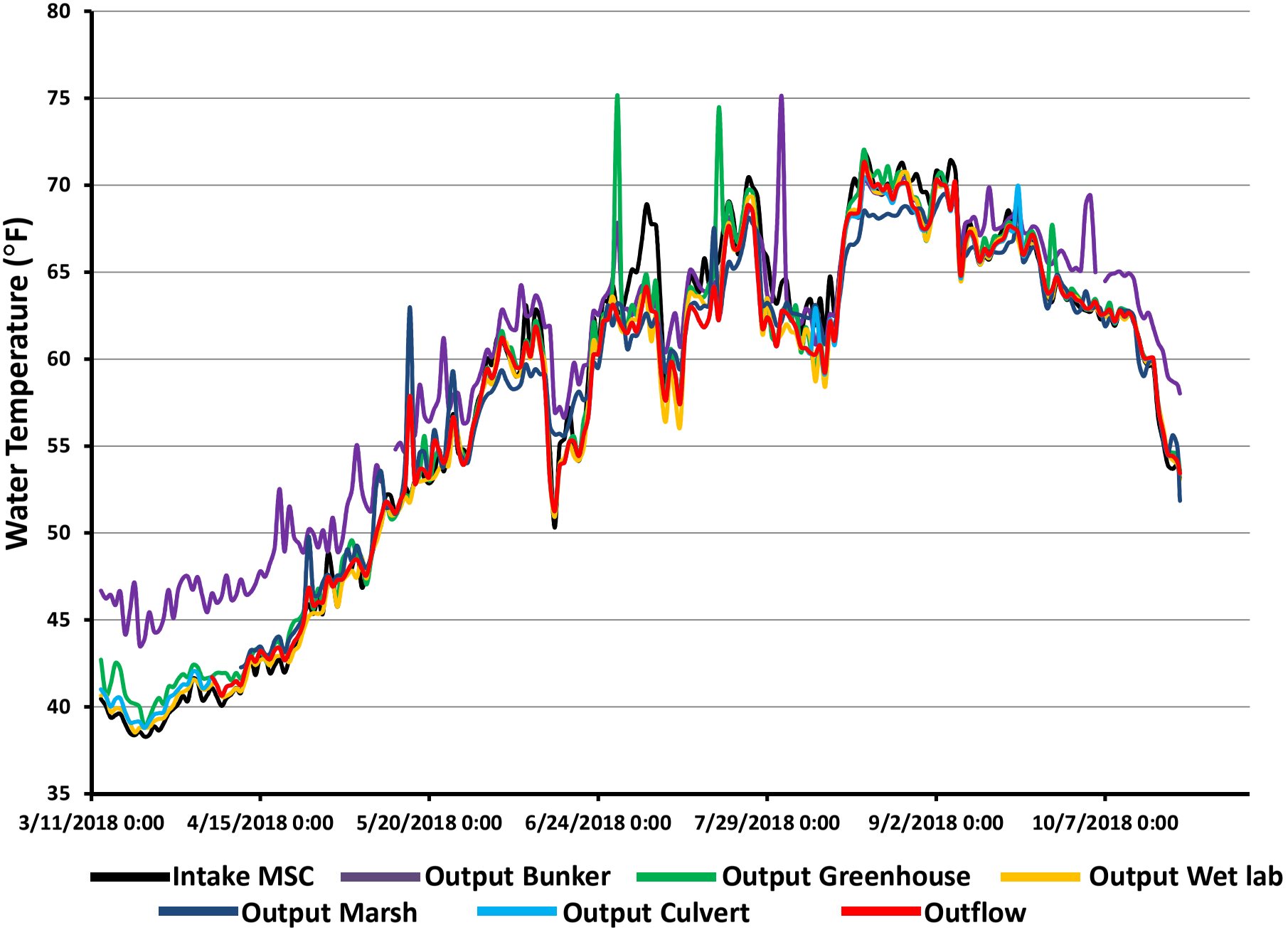
Proposed Seawater Intake Upgrade

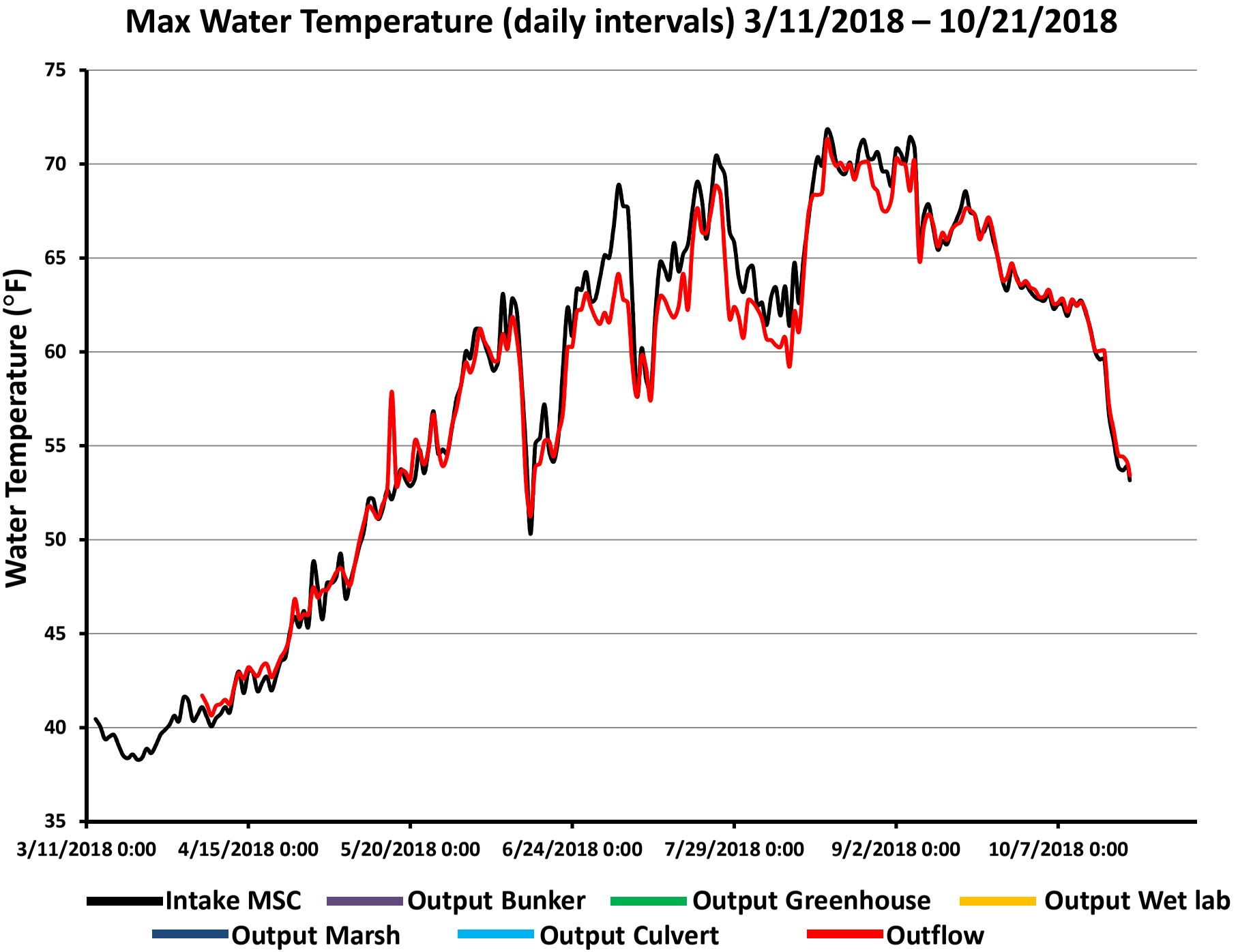
Data Tracking Update

Fall 2018

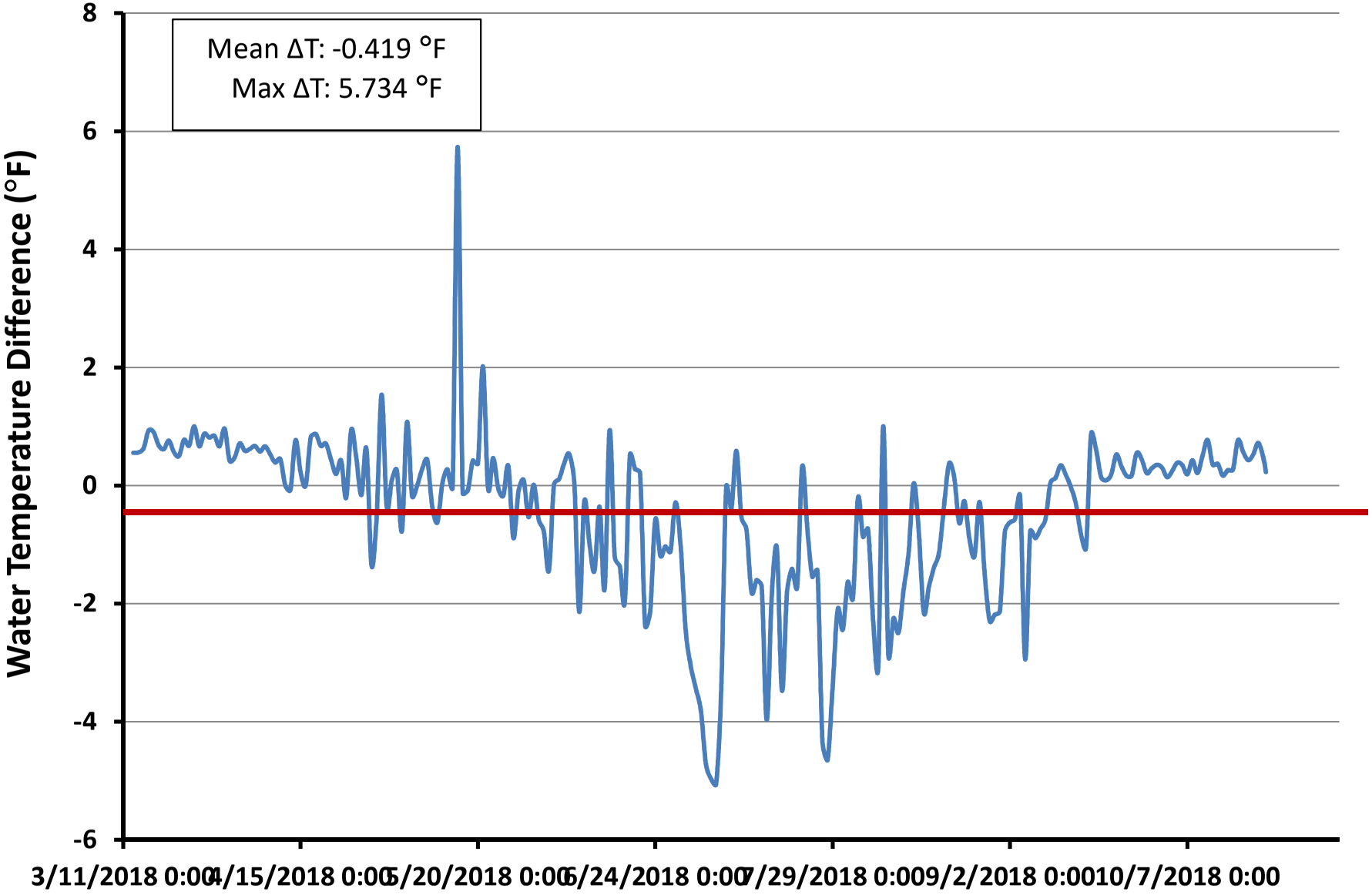

Avg Water Temperature (daily intervals) 3/11/2018 – 10/21/2018
Water Temperature (°F)
80
75
70
65
60
55
50
45
40
35
3/11/2018 0:00
4/15/2018 0:00
5/20/2018 0:00
6/24/2018 0:00
7/29/2018 0:00
9/2/2018 0:00
10/7/2018 0:00
Intake MSC
Output Bunker
Output Greenhouse
Output Wet lab
Output Marsh
Output Culvert
Outflow

Max Water Temperature (daily intervals) 3/11/2018 – 10/21/2018




Max Water Temperature (daily intervals) 3/11/2018 – 10/21/2018
Water Temperature (°F)
75
70
65
60
55
50
45
40
35
3/11/2018 0:00
4/15/2018 0:00
5/20/2018 0:00
6/24/2018 0:00
7/29/2018 0:00
9/2/2018 0:00
10/7/2018 0:00
Intake MSC
Output Bunker
Output Greenhouse
Output Wet lab
Output Marsh
Output Culvert
Outflow

Outflow minus Intake (Daily Maxima): 3/11/2018 – 10/21/2018



Seawater Best Management Practices Document

SEAWATER BEST MANAGEMENT PRACTICES

Northeastern University Marine Science Center
February 18, 2020

Goals

The goal of the Marine Science Center (MSC) at Northeastern University is to alter the discharge of seawater as little as possible, so that the seawater returned to the ocean is close to ambient conditions. The seawater that is ultimately returned to the ocean from the MSC is influenced by the diverse uses of individual Principal Investigators (PIs) and their labs. This "Best Practices" document provides a guide for PIs and their students on how to safely return the seawater from their tanks or arrays to the ocean. The goal of the Seawater Advisory Committee (SAC) is to maintain and update this document, and to provide a reporting system for seawater use from individual labs.

Here, the term "return seawater" refers to seawater that is returned from a local array of tanks or seatables, not the entire discharge of the MSC. Because of the diverse experiments done at the MSC, PIs may have different requirements for processing return seawater at different times. These requirements may vary depending on the conditions of the experiment and the species that are kept in tanks.

Definitions

Open System - Seawater comes in and is not treated before entering the seawater discharge.

Closed System - Seawater comes in and is not put back into the seawater discharge, or water is appropriately treated before it is put back into seawater discharge.

Filtration of return seawater from individual labs

Filtration of seawater removes biomass (e.g., phytoplankton), particulate matter and suspended sediments. For this reason, return seawater should only be filtered if required (see below). If filtration is required for the return seawater, we recommend a mechanical filter (e.g. 5-50 um) and UV filtration. Ozone should be avoided because it leaves chemical residues in the seawater. If ozone is required, please consult with the SAC before implementing.

How to determine if return seawater requires filtration

Our coastlines already have many locally established invasive species (see below for specific guidelines for invasive/injurious species). SAC does not require seawater filtration for species that are collected on Nahant. When applying for a collection permit from Massachusetts Department of Marine Fisheries (MA-DMF), PIs must specify in their permit description whether return seawater will be filtered and if so, how. Doing so will allow MA-DMF to review the plan and make recommendations. If housing a species that was collected under a different permit (other than

MA-DMF), please correspond with the relevant agencies to learn the requirements for transporting the species across state borders and ask if seawater filtration is recommended. If collecting outside of the Gulf of Maine biogeographic region, then seawater filtration is required.

Returning animals to the wild

Under no circumstances should animals be released on Nahant if they were not collected here. If specimens were collected from locations other than in Nahant and the PI wants to return them to their site of origin, note that MA-DMF has some concerns about returning animals to the wild once they have been exposed to water from a different location. The SAC recommends that the PI contacts MA-DMF and follows their recommendation on whether or not animals should be returned to their site of origin or disposed of in an appropriate landside disposal system (solid waste or wastewater treatment).

Freshwater use

The freshwater supplied to the MSC is municipal freshwater. It is permissible to use small amounts of municipal freshwater to rinse tanks. If PIs have concerns about trace amounts of municipal freshwater in their tanks and/or glassware (for example in experiments with marine larvae), it is recommended to use a carbon filter (see Lotterhos lab example in bunker), reverse osmosis (see OGL), or letting the water offgas for 24 hours. SAC does do not recommend using municipal freshwater to control salinity in experiments.

Copper

Copper paint is sometimes used in experiments to keep out herbivores. Copper is considered pollution. **Copper is not permitted in the seawater system at the MSC.**

Submerged Sump Pumps

The SAC does not recommend using sump pumps that contain oil. If these break, they could be a source of oil in the MSC seawater system. The SAC recommends the use of sump pumps that work with water.

Antibiotics, cleaning agents, other hazardous chemicals

All hazardous chemicals used at MSC must be used in compliance with all occupational health, safety, and environmental rules and regulations. Contact the Office of Environmental Health and Safety (EHS) for information on disposal of chemicals and hazardous waste. In no cases should antibiotics, cleaners, or hazardous chemicals be disposed of in the seawater discharge.

Invasive/non-native and potentially injurious species

Researchers at the MSC work with a variety of species from the Gulf of Maine/Massachusetts Bay ecosystem and will use their best professional judgement regarding which species should be permitted in the flow-through system, with particular attention to potentially injurious species (e.g., recently invasive predators, potential disease vectors). Nevertheless, on an annual basis, MSC researchers will consult with the Massachusetts Invasive Species Program (MISP) to summarize and discuss the species that are expected to be used in experiments in a given year. Species that are not native to or well-established in the Gulf of Maine/Massachusetts Bay will be observed or experimented on in a closed system and no experiments with such species will be initiated without consulting MISP and obtaining approval (see below). Species used in such approved experiments will be ultimately be disposed of in an appropriate landside disposal system (solid waste or wastewater treatment).

Process for reporting to MISP. The SAC committee will compile the seawater plans that require MISP approval as described above. The compiled seawater plans will be given to the MSC Facilities Manager (Ryan Hill) and Director (Geoff Trussell), who will communicate with MISP to obtain approval. **Please note that at 60 days advance is needed to approve seawater plans that require MISP approval**.

Submission of seawater plans

Feb 15 standard submission for May 1 to April 30 of the following year.

Emergency Chemical Spill Response Plan

Each PI is required to have an Emergency Spill Response Plan on file with the SAC. The plan should explain how a chemical spill would be contained, if one were to occur in a tank that drains to the ocean. The plan should contain specific instructions for turning off inflow, isolating the affected area, and containing the spill. Each PI is responsible to make sure all lab personnel know the emergency spill response plan. If a spill were to occur, please contain it and contact the MSC Facilities Manager (Ryan Hill) immediately. The Facilities Manager will work with Environmental Health and Safety and Clean Harbors to make sure that the spill is appropriately handled and disposed of.

Tank labeling system

Every array of tanks or seatables should have a label with the following information:

1) Person leading the experiment and contact information
2) PI or Lab and contact information
3) Species kept in tank(s)
4) Date of approval from SAC
5) SAC Plan ID

6) Seawater: (ambient) OR (other - please describe)
7) Active dates

Reporting seawater use

For each separate project requiring seawater use, PIs are required to submit a "Seawater Plan Form" at a deadline given by the committee, and "Seawater Report Form" one month following project completion. There is also an Addendum for reporting minor changes to a Plan.

Save the Spill Response Plan as: PILastName_SpillResponsePlan_YYYYMMDD

Save the Seawater Plan as: PILastName_ProjectShortName_Plan_YYYYMMDDstart-YYYYMMDDend

- Save the Addendum as PILastName_ProjectShortName_Plan_YYYYMMDDstart-YYYYMMDDend_Addendum

Save the Seawater Report as: PILastName_ProjectShortName_Report_YYYYMMDDend

A plan can be submitted that cover multiple years of a project (up to 5 years). The report is due once at the end of the project, as well as every semester that there is an event that happens outside the parameters outlined in the Seawater Plan.

Original Seawater System Permits

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

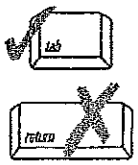
WPA Form 5 – Order of Conditions

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

MassDEP File Number: 047-0475

A. General Information

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



1. From: Nahant
   Conservation Commission

2. This issuance is for (check one): a. ☒ Order of Conditions b. ☐ Amended Order of Conditions

3. To: Applicant:

Samuel	Solomon
a. First Name	b. Last Name

Northeastern University
c. Organization

360 Huntington Ave
d. Mailing Address

Boston	MA	02115-5000
e. City/Town	f. State	g. Zip Code

4. Property Owner (if different from applicant):

a. First Name	b. Last Name

c. Organization

d. Mailing Address

e. City/Town	f. State	g. Zip Code

5. Project Location:

430 Nahant Rd	Nahant
a. Street Address	b. City/Town
1B	1
c. Assessors Map/Plat Number	d. Parcel/Lot Number

Latitude and Longitude, if known:

42.416713	-70.906807
e. Latitude	f. Longitude

6. Property recorded at the Registry of Deeds for (attach additional information if more than one parcel):

Essex	
a. County	b. Certificate Number (if registered land)
5344	142
c. Book	d. Page

7. Dates:

June 3, 2009	June 23, 2009	June 24, 2009
a. Date Notice of Intent Filed	b. Date Public Hearing Closed	c. Date of Issuance

8. Final Approved Plans and Other Documents (attach additional plan or document references as needed):

Salt Water Intake Pipe Replacement and Extension
a. Plan Title

Pare Corporation	Karl Hammond, PE
b. Prepared By	c. Signed and Stamped by
May 2009	1"=20'
d. Final Revision Date	e. Scale

f. Additional Plan or Document Title	g. Date

B. Findings

1. Findings pursuant to the Massachusetts Wetlands Protection Act:

   Following the review of the above-referenced Notice of Intent and based on the information provided in this application and presented at the public hearing, this Commission finds that the areas in which work is proposed is significant to the following interests of the Wetlands Protection Act. Check all that apply:

a. ☐ Public Water Supply b. ☐ Land Containing Shellfish c. ☐ Prevention of Pollution
d. ☐ Private Water Supply e. ☐ Fisheries f. ☐ Protection of Wildlife Habitat
g. ☐ Groundwater Supply h. ☐ Storm Damage Prevention i. ☐ Flood Control

2. This Commission hereby finds the project, as proposed, is: (check one of the following boxes)

Approved subject to:

a. ☒ the following conditions which are necessary in accordance with the performance standards set forth in the wetlands regulations. This Commission orders that all work shall be performed in accordance with the Notice of Intent referenced above, the following General Conditions, and any other special conditions attached to this Order. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, these conditions shall control.

Denied because:

b. ☐ the proposed work cannot be conditioned to meet the performance standards set forth in the wetland regulations. Therefore, work on this project may not go forward unless and until a new Notice of Intent is submitted which provides measures which are adequate to protect these interests, and a final Order of Conditions is issued. **A description of the performance standards which the proposed work cannot meet is attached to this Order.**

c. ☐ the information submitted by the applicant is not sufficient to describe the site, the work, or the effect of the work on the interests identified in the Wetlands Protection Act. Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides sufficient information and includes measures which are adequate to protect the Act's interests, and a final Order of Conditions is issued. **A description of the specific information which is lacking and why it is necessary is attached to this Order as per 310 CMR 10.05(6)(c).**

Inland Resource Area Impacts: Check all that apply below. (For Approvals Only)

3. ☐ Buffer Zone Impacts: Shortest distance between limit of project disturbance and wetland boundary (if available) _____ a. linear feet

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
4. ☐ Bank	a. linear feet	b. linear feet	c. linear feet	d. linear feet
5. ☐ Bordering Vegetated Wetland	a. square feet	b. square feet	c. square feet	d. square feet
6. ☐ Land Under Waterbodies and Waterways	a. square feet	b. square feet	c. square feet	d. square feet
	e. c/y dredged	f. c/y dredged		

B. Findings (cont.)

Resource Area	Proposed Alteration	Permitted Alteration	Proposed Replacement	Permitted Replacement
7. ☐ Bordering Land Subject to Flooding	a. square feet	b. square feet	c. square feet	d. square feet
Cubic Feet Flood Storage	e. cubic feet	f. cubic feet	g. cubic feet	h. cubic feet
8. ☐ Isolated Land Subject to Flooding	a. square feet	b. square feet		
Cubic Feet Flood Storage	c. cubic feet	d. cubic feet	e. cubic feet	f. cubic feet
9. ☐ Riverfront area	a. total sq. feet	b. total sq. feet		
Sq ft within 100 ft	c. square feet	d. square feet	e. square feet	f. square feet
Sq ft between 100-200 ft	g. square feet	h. square feet	i. square feet	j. square feet

Coastal Resource Area Impacts: Check all that apply below. (For Approvals Only)

10. ☐ Designated Port Areas	Indicate size under Land Under the Ocean, below			
11. ☒ Land Under the Ocean	211.80 a. square feet	b. square feet		
	0 c. c/y dredged	d. c/y dredged		
12. ☐ Barrier Beaches	Indicate size under Coastal Beaches and/or Coastal Dunes below			
13. ☐ Coastal Beaches	a. square feet	b. square feet	c. c/y nourishmt.	d. c/y nourishmt.
14. ☐ Coastal Dunes	a. square feet	b. square feet	c. c/y nourishmt.	d. c/y nourishmt.
15. ☐ Coastal Banks	0 a. linear feet	b. linear feet		
16. ☐ Rocky Intertidal Shores	0 a. square feet	b. square feet		
17. ☐ Salt Marshes	a. square feet	b. square feet	c. square feet	d. square feet
18. ☐ Land Under Salt Ponds	a. square feet	b. square feet		
	c. c/y dredged	d. c/y dredged		
19. ☐ Land Containing Shellfish	0 a. square feet	b. square feet	c. square feet	d. square feet
20. ☐ Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above			
	a. c/y dredged	b. c/y dredged		
21. ☐ Land Subject to Coastal Storm Flowage	a. square feet	b. square feet		

C. General Conditions Under Massachusetts Wetlands Protection Act

(only applicable to approved projects)

1. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this Order.

2. The Order does not grant any property rights or any exclusive privileges; it does not authorize any injury to private property or invasion of private rights.

3. This Order does not relieve the permittee or any other person of the necessity of complying with all other applicable federal, state, or local statutes, ordinances, bylaws, or regulations.

4. The work authorized hereunder shall be completed within three years from the date of this Order unless either of the following apply:
   a. the work is a maintenance dredging project as provided for in the Act; or
   b. the time for completion has been extended to a specified date more than three years, but less than five years, from the date of issuance. If this Order is intended to be valid for more than three years, the extension date and the special circumstances warranting the extended time period are set forth as a special condition in this Order.

5. This Order may be extended by the issuing authority for one or more periods of up to three years each upon application to the issuing authority at least 30 days prior to the expiration date of the Order.

6. Any fill used in connection with this project shall be clean fill. Any fill shall contain no trash, refuse, rubbish, or debris, including but not limited to lumber, bricks, plaster, wire, lath, paper, cardboard, pipe, tires, ashes, refrigerators, motor vehicles, or parts of any of the foregoing.

7. This Order is not final until all administrative appeal periods from this Order have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed.

8. No work shall be undertaken until the Order has become final and then has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the proposed work is to be done. In the case of the registered land, the Final Order shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the proposed work is done. The recording information shall be submitted to this Conservation Commission on the form at the end of this Order, which form must be stamped by the Registry of Deeds, prior to the commencement of work.

9. A sign shall be displayed at the site not less then two square feet or more than three square feet in size bearing the words,

"Massachusetts Department of Environmental Protection" [or, "MassDEP"]

"File Number 047-0474 "

C. General Conditions Under Massachusetts Wetlands Protection Act

10. Where the Department of Environmental Protection is requested to issue a Superseding Order, the Conservation Commission shall be a party to all agency proceedings and hearings before MassDEP.

11. Upon completion of the work described herein, the applicant shall submit a Request for Certificate of Compliance (WPA Form 8A) to the Conservation Commission.

12. The work shall conform to the plans and special conditions referenced in this order.

13. Any change to the plans identified in Condition #12 above shall require the applicant to inquire of the Conservation Commission in writing whether the change is significant enough to require the filing of a new Notice of Intent.

14. The Agent or members of the Conservation Commission and the Department of Environmental Protection shall have the right to enter and inspect the area subject to this Order at reasonable hours to evaluate compliance with the conditions stated in this Order, and may require the submittal of any data deemed necessary by the Conservation Commission or Department for that evaluation.

15. This Order of Conditions shall apply to any successor in interest or successor in control of the property subject to this Order and to any contractor or other person performing work conditioned by this Order.

16. Prior to the start of work, and if the project involves work adjacent to a Bordering Vegetated Wetland, the boundary of the wetland in the vicinity of the proposed work area shall be marked by wooden stakes or flagging. Once in place, the wetland boundary markers shall be maintained until a Certificate of Compliance has been issued by the Conservation Commission.

17. All sedimentation barriers shall be maintained in good repair until all disturbed areas have been fully stabilized with vegetation or other means. At no time shall sediments be deposited in a wetland or water body. During construction, the applicant or his/her designee shall inspect the erosion controls on a daily basis and shall remove accumulated sediments as needed. The applicant shall immediately control any erosion problems that occur at the site and shall also immediately notify the Conservation Commission, which reserves the right to require additional erosion and/or damage prevention controls it may deem necessary. Sedimentation barriers shall serve as the limit of work unless another limit of work line has been approved by this Order.

18. **The work associated with this Order is** (1) ☐ **is not** (2) ☒ **subject to the Massachusetts Stormwater Policy Standards. If the work is subject to the Stormwater Policy, the following conditions apply to this work and are incorporated into this Order:**

    a) No work, including site preparation, land disturbance, construction and redevelopment, shall commence unless and until the construction period pollution prevention and erosion and sedimentation control plan required by Stormwater Standard 8 is approved in writing by the issuing authority. Until the site is fully stabilized, construction period erosion, sedimentation and pollution control measures and best management practices (BMPs) shall be implemented in accordance with the construction period pollution prevention and erosion and sedimentation control plan, and if applicable, the Stormwater Pollution Plan required by the National Discharge Elimination System Construction General Permit.

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

b) No stormwater runoff may be discharged to the post-construction stormwater BMPs until written approval is received from the issuing authority. To request written approval, the following must be submitted: illicit discharge compliance statement required by Stormwater Standard 10 and as-built plans signed and stamped by a registered professional engineer certifying the site is fully stabilized; all construction period stormwater BMPs and any illicit discharges to the stormwater management system have been removed; and all post-construction stormwater BMPs were installed in accordance with the plans (including all planting plans) approved by the issuing authority, and have been inspected to ensure they are not damaged and will function properly.

c) Prior to requesting a Certificate of Compliance, the responsible party (defined in General Condition 18(e)) shall submit to the issuing authority an Operation and Maintenance (O & M) Compliance Statement for the Stormwater BMPs. This Statement shall identify the responsible party for implementing the Operation and Maintenance Plan and also state that: 1. "Future responsible parties shall be notified in writing of their continuing legal responsibility to operate and maintain the stormwater management BMPs and implement the Pollution Prevention Plan; and 2. The Operation and Maintenance Plan for the stormwater BMPs is complete and will be implemented upon receipt of the Certificate."

d) Post-construction pollution prevention and source control shall be implemented in accordance with the long-term pollution prevention plan section of the approved Stormwater Report and, if applicable, the Stormwater Pollution Prevention Plan required by the National Discharge Elimination System Multi-Sector General Permit.

e) Unless and until another party accepts responsibility, the issuing authority shall presume that the responsible party for maintaining each BMP is the landowner of the property on which the BMP is located. To overcome this presumption, the landowner of the property must submit to the issuing authority a legally binding agreement acceptable to the issuing authority evidencing that another entity has accepted responsibility for maintaining the BMP, and that the proposed responsible party shall be treated as a permittee for purposes of implementing the requirements of Conditions 18(f) through 18(k) with respect to that BMP. Any failure of the proposed responsible party to implement the requirements of Conditions 18(f) through 18(k) with respect to that BMP shall be a violation of the Order of Conditions or Certificate of Compliance. In the case of stormwater BMPs that are serving more than one lot, the legally binding agreement shall also identify the lots that will be serviced by the stormwater BMPs. A plan and easement deed that grants the responsible party access to perform the required operation and maintenance must be submitted along with the legally binding agreement.

f) The responsible party shall operate and maintain all stormwater BMPs in accordance with the design plans, the Operation and Maintenance Plan section of the approved Stormwater Report, and the Massachusetts Stormwater Handbook.

g) The responsible party shall:
1. Maintain an operation and maintenance log for the last three years including inspections, repairs, replacement and disposal (for disposal the log shall indicate the type of material and the disposal location);
2. Make this log available to MassDEP and the Conservation Commission upon request; and
3. Allow members and agents of the MassDEP and the Conservation Commission to enter and inspect the premises to evaluate and ensure that the responsible party complies with the Operation and Maintenance requirements for each BMP set forth in the Operations and Maintenance Plan approved by the issuing authority.

h) All sediments or other contaminants removed from stormwater BMPs shall be disposed of in accordance with all applicable federal, state, and local laws and regulations.

i) Illicit discharges to the stormwater management system as defined in 310 CMR 10.04 are prohibited.

C. General Conditions Under Massachusetts Wetlands Protection Act (cont.)

j) The stormwater management system approved in the Final Order of Conditions shall not be changed without the prior written approval of the issuing authority. Areas designated as qualifying pervious areas for purpose of the Low Impact Site Design Credit shall not be altered without the prior written approval of the issuing authority.

k) Access for maintenance of stormwater BMPs shall not be obstructed or blocked. Any fencing constructed around stormwater BMPs shall include access gates. Fence(s) shall be at least six inches above grade to allow for wildlife passage.

Special Conditions (if you need more space for additional conditions, please attach a text document):

D. Findings Under Municipal Wetlands Bylaw or Ordinance

1. Is a municipal wetlands bylaw or ordinance applicable? ☐ Yes ☒ No
2. The _____ hereby finds (check one that applies):
   Conservation Commission
   a. ☐ that the proposed work cannot be conditioned to meet the standards set forth in a municipal ordinance or bylaw specifically:

      1. Municipal Ordinance or Bylaw _____ 2. Citation _____

      Therefore, work on this project may not go forward unless and until a revised Notice of Intent is submitted which provides measures which are adequate to meet these standards, and a final Order of Conditions is issued.

   b. ☐ that the following additional conditions are necessary to comply with a municipal ordinance or bylaw:

      1. Municipal Ordinance or Bylaw _____ 2. Citation _____

3. The Commission orders that all work shall be performed in accordance with the following conditions and with the Notice of Intent referenced above. To the extent that the following conditions modify or differ from the plans, specifications, or other proposals submitted with the Notice of Intent, the conditions shall control.
   The special conditions relating to municipal ordinance or bylaw are as follows (if you need more space for additional conditions, attach a text document):

E. Issuance

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 5 – Order of Conditions

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

MassDEP File Number:

This Order is valid for three years, unless otherwise specified as a special condition pursuant to General Conditions #4, from the date of issuance.
Please indicate the number of members who will sign this form:
This Order must be signed by a majority of the Conservation Commission.

1. Date of Issuance

10
2. Number of Signers

The Order must be mailed by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate Department of Environmental Protection Regional Office, if not filing electronically, and the property owner, if different from applicant.

Signatures:

Notary Acknowledgement

Commonwealth of Massachusetts County of

On this 26th Day of June Month 2009 Year

Before me, the undersigned Notary Public, personally appeared Conserv. Comm. Name of Document Signer

proved to me through satisfactory evidence of identification, which was/were

Know Personally
Description of evidence of identification

to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he/she signed it voluntarily for its stated purpose.

As member of Amherst City/Town Conservation Commission

OFFICIAL SEAL
KATHLEEN COSTIN
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Comm. Expires Apr. 26, 2013

Signature of Notary Public

Kathleen Costin
Printed Name of Notary Public

April 26 2013
My Commission Expires (Date)

Place notary seal and/or any stamp above

This Order is issued to the applicant as follows:

☐ by hand delivery on Date

☐ by certified mail, return receipt requested, on Date

F. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate MassDEP Regional Office to issue a Superseding Order of Conditions. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request of Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant. Any appellants seeking to appeal the Department's Superseding Order associated with this appeal will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40), and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal ordinance or bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

Section G, Recording Information is available on the following page.

G. Recording Information

This Order of Conditions must be recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property. In the case of recorded land, the Final Order shall also be noted in the Registry's Grantor Index under the name of the owner of the land subject to the Order. In the case of registered land, this Order shall also be noted on the Land Court Certificate of Title of the owner of the land subject to the Order of Conditions. The recording information on this page shall be submitted to the Conservation Commission listed below.

Nahant
Conservation Commission

Detach on dotted line, have stamped by the Registry of Deeds and submit to the Conservation Commission.

To:

_____
Conservation Commission

Please be advised that the Order of Conditions for the Project at:

_____ _____
Project Location MassDEP File Number

Has been recorded at the Registry of Deeds of:

_____ _____ _____
County Book Page

for:

_____
Property Owner

and has been noted in the chain of title of the affected property in:

_____ _____
Book Page

In accordance with the Order of Conditions issued on:

_____
Date

If recorded land, the instrument number identifying this transaction is:

_____
Instrument Number

If registered land, the document number identifying this transaction is:

_____
Document Number

_____
Signature of Applicant

2

JJC

2013110700087 Bk:32940 Pg:339
11/07/2013 09:42 COMPLI Pg 1/2

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

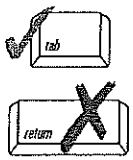
WPA Form 8B – Certificate of Compliance

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

DEP File Number: 047-0475
Provided by DEP

A. Project Information

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



1. This Certificate of Compliance is issued to:

Northeastern University
Name

360 Huntington Avenue
Mailing Address

Boston | MA | 02115-5000
City/Town | State | Zip Code

2. This Certificate of Compliance is issued for work regulated by a final Order of Conditions issued to:

Northeastern University
Name

November 10, 2009 | 047-0475
Dated | DEP File Number

3. The project site is located at:

430 Nahant Road | Nahant
Street Address | City/Town

13 | 1
Assessors Map/Plat Number | Parcel/Lot Number

the final Order of Condition was recorded at the Registry of Deeds for:

Property Owner (if different)

ESSEX | 29187 | 423
County | Book | Page

Certificate

4. A site inspection was made in the presence of the applicant, or the applicant's agent, on:

10-12-13
Date

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 8B – Certificate of Compliance

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

DEP File Number: 047-0475
Provided by DEP

B. Certification

Check all that apply:

☒ **Complete Certification**: It is hereby certified that the work regulated by the above-referenced Order of Conditions has been satisfactorily completed.

☐ **Partial Certification:** It is hereby certified that only the following portions of work regulated by the above-referenced Order of Conditions have been satisfactorily completed. The project areas or work subject to this partial certification that have been completed and are released from this Order are:

☐ Invalid Order of Conditions: It is hereby certified that the work regulated by the above-referenced Order of Conditions never commenced. The Order of Conditions has lapsed and is therefore no longer valid. No future work subject to regulation under the Wetlands Protection Act may commence without filing a new Notice of Intent and receiving a new Order of Conditions.

☐ **Ongoing Conditions**: The following conditions of the Order shall continue: (Include any conditions contained in the Final Order, such as maintenance or monitoring, that should continue for a longer period).

Condition Numbers:

C. Authorization

Issued by:

Nahant
Conservation Commission

10/29/13
Date of Issuance

This Certificate must be signed by a majority of the Conservation Commission and a copy sent to the applicant and appropriate DEP Regional Office (See http://www.mass.gov/dep/about/region/findyour.htm).

Signatures:

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

WPA Form 8B – Certificate of Compliance

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

DEP File Number:

047-0475

Provided by DEP

D. Recording Confirmation

The applicant is responsible for ensuring that this Certificate of Compliance is recorded in the Registry of Deeds or the Land Court for the district in which the land is located.

Detach on dotted line and submit to the Conservation Commission.

To:

Conservation Commission

Please be advised that the Certificate of Compliance for the project at:

Project Location DEP File Number

Has been recorded at the Registry of Deeds of:

County

for:

Property Owner

and has been noted in the chain of title of the affected property on:

Date Book Page

If recorded land, the instrument number which identifies this transaction is:

If registered land, the document number which identifies this transaction is:

Document Number

Signature of Applicant

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON , MA 02108 617-292-5500

08195.00

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

IAN A. BOWLES
Secretary

LAURIE BURT
Commissioner

Northeastern University
c/o Pare Corporation
8 Blackstone Valley Place
Lincoln, RI 02865
Attn: Briscoe B. Lang, PWS

JAN X 6 2010

RE: ISSUANCE OF CHAPTER 91 WATERWAYS LICENSE
Waterways License Application No. W09-2680, License No. 12627
Nahant Harbor, Nahant, Essex County

Dear Licensee,

The Department of Environmental Protection hereby issues the above-referenced Waterways license, enclosed, authorizing you to perform certain activities pursuant to M.G.L. c. 91, the Public Waterfront Act and its regulations 310 CMR 9.00. Any change in use or alteration of any structure or fill not authorized by this license shall render this license void.

This License is not final until all administrative appeal periods from this License have elapsed, or if such an appeal has been taken, until all proceedings before the Department have been completed. The appeal period is for twenty-one (21) days. No work shall be undertaken until the License has become final and has been recorded in the Registry of Deeds or the Land Court for the district in which the land is located, within the chain of title of the affected property

RECORDING OF THE LICENSE

This License must be recorded at the County Registry of Deeds or, if registered land, with the Land Registration Office within sixty (60) days from the date of license issuance. In the case of recorded land, the License shall also be noted in the Registry's Grantor Index under the name of the owner of the land upon which the project is located. In the case of the registered land, the License shall also be noted on the Land Court Certificate of Title of the owner of the land upon which the project is located. **Failure to record this license within sixty (60) days of the date of issuance will render this license void pursuant to 310 CMR 9.18.**

A Waterways License Recordation Notice Form has been enclosed for your use in notifying the Department of the recording information for this License. **Failure to notify the Department of the recording of this license is a violation of 310 CMR 9.00 and is subject to enforcement action by the Department.**

REQUEST CERTIFICATE OF COMPLIANCE

Pursuant to 310 CMR 9.19, once the proposed project is completed you must file a Request for a Certificate of Compliance form, BRP WW05, within sixty (60) days of completion but in no event

later than five (5) years from the License's issuance date. The license for any project for which such a request is not filed and certificate issued may be revoked pursuant to 310 CMR 9.26.

APPEAL RIGHTS AND TIME LIMITS

The following persons shall have the right to an adjudicatory hearing concerning this decision by the Department to grant or deny a license or permit, in accordance with 310 CMR 9.17(1): (a) an applicant who has demonstrated property rights in the lands in question, or which is a public agency; (b) any person aggrieved by the decision of the Department to grant a license or permit who has submitted written comments within the public comment period; (c) ten (10) residents of the Commonwealth who, pursuant to M.G.L. c. 30A, § 10A, have submitted comments within the public comment period with at least 5 of the 10 residents residing in the municipality(s) in which the license or permitted activity is located. The appeal shall clearly and specifically state the facts and grounds for the appeal and the relief sought, and each appealing resident shall file an affidavit stating the intent to be part of the group and to be represented by its authorized representative; (d) the municipal official in the affected municipality who has submitted written comments within the public comment period; and (e) CZM, for any project identified in 310 CMR 9.13(2) (a) for CZM participation or, in an Ocean Sanctuary, if it has filed a notice of participation within the public comment period.

A person requesting an adjudicatory hearing must submit a "Notice of Claim" to the Department, with a copy of the MassDEP Transmittal Form and including the detail specified below, within twenty-one (21) days of the date of issuance of this decision. The MassDEP Fee Transmittal Form is available at the following website: http://www.mass.gov/dep/service/adr/adjherfm.doc. The Notice of Claim must be made in writing and sent by certified mail or hand delivery to:

Case Administrator
MassDEP
One Winter Street, 2nd Floor
Boston, MA 02108

A copy of the complete Notice of Claim must be sent at the same time by certified mail or hand delivery to: (1) the applicant, (2) the municipal official of the city or town where the project is located, and (3) the issuing office of the MassDEP, which in this case is located at:

MassDEP Waterways Regulation Program
One Winter Street, 5th Floor
Boston, MA 02108

The MassDEP Fee Transmittal Form and a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars ($100) must be mailed to:

Mass. Department of Environmental Protection
Commonwealth Master Lockbox
P.O. Box 4062
Boston, Massachusetts 02211

CONTENTS OF APPEAL REQUEST

Pursuant to 310 CMR 9.17(3), any Notice of Claim requesting an adjudicatory hearing must include the following information:

(a) the MassDEP Waterways Application File Number;
(b) the complete name, address, fax number and telephone number of the applicant;
(c) the address of the project;
(d) the complete name, address, fax number, and telephone number of the party filing the request and, if represented by counsel, the name, address, fax number, and phone number of the attorney;

(e) if claiming to be a person aggrieved, the specific facts that demonstrate that the party satisfies the definition of "aggrieved person" found in 310 CMR 9.02;

(f) a clear statement that a formal adjudicatory hearing is being requested;

(g) a clear statement of the facts which are the grounds for the proceedings, the specific objections to the MassDEP's written decision, and the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written decision; and

(h) a statement that a copy of the request has been sent to: the applicant and the municipal official of the city or town where the project is located.

DISMISSAL OF REQUEST

The request for appeal will be dismissed if the filing fee is not paid, unless the appellant is exempt or is granted a waiver. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority. The Department may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Please feel free to contact David B. Slagle of the Waterways Regulation Program, (617) 654-6640, if you have any questions pertaining to the recording of your Waterways license or Certificate of Compliance.

Sincerely,

Ben Lynch
Program Chief
Waterways Regulation Program

cc: Nahant, Board of Selectmen
Nahant, Conservation Commission
Nahant, Planning Board
Nahant, Harbormaster

Ecc: DEP/NE Wetlands File #
EOEEA, MEPA Unit File #

Enclosure(s) Waterways License # **12627**
Notification of Waterways License Recordation form

Michael Girvan
Waterways Regulation Program
Department of Environmental Protection
1 Winter Street, 5th Floor
Boston, Massachusetts 02108

RE: NOTIFICATION OF RECORDING THE WATERWAYS LICENSE
Waterways License No. 12627
Nahant Harbor, Nahant, Essex County

Dear Mr. Girvan:

This is to notify you that the above referenced Waterways license was recorded with the appropriate Registry of Deeds/ Land Court for this project location and to provide your office with the following recordation information.

Date of Recordation: _____
County Registry of Deeds/ Land Court: _____
Book number_____, and page number(s) _____.

We will apply for a Certificate of Compliance with your office when the authorized work or change in use is completed.

Sincerely,

_____, Chapter 91 Waterways Licensee

License is void if not recorded within sixty (60) days of issuance.

The Commonwealth of Massachusetts

No. 12627

Whereas, Northeastern University

of -- Boston --, in the County of -- Suffolk -- and Commonwealth aforesaid, has applied to the Department of Environmental Protection for license to -- replace, extend and maintain salt water intake pipes to be held in place by concrete anchor blocks -----

and has submitted plans of the same; and whereas due notice of said application has been given, as required by law, to the -- Board of Selectmen -- of the -- Town of Nahant; ---------

NOW, said Department, having heard all parties desiring to be heard, and having fully considered said application, hereby, subject to the approval of the Governor, authorizes and licenses the said

-- Northeastern University --, subject to the provisions of the ninety-first chapter of the General Laws, and of all laws which are or may be in force applicable thereto, to -- replace, extend and maintain salt water intake pipes to be held in place by concrete anchor blocks --

in and over the waters of -- Boston Harbor -- located at the Marine Science Center, 430 Nahant Road -- in the -- Town -- of -- Nahant -- and in accordance with the locations shown and details indicated on the accompanying DEP License Plan No. 12627, (4 sheets).

The structures hereby authorized shall be limited to the following uses: to provide for the conveyance of salt water for use within the Marine Science Center's Edwards Laboratory.

SPECIAL CONDITIONS

This license will expire thirty (30) years from the date of issuance.

In accordance with any license condition, easement, or other public right of lateral passage that exists in the area of the subject property lying below the high water mark, the Licensee shall allow the public in the exercise of such rights to pass freely over/around all structures within such area.

In partial compensation for the private use of structures on land within Commonwealth tidelands, which interferes with the rights of the public to use such lands, the Licensee shall allow the public to pass on foot, for any purpose and from dawn to dusk, along the upland of the subject property within five (5) feet of the high water mark. This condition shall not be construed to prevent the Licensee from taking reasonable measures to discourage unlawful activity by users of the area intended for public passage, including but not limited to trespassing on adjacent private areas and deposit of refuse of any kind or nature in the water or on the shore. Further, the exercise by the public of free on-foot passage in accordance with this condition shall be considered a permitted use to which the limited liability provisions of M.G.L. c.21, s17c shall apply.

All work authorized herein shall be completed within five (5) years of the date of license issuance. Said construction period may be extended by the Department for one or more one year periods without public notice, provided that the Applicant submits to the Department thirty (30) days prior to the end of the construction period, a written request to extend the period and provides adequate justification for said extension.

Within 60 days of completion of the licensed project, the Licensee shall request in writing that the Department issue a Certificate of Completion in accordance with 310 CMR 9.19. The request shall be accompanied by a certification by a registered professional engineer licensed in the Commonwealth that the project was completed in accordance with the License.

By written request of the licensee for an amendment, the Department may grant a renewal for a term not to exceed that authorized in the original license.

Please see page 3 for additional conditions to this license.

Duplicate of said plan, number 12627 on file in the office of said Department, and original of said plan accompanies this License, and is to be referred to as a part hereof.

STANDARD WATERWAYS LICENSE CONDITIONS

1. Acceptance of this Waterways License shall constitute an agreement by the Licensee to conform to all terms and conditions stated herein.

2. This License is granted upon the express condition that any and all other applicable authorizations necessitated due to the provisions hereof shall be secured by the Licensee prior to the commencement of any activity or use authorized pursuant to this License.

3. Any change in use or any substantial structural alteration of any structure or fill authorized herein shall require the issuance by the Department of a new Waterways License in accordance with the provisions and procedures established in Chapter 91 of the Massachusetts General Laws. Any unauthorized substantial change in use or unauthorized substantial structural alteration of any structure or fill authorized herein shall render this Waterways License void.

4. This Waterways License shall be revocable by the Department for noncompliance with the terms and conditions set forth herein. This license may be revoked after the Department has given written notice of the alleged noncompliance to the Licensee and those persons who have filed a written request for such notice with the Department and afforded them a reasonable opportunity to correct said noncompliance. Failure to correct said noncompliance after the issuance of a written notice by the Department shall render this Waterways License void and the Commonwealth may proceed to remove or cause removal of any structure or fill authorized herein at the expense of the Licensee, its successors and assigns as an unauthorized and unlawful structure and/or fill.

5. The structures and/or fill authorized herein shall be maintained in good repair and in accordance with the terms and conditions stated herein and the details indicated on the accompanying license plans.

6. Nothing in this Waterways License shall be construed as authorizing encroachment in, on or over property not owned or controlled by the Licensee, except with the written consent of the owner or owners thereof.

7. This Waterways License is granted subject to all applicable Federal, State, County, and Municipal laws, ordinances and regulations including but not limited to a valid final Order of Conditions issued pursuant to the Wetlands Protection Act, G.L. Chapter 131, s.40.

8. This Waterways License is granted upon the express condition that the use of the structures and/or fill authorized hereby shall be in strict conformance with all applicable requirements and authorizations of the DEP.

9. This License authorizes structure(s) and/or fill on:

X Private Tidelands. In accordance with the public easement that exists by law on private tidelands, the licensee shall allow the public to use and to pass freely upon the area of the subject property lying between the high and low water marks, for the purposes of fishing, fowling, navigation, and the natural derivatives thereof.

X Commonwealth Tidelands. The Licensee shall not restrict the public's right to use and to pass freely, for any lawful purpose, upon lands lying seaward of the low water mark. Said lands are held in trust by the Commonwealth for the benefit of the public.

__ a Great Pond of the Commonwealth. The Licensee shall not restrict the public's right to use and to pass freely upon lands lying seaward of the high water mark for any lawful purpose.

__ Navigable River or Stream. The Licensee shall not restrict the public's right to use and to pass freely, for any lawful purpose, in the waterway.

No restriction on the exercise of these public rights shall be imposed unless otherwise expressly provided in this license.

10. Unless otherwise expressly provided by this license, the licensee shall not limit the hours of availability of any areas of the subject property designated for public passage, nor place any gates, fences, or other structures on such areas in a manner that would impede or discourage the free flow of pedestrian movement thereon.

The amount of tidewater displaced by the work hereby authorized has been ascertained by said Department, and compensation thereof has been made by the said -- Northeastern University -- by paying into the treasury of the Commonwealth -- two dollars and zero cents ($2.00)-- for each cubic yard so displaced, being the amount hereby assessed by said Department. (0.0 cu. yds. = $0.00)

Nothing in this License shall be so construed as to impair the legal rights of any person. This License shall be void unless the same and the accompanying plan are recorded within 60 days from the date hereof, in the Registry of Deeds for the County of -- Essex -------

IN WITNESS WHEREAS, said Department of Environmental Protection have hereunto set their hands this 6th day of January in the year two thousand and ten.

Commissioner _____ Department of Environmental Protection

Program Chief _____

THE COMMONWEALTH OF MASSACHUSETTS

This license is approved in consideration of the payment into the treasury of the Commonwealth by the said -- Northeastern University

-- the further sum of -- zero dollars and zero cents ($0.00)

the amount determined by the Governor as a just and equitable charge for rights and privileges hereby granted in the land of the Commonwealth.

BOSTON,

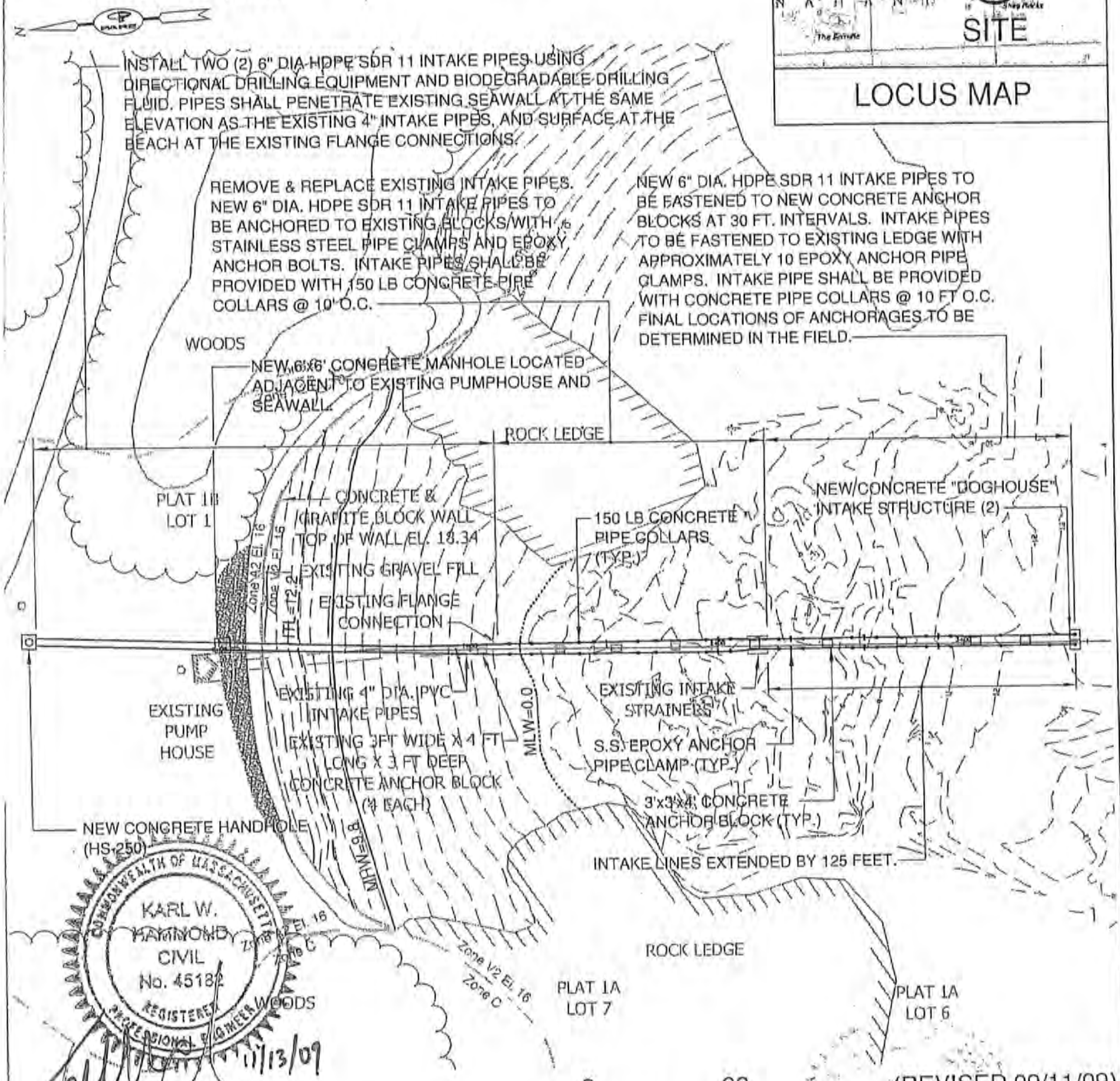
Approved by the Governor.

Governor

2. TOPOGRAPHIC SURVEY PERFORMED BY PARE CORPORATION ON SEPTEMBER 2, 2008.

3. BATHYMETRIC SURVEY PERFORMED BY INNERTEK INC. ON SEPTEMBER 5, 2008.

LOCUS MAP


INSTALL TWO (2) 6" DIA HDPE SDR 11 INTAKE PIPES USING DIRECTIONAL DRILLING EQUIPMENT AND BIODEGRADABLE DRILLING FLUID. PIPES SHALL PENETRATE EXISTING SEAWALL AT THE SAME ELEVATION AS THE EXISTING 4" INTAKE PIPES, AND SURFACE AT THE BEACH AT THE EXISTING FLANGE CONNECTIONS.
REMOVE & REPLACE EXISTING INTAKE PIPES. NEW 6" DIA. HDPE SDR 11 INTAKE PIPES TO BE ANCHORED TO EXISTING BLOCKS WITH STAINLESS STEEL PIPE CLAMPS AND EPOXY ANCHOR BOLTS. INTAKE PIPES SHALL BE PROVIDED WITH 150 LB CONCRETE PIPE COLLARS @ 10' O.C.
NEW 6" DIA. HDPE SDR 11 INTAKE PIPES TO BE FASTENED TO NEW CONCRETE ANCHOR BLOCKS AT 30 FT. INTERVALS. INTAKE PIPES TO BE FASTENED TO EXISTING LEDGE WITH APPROXIMATELY 10 EPOXY ANCHOR PIPE CLAMPS. INTAKE PIPE SHALL BE PROVIDED WITH CONCRETE PIPE COLLARS @ 10 FT O.C. FINAL LOCATIONS OF ANCHORAGES TO BE DETERMINED IN THE FIELD.
WOODS
NEW 6'x6' CONCRETE MANHOLE LOCATED ADJACENT TO EXISTING PUMPHOUSE AND SEAWALL.
ROCK LEDGE
PLAT 1B LOT 1
CONCRETE & GRANITE BLOCK WALL TOP OF WALL EL. 13.34
EXISTING GRAVEL FILL
EXISTING FLANGE CONNECTION
150 LB CONCRETE PIPE COLLARS (TYP.)
NEW CONCRETE "DOGHOUSE" INTAKE STRUCTURE (2)
EXISTING PUMP HOUSE
EXISTING 4" DIA. PVC INTAKE PIPES
EXISTING 3FT WIDE X 4 FT LONG X 3 FT DEEP CONCRETE ANCHOR BLOCK (4 EACH)
MLW=0.0
MHW=9.8
EXISTING INTAKE STRAINERS
S.S. EPOXY ANCHOR PIPE CLAMP (TYP.)
3'x3'x4' CONCRETE ANCHOR BLOCK (TYP.)
NEW CONCRETE HANDHOLE (HS-250)
INTAKE LINES EXTENDED BY 125 FEET.
ROCK LEDGE
Zone V2 El. 16
Zone C
WOODS
PLAT 1A LOT 7
PLAT 1A LOT 6

COMMONWEALTH OF MASSACHUSETTS
KARL W. HAMMOND
CIVIL
No. 45182
REGISTERED PROFESSIONAL ENGINEER

11/13/09

0 60

(REVISED 09/11/09)
SHEET 1 OF 4

PLAN

SCALE: 1"=60'

PLAN ACCOMPANYING PETITION OF:
NORTHEASTERN UNIVERSITY
MARINE SCIENCE CENTER
TO LICENSE SALT WATER INTAKE PIPE
REPLACEMENT AND EXTENSION.
NAHANT HARBOR,
NAHANT, MASSACHUSETTS
September 2009

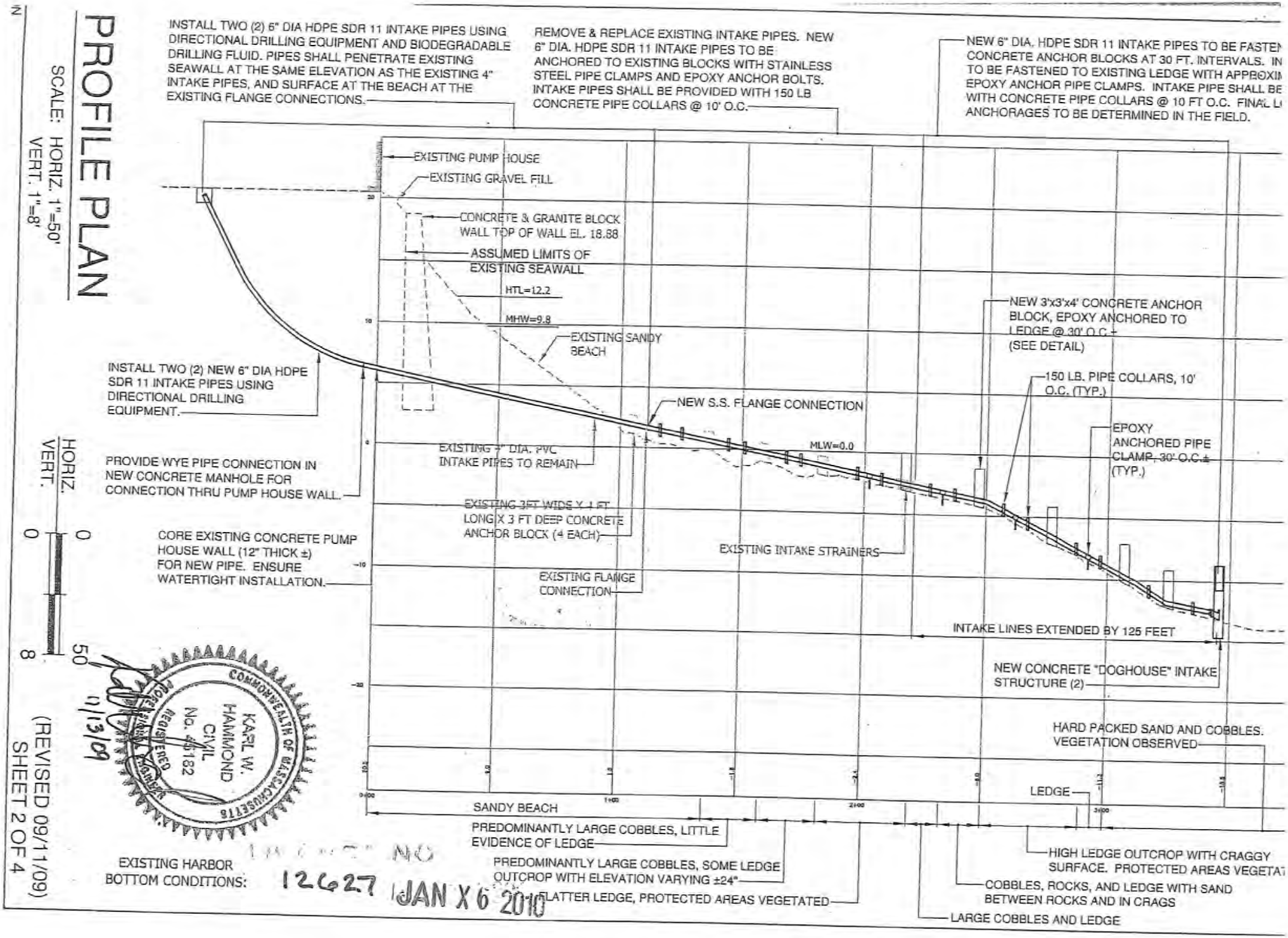
LICENSE PLAN NO. 12627

JAN X 6 2010

ION

PROFILE PLAN

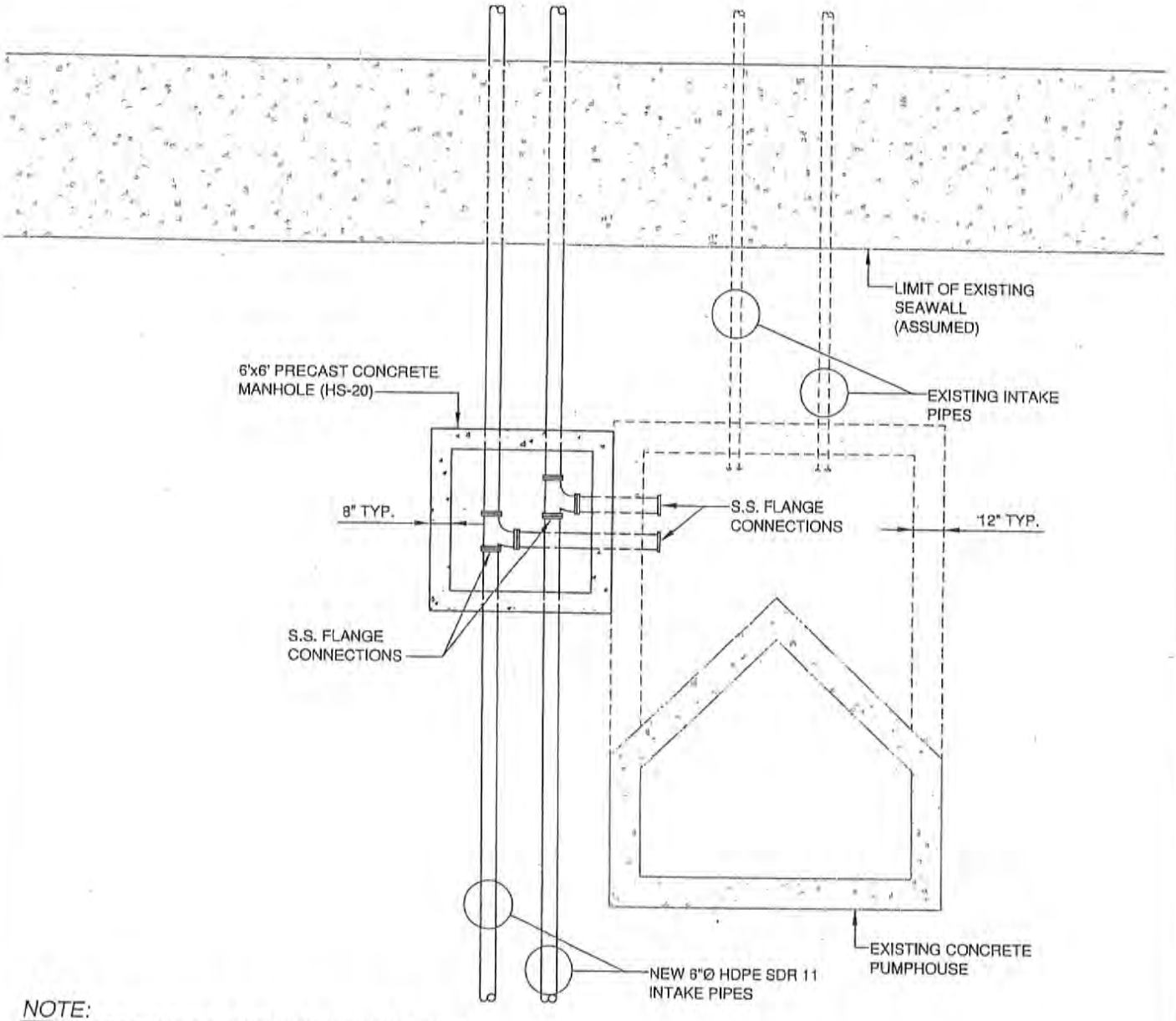
SCALE: HORIZ. 1"=50'
VERT. 1"=8'



COMMONWEALTH OF MASSACHUSETTS
KARL W. HAMMOND
CIVIL
No. 45182
REGISTERED PROFESSIONAL ENGINEER
1/13/09

INCOMING NO
12627 JAN X 6 2010

(REVISED 09/11/09)
SHEET 2 OF 4



NOTE:

1. INVERT ELEVATIONS OF NEW INTAKE PIPE TO MATCH INVERT ELEVATIONS OF EXISTING INTAKE PIPES.

PUMPHOUSE PIPE PENETRATION
PLAN VIEW
SCALE: 3/16" = 1'-0"

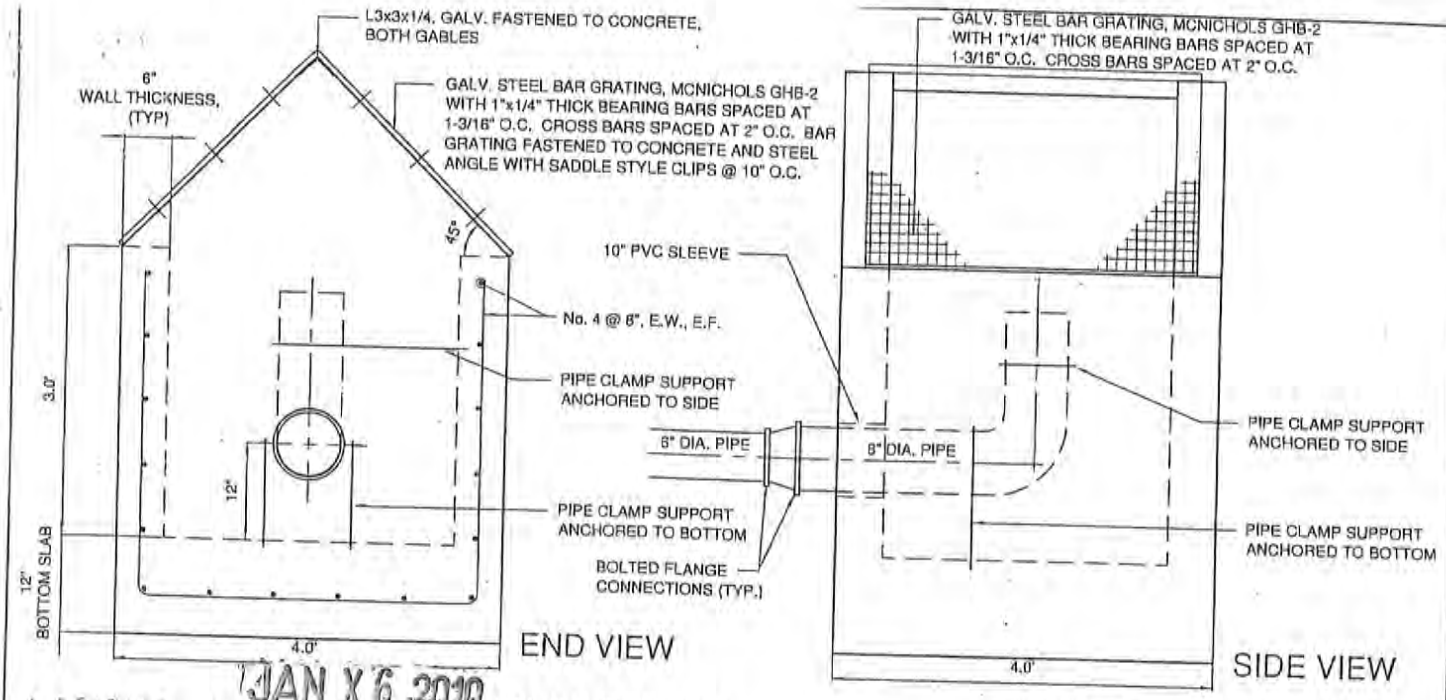
LICENSE PLAN NO. 12627
Approved by Department of Environmental Protection
Date: JAN X 6 2010

COMMONWEALTH OF MASSACHUSETTS
KARL W. HAMMOND
CIVIL
No. 45182
REGISTERED PROFESSIONAL ENGINEER
11/13/09

DETAILS

SCALE: AS NOTED

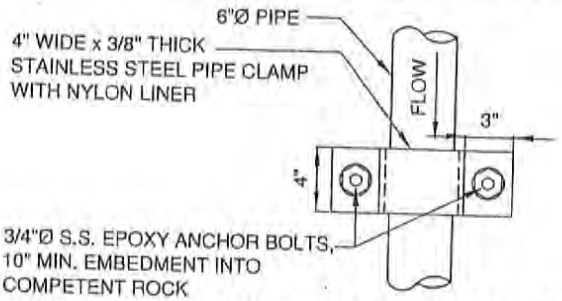
(REVISED 09/11/09)
SHEET 4 OF 4



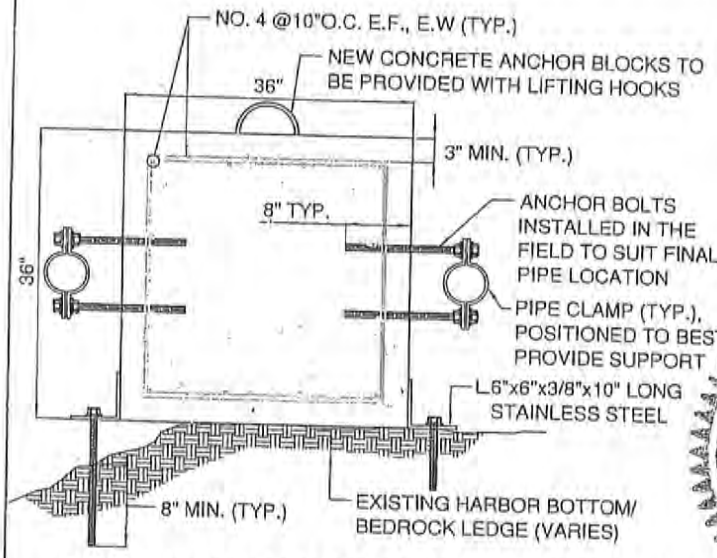
JAN X 6 2010

12.627

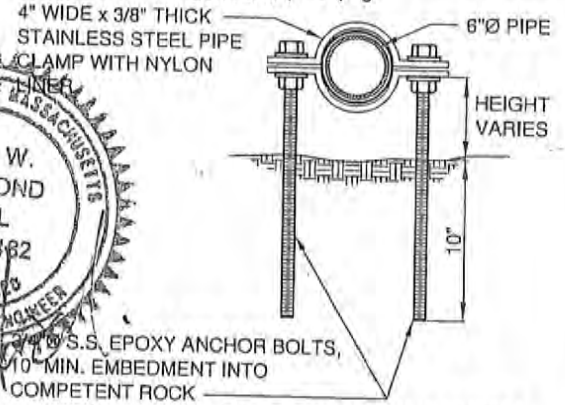
DOGHOUSE DETAILS
SCALE: 1" = 1'-0"



TYPICAL PIPE CLAMP PLAN VIEW
SCALE: 1" = 1'-0"

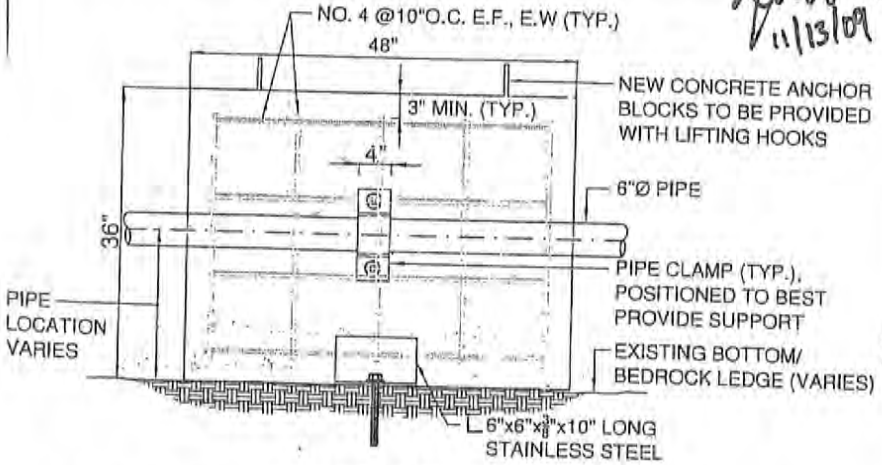


CONCRETE ANCHOR BLOCK SECTION VIEW
SCALE: 1" = 1'-0"

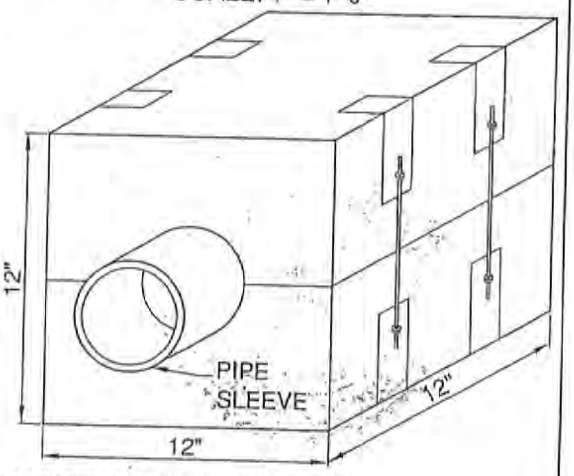


TYPICAL PIPE CLAMP SECTION
SCALE: 1" = 1'-0"

11/13/09



CONCRETE ANCHOR BLOCK ELEVATION VIEW
SCALE: 1" = 1'-0"



150 LB CONCRETE PIPE COLLAR
SCALE: 1 1/2" = 1'-0"

DETAILS

SCALE: AS NOTED

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

Northeastern University
c/o Pare Corporation
10 Lincoln Road, Suite 103
Foxborough, MA 02035
Attn: Briscoe Lang

Re: Certificate of Compliance, DEP License No. 12627
Nahant Bay, Nahant, Essex County

Dear Mr. Lang:

Enclosed is the Certificate of Compliance for the above referenced Waterways License pursuant to Waterways Licensing Regulations 310 CMR 9.19. This Certificate could be attached to the License documents for future reference and a copy of the Certificate will be placed in the License file on record with the Department.

Should you have any questions comments on this matter, please call David B. Slagle of my office at (617) 654-6520.

Sincerely,

Ben Lynch
Program Chief
Waterways Regulation Program

Cc: Nahant Conservation Commission
WRP file

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
One Winter Street Boston, MA 02108 • 617-292-5500

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Martin Suuberg
Commissioner

CERTIFICATE OF COMPLIANCE PURSUANT TO MGL CHAPTER 91 WATERWAYS LICENSING REGULATIONS 310 CMR 9.19

This Certificate of Compliance is issued pursuant to Waterways Regulations 310 CMR 9.19 to:

Northeastern University Marine Science Center
430 Nahant Road
Nahant, MA 01908

Waterways License No. 12627, issued on April 27, 2010 and the accompanying license plans authorized the Licensee, Northeastern University to construct and maintain a salt water intake structure. The site is located in within the waters of Nahant Bay in the Town of Nahant.

The License was duly recorded at the Registry of Deeds in Essex County on May 7, 2010.

In accordance with the foregoing and the affidavit of Karl W. Hammond, P.E. of Pare Corporation, 10 Lincoln Road, Suite 103; Foxborough, MA 02035, signed September 29, 2014, submitted pursuant to 310 CMR 9.19, the undersigned certifies to the best of his knowledge that the work authorized in said License has been completed in substantial accordance with the terms and conditions of Chapter 91 Waterways License No. 12627.

The Licensee shall continue to maintain in good repair all authorized structures and uses in accordance with the terms and conditions stated in Waterways License No. 12627 for the full term of the license.

IN WITNESS WHEREAS, said Department of Environmental Protection have hereunto set their hands this 11th day of APRIL in the year two thousand and fifteen.

Program Chief _____

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO:
ATTENTION OF:

October 28, 2009

Regulatory Division
CENAE-R-PEA
Permit Number: NAE-2009-1693

Northeastern University
Attn: Samuel Solomon, Director of Finance and Treasurer
360 Huntington Avenue
Boston, Massachusetts 02115

Dear Mr. Solomon:

We have reviewed your application for Northeastern University to replace and extend to deeper water the existing paired seawater intake pipes at the Northeastern University's Marine Science Center in Nahant. The work will replace about 105 feet of 4-inch piping with 6-inch piping, extend the intake about 130 feet seaward with 6-inch diameter piping, and install a concrete intake structure. The new piping will be anchored to blocks with stainless steel pipe clamps along its length. The project site is located in Nahant Bay, 430 Nahant Road, Nahant Massachusetts. The work is shown on the attached plans entitled "PROPOSED SALT WATER INTAKE PIPE REPLACEMENT AND EXTENSION NAHANT HARBOR NAHANT, MASSACHUSETTS", on 5 sheets, and dated "09/11/09".

Based on the information you have provided, we have determined that the proposed activity will have only minimal individual or cumulative environmental impacts on waters of the United States, including wetlands. Therefore, this work is authorized as a Category 2 activity under the attached Federal permit known as the Massachusetts Programmatic General Permit (PGP). This work must be performed in accordance with the terms and conditions of the PGP.

The Corps of Engineers has consulted with the National Marine Fisheries Service (NMFS) regarding the effects of your project on Essential Fish Habitat (EFH) as designated under the Magnuson-Stevens Fishery Conservation and Management Act. The NMFS did not provide EFH conservation recommendations.

You are responsible for complying with all of the PGP's requirements. Please review the attached PGP carefully, in particular the PGP conditions beginning on Page 9, to familiarize yourself with its contents. You should ensure that whoever does the work fully understands the requirements and that a copy of the permit document and this authorization letter are at the project site throughout the time the work is underway.

Your project is located within, or may affect resources within the coastal zone. The Massachusetts Office of Coastal Zone Management (CZM) has already determined that no further Federal Consistency Review is required.

This authorization expires on January 20, 2010, unless the PGP is modified, suspended, or revoked. You must commence or have under contract to commence the work authorized herein by January 20, 2010 and complete the work by January 20, 2011. For work within Corps jurisdiction that is not completed by January 20, 2011, you will need to reapply to the Corps to continue work within our jurisdiction. We recommend you contact us *before* this permit expires to discuss permit reissuance.

If you change the plans or construction methods for work within our jurisdiction, please contact us immediately to discuss modification of this authorization. This office must approve any changes before you undertake them.

This authorization requires you to complete and return the enclosed Work Start Notification Form to this office at least two weeks before the anticipated starting date. You must also complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work and any required mitigation.

This authorization presumes that the work as described above and as shown on your plans noted above is in waters of the U.S. Should you desire to appeal our jurisdiction, please submit a request for an approved jurisdictional determination in writing to this office.

This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law, as listed on Page 1 of the PGP. Performing work not specifically authorized by this determination or failing to comply with all the terms and conditions of the PGP may subject you to the enforcement provisions of our regulations.

We continually strive to improve our customer service. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://per2.nwp.usace.army.mil/survey.html

Please contact John Sargent, of my staff at 978-318-8026 if you have any questions.

Sincerely,

Karen Kirk Adams
Chief, Permits & Enforcement Branch
Regulatory Division

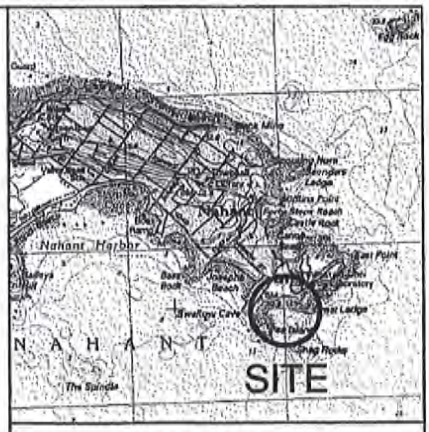
Attachments

Copies Furnished:

Ed Reiner, U.S. EPA, Region 1, Boston, Massachusetts, reiner.ed@epa.gov
Christopher Boelke, National Marine Fisheries Service, Gloucester, Massachusetts, christopher.boelke@noaa.gov
Rachel Freed, DEP NERO, Wetland and Waterways, Wilmington, Massachusetts, rachel.freed@state.ma.us (DEP File No. 047-0475)
Robert Boeri, Coastal Zone Management, Boston, Massachusetts Robert.Boeri@state.ma.us
Briscoe Lang, Pare Corporation, 8 Blackstone Valley Place, Lincoln, Rhode Island 02865

NOTES:

1. VERTICAL ELEVATIONS REFERENCED TO BENCHMARK SET ON TOP OF THE EXISTING SEAWALL. VERTICAL DATUM REFERENCED TO MLW = 0.0 , MHW = +9.8 , HTL = +12.2.
2. TOPOGRAPHIC SURVEY PERFORMED BY PARE CORPORATION ON SEPTEMBER 2, 2008.
3. BATHYMETRIC SURVEY PERFORMED BY INNERTEK INC. ON SEPTEMBER 5, 2008.



LOCUS MAP

INSTALL TWO (2) 6" DIA HDPE SDR 11 INTAKE PIPES USING DIRECTIONAL DRILLING EQUIPMENT AND BIODEGRADABLE DRILLING FLUID. PIPES SHALL PENETRATE EXISTING SEAWALL AT THE SAME ELEVATION AS THE EXISTING 4" INTAKE PIPES, AND SURFACE AT THE BEACH AT THE EXISTING FLANGE CONNECTIONS.

REMOVE & REPLACE EXISTING INTAKE PIPES. NEW 6" DIA. HDPE SDR 11 INTAKE PIPES TO BE ANCHORED TO EXISTING BLOCKS WITH STAINLESS STEEL PIPE CLAMPS AND EPOXY ANCHOR BOLTS. INTAKE PIPES SHALL BE PROVIDED WITH 150 LB CONCRETE PIPE COLLARS @ 10' O.C.

NEW 6" DIA. HDPE SDR 11 INTAKE PIPES TO BE FASTENED TO NEW CONCRETE ANCHOR BLOCKS AT 30 FT. INTERVALS. INTAKE PIPES TO BE FASTENED TO EXISTING LEDGE WITH APPROXIMATELY 10 EPOXY ANCHOR PIPE CLAMPS. INTAKE PIPE SHALL BE PROVIDED WITH CONCRETE PIPE COLLARS @ 10 FT O.C. FINAL LOCATIONS OF ANCHORAGES TO BE DETERMINED IN THE FIELD.

WOODS

NEW 6'X6' CONCRETE MANHOLE LOCATED ADJACENT TO EXISTING PUMPHOUSE AND SEAWALL.

ROCK LEDGE

PLAT 1B LOT 1

CONCRETE & GRANITE BLOCK WALL TOP OF WALL EL. 18.34

EXISTING GRAVEL FILL

EXISTING FLANGE CONNECTION

150 LB CONCRETE PIPE COLLARS (TYP.)

NEW CONCRETE "DOGHOUSE" INTAKE STRUCTURE (2)

Zone A2 El. 16

Zone V2 El. 16

EL=12.2

EXISTING PUMP HOUSE

EXISTING 4" DIA. PVC INTAKE PIPES

EXISTING 3FT WIDE X 4 FT LONG X 3 FT DEEP CONCRETE ANCHOR BLOCK (4 EACH)

MLW=0.0

EXISTING INTAKE STRAINERS

S.S. EPOXY ANCHOR PIPE CLAMP (TYP.)

3'x3'x4' CONCRETE ANCHOR BLOCK (TYP.)

NEW CONCRETE HANDHOLE (HS-250)

MHW=9.8

INTAKE LINES EXTENDED BY 125 FEET.

Zone A2 El. 16

Zone C

Zone V2 El. 16

Zone C

ROCK LEDGE

WOODS

PLAT 1A LOT 7

PLAT 1A LOT 6

PLAN

SCALE: 1"=60'

0 60

PROPOSED SALT WATER INTAKE PIPE
REPLACEMENT AND EXTENSION
NAHANT HARBOR
NAHANT, MASSACHUSETTS
SEPTEMBER 2009

(REVISED 09/11/09)
SHEET 1 OF 5

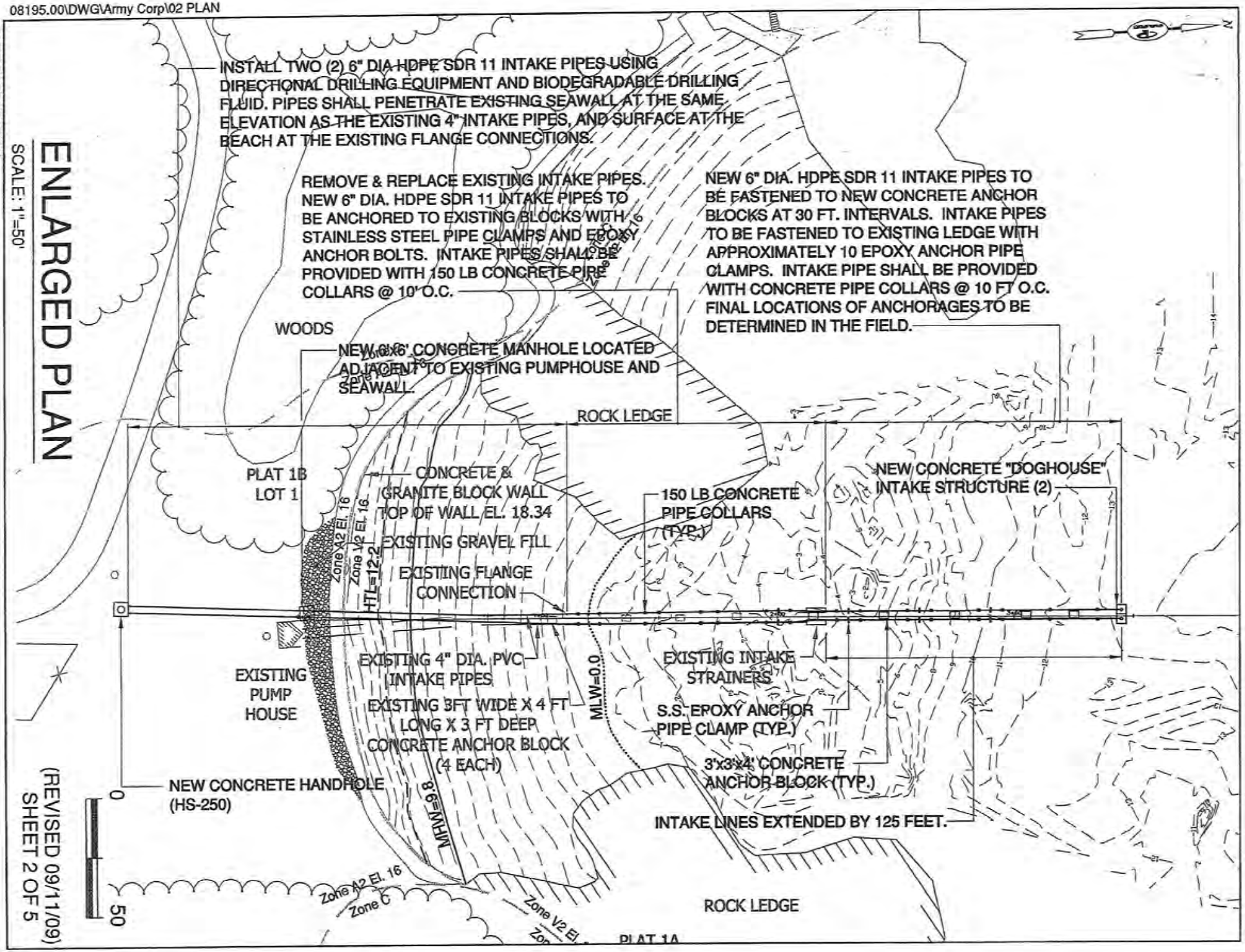
08195.00\DWG\Army Corp\01 TITLE

PARE CORPORATION

FARE CORPORATION

ENLARGED PLAN

SCALE: 1"=50'



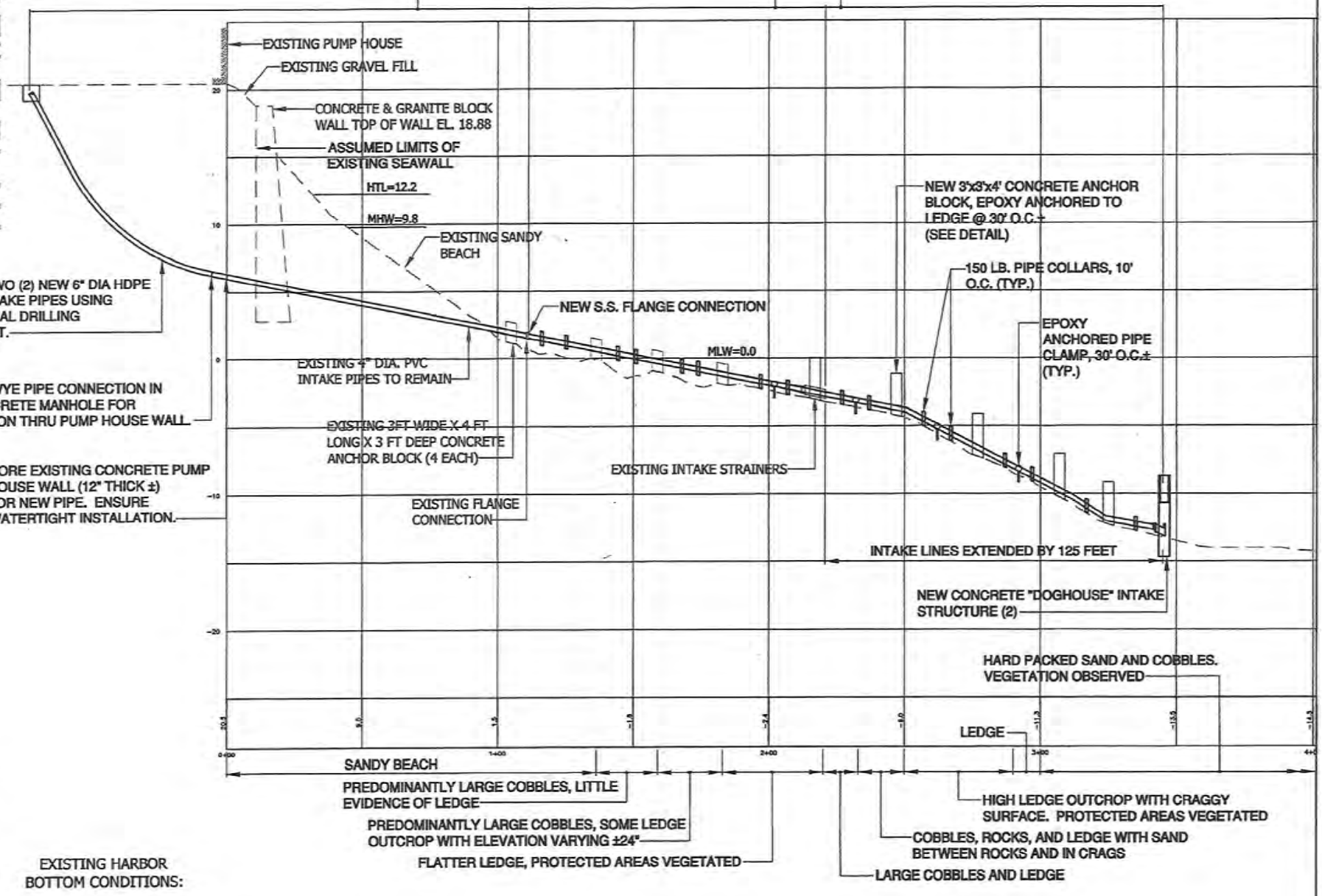
(REVISED 09/11/09)

08195.00\DWG\Army Corp\03 PROFILE

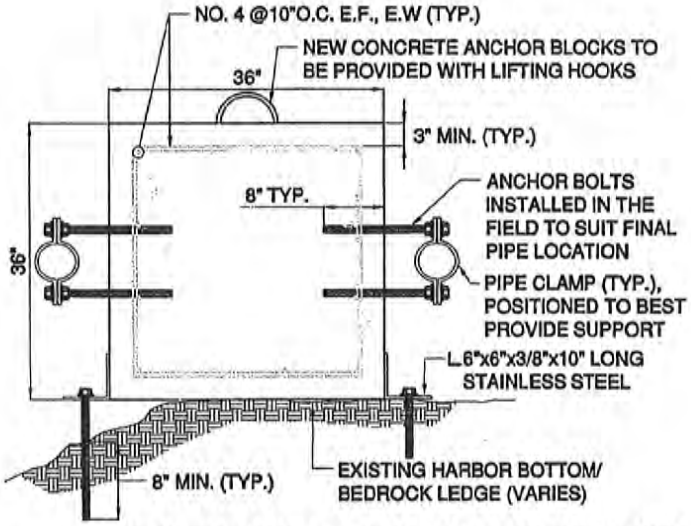
PARE CORPORATION

PROFILE PLAN

SCALE: HORIZ. 1"=50'
VERT. 1"=8'

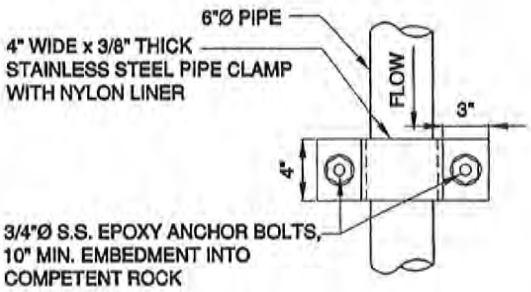


(REVISED 09/11/09)
SHEET 3 OF 5



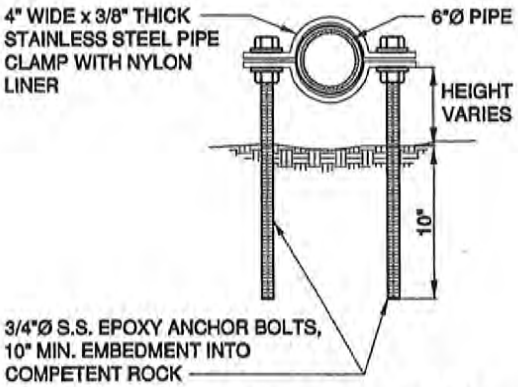
CONCRETE ANCHOR BLOCK SECTION VIEW

SCALE: 1" = 1'-0"



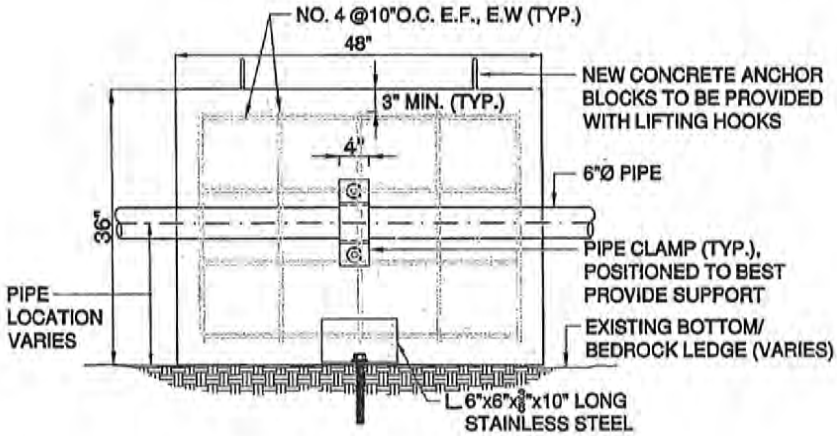
TYPICAL PIPE CLAMP PLAN VIEW

SCALE: 1" = 1'-0"



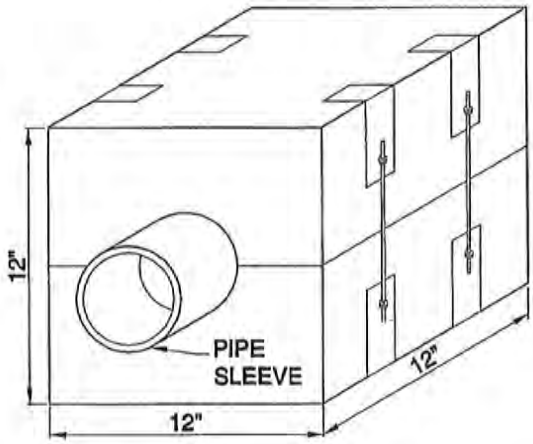
TYPICAL PIPE CLAMP SECTION

SCALE: 1" = 1'-0"



CONCRETE ANCHOR BLOCK ELEVATION VIEW

SCALE: 1" = 1'-0"



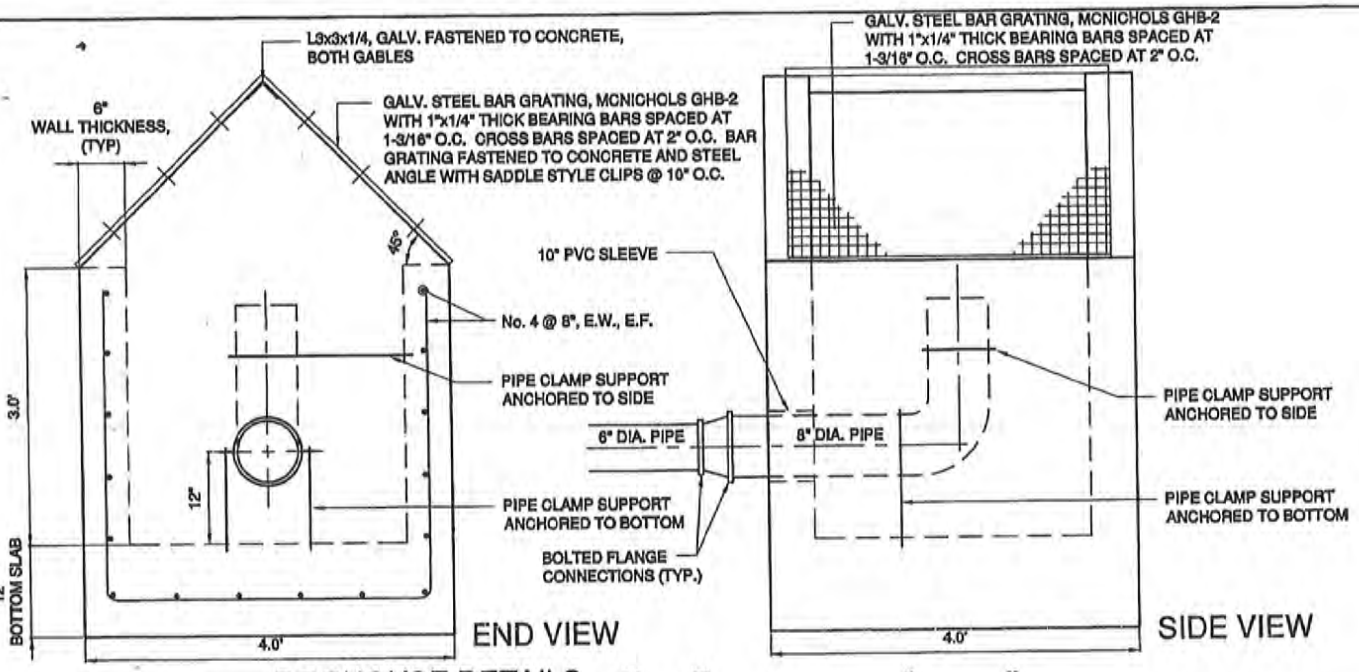
150 LB CONCRETE PIPE COLLAR

SCALE: 1 1/2" = 1'-0"

DETAILS

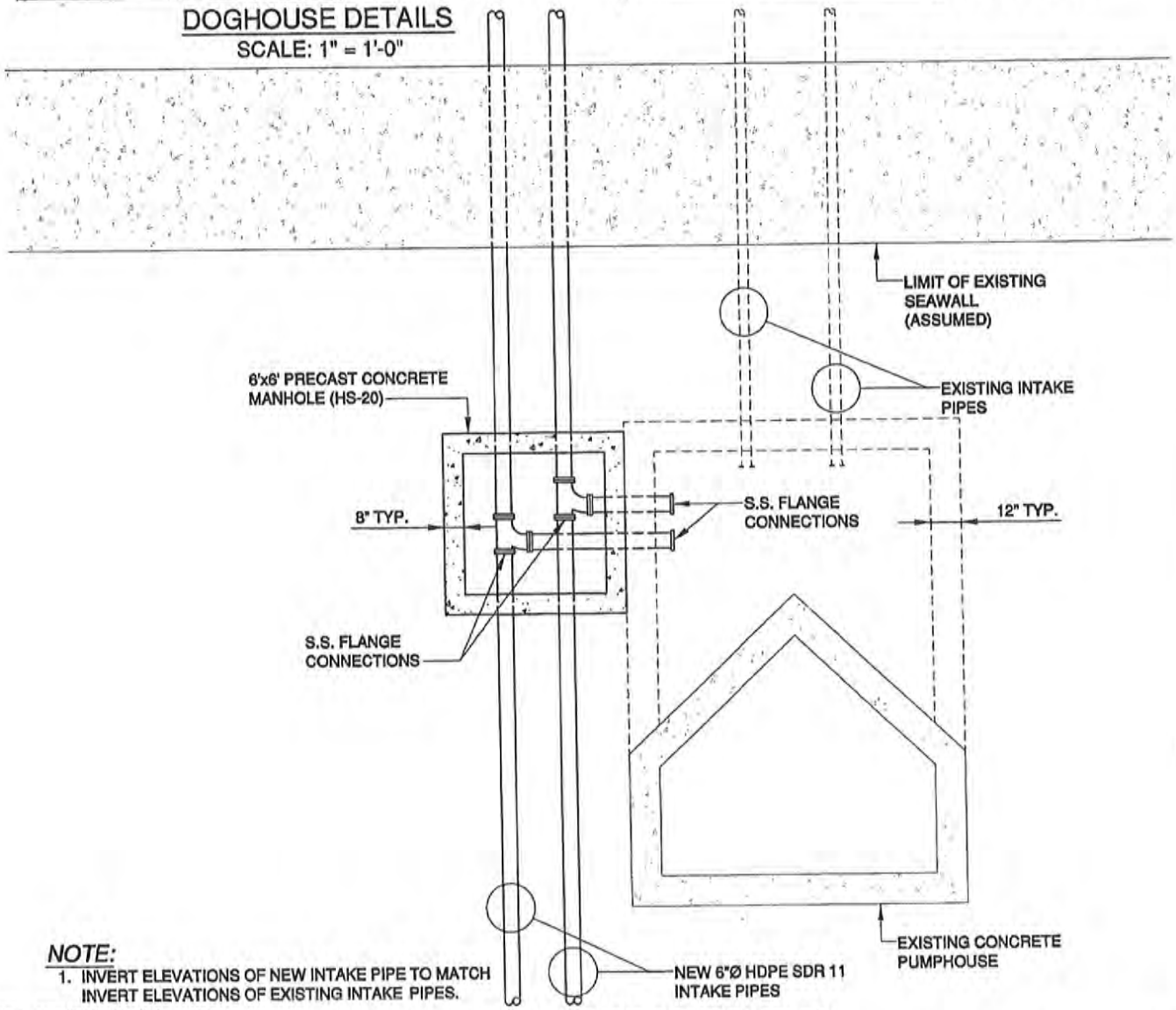
SCALE: AS NOTED

(REVISED 09/11/09)



DOGHOUSE DETAILS

SCALE: 1" = 1'-0"



NOTE:

1. INVERT ELEVATIONS OF NEW INTAKE PIPE TO MATCH INVERT ELEVATIONS OF EXISTING INTAKE PIPES.

DETAILS

SCALE: AS NOTED

PUMPHOUSE PIPE PENETRATION PLAN VIEW

SCALE: 3/16" = 1'-0"

(REVISED 09/11/09)

08195.00\DWG\Army Corp\04 DETAILS

PARE CORPORATION

MEPA Certificate on the FEIR

The Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114

Charles D. Baker
GOVERNOR

Karyn E. Polito
LIEUTENANT GOVERNOR

Kathleen A. Theoharides
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181
http://www.mass.gov/envir

June 19, 2020

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
FINAL ENVIRONMENTAL IMPACT REPORT

PROJECT NAME	: Northeastern University Coastal Sustainability Institute
PROJECT MUNICIPALITY	: Nahant
PROJECT WATERSHED	: North Coastal
EEA NUMBER	: 16046
PROJECT PROPONENT	: Northeastern University
DATE NOTICED IN MONITOR	: March 25, 2020

Pursuant to the Massachusetts Environmental Policy Act (MEPA, M.G. L. c. 30, ss. 61-62I) and Section 11.08 and 11.10 of the MEPA regulations (301 CMR 11.00), I have reviewed the Final Environmental Impact Report (FEIR) and hereby determine that it **adequately and properly complies** with MEPA and its implementing regulations.

While this project may now proceed to permitting, I acknowledge the numerous comments received from the Town of Nahant, residents, advocacy organizations and State Agencies throughout the course of this review. This level of public participation, together with review of the project through submission of Draft and Final Environmental Impact Reports (EIRs), have allowed for extensive disclosures of relevant environmental impacts associated with the project, including land, water/waterways, wetlands, historic resources, climate change and other related impacts. Given this record, I am satisfied that the FEIR and prior reviews have provided an adequate description and analysis of the project and its alternatives, and assessment of its potential environmental impacts and mitigation measures, so as to enable Participating Agencies to fulfill their obligations under Section 61 of M.G.L. c. 30. As indicated below, to the extent material changes are made to the project in the course of future permitting or other related developments prior to the taking of Agency Actions, including completion of archaeological

surveys, feasibility studies of proposed geothermal wells, and pending litigation regarding the status of the project site under Article 97 of the Amendments to the State Constitution, the Proponent is directed to consult with the MEPA Office to determine the need for additional MEPA review in the form of a Notice of Project Change (NPC).

I note that MEPA review is not a permitting process, nor does it serve as an appeal for local decisions. It does not pass judgment on whether a project is or is not beneficial, or whether a project can or should receive a particular permit. Rather, the MEPA process requires public disclosure of a project's environmental impacts as well as the measures that the proponent will undertake to avoid, minimize and mitigate these impacts. MEPA review occurs before public agencies act to issue permits and approvals for a proposed project to ensure that those agencies are fully cognizant of the environmental consequences of their actions. I am confident that review of the FEIR and prior MEPA documents have garnered sufficient input from the public so as to make State Agencies with permitting authority for this project fully aware of the important environmental issues involved.

Project Description

As described in the FEIR the project consists of the development of a Coastal Sustainability Institute (CSI) that will include academic, research, meeting, office space and support facilities at Northeastern University's Marine Science Center (MSC). The CSI would support an additional 114 faculty, staff and students for a total campus population of 228.

The CSI will consist of an approximately 55,000 square foot (sf) structure proposed to be located on top of the Murphy Bunker, which is part of the MSC. The project includes a reconfigured entrance from Nahant Road, reconstruction and minor realignment of driveways, and new parking areas that will provide 125 spaces. The project includes grading; upgrades to water, sewer, gas, electric and telecommunication systems and stormwater management; and removal of invasive plants and restoration of native species in the vicinity of the new building.

A geothermal heating and cooling system will be located in the area to the east of the CSI. The geothermal wellfield will occupy an area of approximately 1.06 acres and consist of approximately 80 wells in total that are spaced approximately 25 feet (ft) apart. The wells will be arranged along seven parallel lines that are generally oriented north-south and will be connected to the CSI via a central pipe. The wells will be completely buried and the land over it will be restored in accordance with a habitat restoration plan.

In addition, the project includes replacement of a seawater intake system and associated pump house that support research in the Murphy Bunker and Edwards Laboratory. The seawater intake system will be replaced with two 14-inch diameter high-density polyethylene (HDPE) pipes which will extend approximately 400 ft from the seawall into Bathing Beach Cove. The FEIR notes that the pipes will be oversized due to the long pipe length from the pump house to the intake site and will help compensate for friction losses that result from biofouling and associated cavitation problems. The intake pipes will be used on a rotating basis to prevent biofouling and will operate at a flow capacity of 600 gpm (reduced from the originally proposed 2,400 gpm flow capacity). The replacement is proposed to improve the reliability of the

seawater system and to meet existing and future research needs of the MSC and the CSI. The seawater system discharge replacement will consist of two 16-inch diameter HDPE pipes extending approximately 275 ft into Bathing Beach Cove. Both the intake and discharge lines will be directionally drilled below the Bathing Beach seawall and emerge seaward of mean low water (MLW). The lines will be secured to the ocean floor using concrete ballast blocks. The intake structures and discharge diffusers will be mounted on a concrete pad. The dive locker and indoor aquatics lab at the southwest end of the Edwards Lab will be demolished and replaced with a 3,270-sf pump house with below grade level that will have a 1,400 sf footprint. Before discharge, seawater will be collected in a new discharge chamber located slightly northeast of the existing pump house. Before seawater is discharged back into the ocean it will pass through an energy recovery heat exchanger that helps to further reduce any temperature differential of the effluent.

Project Changes Since the NPC/DEIR

The Certificate on the NPC/DEIR required the FEIR to address vulnerabilities to the project including the location of the site's only access way and the associated utilities located within a VE Zone. In response, the Proponent is proposing to relocate the water and electric lines away from Canoe Beach. An approximately 200 linear foot (lf) segment of these utilities will remain along the beach before it travels southward away from the beach, out of the VE Zone and potential areas of erosion. A new water line connection will be made from Swallow Cave Road and run along the south side of the site to the new CSI Building. The former water line will be abandoned in place. The existing electrical ductbank in the access road will be also be abandoned in place and the overhead electrical lines that run from a point near the access gate adjacent to Canoe Beach to the rear of the Edwards Building will be taken down. A new electric ductbank connection will be installed on the south side of the Site to service the CSI. As described in the FEIR, the sewer line cannot practicably be relocated. Because it is gravity fed and the low point leaving the site is in the roadway near Canoe Beach, a relocation would require the construction of new pump station. The Proponent maintains that the most practicable solution is to replace the sewer pipe in its existing location, and to armor it to protect it from potential storm induced erosion.

Project Site

The 20.4-acre project site is located on East Point in Nahant. The project site is bounded by Shallow Cave Road and a residential area to the west, Canoe Beach and Nahant Bay to the north, Bathing Beach and Broad Sound to the south and Lodge Park to the east. The site is in an area zoned as a Natural Resource District by the Town of Nahant.[1]

Sole access to the site and to Lodge Park is provided via Nahant Road and a site access road that bisects the MSC campus. The site includes a public access easement to Lodge Park. The site was acquired by Northeastern in 1966 from the U.S. Government. It was formerly part

[1] The Proponent asserts that the project is not subject to the local zoning district based on protections provided by the Dover Amendment (M.G.L. c. 40A, Sec. 3) which provides that "[n]o zoning ordinance or by-law shall regulate or restrict … the use of land or structures … for educational purposes on land owned or leased by … a nonprofit educational corporation [except for] reasonable regulations concerning the bulk and height of structures and determining yard sizes, lot area, setbacks, open space, parking and building coverage requirements." The Proponent maintains that the educational purpose by a nonprofit educational corporation is consistent with the protections provided by this statute.

of the U.S. National Coastal Defense System in World War II. Remnant military structures, including the Murphy Bunker, were converted into a 31,083-sf research facility. The MSC includes 15,081 sf of lab/research space (Edwards Laboratory), a 1,517-sf greenhouse, a 500-sf ice house and 2,854 sf of temporary trailer space. As currently designed, the seawater intake system consists of two 6-inch diameter HDPE intake pipes that extend approximately 350 ft from the seawall into Bathing Beach Cove. Seawater is pumped to a pump house where it then flows to two 20,000-gallon storage tanks. It is gravity fed to the Edwards Lab and Murphy Bunker. After flowing through research tanks, the seawater is discharged onto Bathing Beach through a 15-inch pipe at the Bathing Beach seawall. The pipe has been identified as a source of beach erosion. The flow capacity of the intake system is 1,100 gpm; flows have averaged 291 gpm over the past year.

The project site is primarily vegetated and contains uplands and wetlands including Bordering Vegetated Wetlands (BVW), Land Subject to Coastal Storm Flowage (LSCSF), Land Under Ocean (LUO), Land Containing Shellfish (LCSF), Coastal Beach, and Coastal Bank. Previously disturbed areas associated with the bunkers, including the area above bunkers have revegetated and are primarily wooded. Site topography is variable, ranging from Mean Low Water (elevation -4.91 NAVD88) to a maximum elevation of approximately 64 feet above the Murphy Bunker. Higher elevations on the west and east sides of the Site border a central valley oriented on a north-south axis between Canoe Beach and Bathing Beach. Portions of the project site are located within a Velocity (VE) Zone with base flood elevation (BFE) of 18 ft NAVD88 along the northern portion of the property (where Canoe Beach is located); Zone AO with a ponding depth of 3 ft through the center of the property; and Zone AE with BFE of 13 ft NAVD88 and VE Zone with BFE of 17 ft NAVD88 along the southern shoreline.[2]

According to the 14th edition of the Massachusetts Natural Heritage Atlas, the project is not located within mapped *Estimated* or *Priority Habitat of Rare Species*. East Point is identified as an Important Bird Area by MassAudubon. Nahant Bay supports recreationally and commercially significant marine fisheries resources and habitats. The project site is habitat for the spawning, larval settlement and juvenile development of winter flounder (*Pseudopleuronectes americanus*). Lobster (*Homarus americanus*) are common and are commercially and recreationally fished in this area. The site provides habitat for the larval settlement and juvenile development of lobster. Several diadromous species can also be found within the project area and include alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), white perch (*Morone americana*), and Atlantic tomcod (*Microgadus tomcod*). Finally, eelgrass (*Zostera marina*) is present along the coves to the west of the site.

Prior MEPA Review

Northeastern (Proponent) submitted an ENF in January 2018 (EEA# 15793) which included only the seawater intake system. The ENF was withdrawn to address a number of issues raised by State agencies and Nahant residents, including concerns that the proposed CSI development was not included in the ENF and potential segmentation issues arising from this

[2] Based on Federal Emergency Management Agency Flood Insurance Rate Map (FIRM) Letter of Map Revision (LOMR) 18-01-0243P effective December 29, 2019 and LOMR 16-01-2425P effective July 7, 2017.

omission. The Proponent filed a new ENF on May 31, 2019 which included both the seawater system upgrade and the proposed CSI building and included additional information based on feedback received including: a reduction in the proposed operation of the seawater system (from 2,400 gpm to 600 gpm); elimination of seawater use for building heating and cooling; use of an offshore diffuser system at Bathing Beach to eliminate erosion; elimination of impacts to BVW associated with the seawater system; and addition of an onsite lobster hatchery to mitigate potential lobster larvae mortality associated with the seawater intake system. On August 2, 2019, a Certificate on the ENF requiring the preparation of a Draft and Final EIR was issued. On November 22, 2019, an NPC/DEIR was submitted by the Proponent with a request for a Phase 1 Waiver which would allow the permitting of the seawater system to move ahead prior to the completion of MEPA review. The waiver was denied and a Scope for an FEIR was issued on January 10, 2020. Among other issues, the Scope required the Proponent to continue to consider resiliency improvements at Canoe Beach to reduce flooding and improve the resiliency of the adjacent access drive to the site. A key focus of the FEIR therefore involved analysis of alternatives that could incorporate resiliency measures while assessing potential locations adjacent to this access point (albeit a low-lying area) to the site.

Environmental Impacts and Mitigation

Potential environmental impacts associated with the project include 23,759 sf[3] of LSCSF of which 6,667 will be permanent impacts; 2,038 sf of LUO (permanent) and 2,038 sf of Land Containing Shellfish (permanent). The Proponent plans to remove the existing intake lines and anchor block which will total approximately 175 sf of temporary impacts to LUO and Land Containing Shellfish. The project will result in the alteration of 4.1 acres of land[4] including the creation of 1.71 acres of new impervious surface. The project will result in the alteration of historic resources and potential alteration of archaeological resources; generation of an additional 175 new average daily trips (adt) (350 total adt for the site)[5]; increase in water demand by 1,094 gpd (2,023 gpd total); and increase in wastewater generation by 995 gpd (1,839 gpd total).[6] The project involves the installation of 0.42 miles of water main and 0.25 miles of sewer main (reduced from calculations included in previous filings). The project will generate greenhouse gas (GHG) emissions associated with energy use.

Measures proposed to avoid, minimize, and mitigate project impacts include improvements to the stormwater management system, habitat restoration (including removal of invasive species), development of a lobster hatchery, and development of a mitigation package to address impacts to municipal infrastructure. Intake and discharge pipes will be directionally drilled under the seawall and beach and will emerge just seaward of MLW to minimize disturbance to the beach and seawall. The project will include measures to reduce GHG emissions and energy use.

[3] The NPC/Certificate listed a total of 28,408 sf to LSCSF which was a calculation error was corrected in the FEIR.
[4] The Certificate on the NPC/DEIR identified 5.9 acres of new land alteration. This number included incorrectly included existing alteration as well as the proposed 4.12 acres of new alteration.
[5] The project does not exceed transportation thresholds outlined in the MEPA Regulations (301 CMR 11.03(6)) nor does it require any transportation related permits from State Agencies.
[6] E-mail correspondence received on January 9, 2020 indicated that the proposed water demand and wastewater generation are accurately reflected in the original ENF and not the NPC from.

Jurisdiction and Permitting

This project is subject to MEPA review and preparation of an ENF pursuant to 301 CMR 11.0 (3)(b)(1)(e); (3)(b)(1)(f); (3)(b)(6); and (10)(b)(1) because it requires Agency Actions and involves the alteration of ½ or more acres of any other wetland; new fill or structure or expansion of fill or structure in a velocity zone or regulatory floodway; construction, reconstruction or expansion of an existing solid fill structure of 1,000 or more sf base area or a pile supported or bottom-anchored structure of 2,000 or more sf base area provided that the structure occupies flowed tidelands or other waterways; and demolition of all or any exterior part of any historic structure listed in or located in the any historic district listed in the State Register of Historic Places or Inventory of Historic and Archaeological Assets of the Commonwealth.[7] The project requires a Chapter 91 (c. 91) License from the Massachusetts Department of Environmental Protection (MassDEP). The project has received a grant from the Office of Coastal Zone Management (CZM) and it requires Federal Consistency Review by CZM. As a discretionary EIR was required for the project, it is subject to the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol (GHG Policy).

The project requires review by the Massachusetts Historical Commission (MHC) acting as the State Historic Preservation Officer (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800). The project will require review and approvals from the Town of Nahant, including an Order of Conditions from the Nahant Conservation Commission, or in the case of an appeal, a Superseding Order of Conditions from MassDEP. The project requires a National Pollutant Discharge Elimination System (NPDES) Remediation General Permit (RGP) and Construction General Permit (CGP) from the U.S. Environmental Protection Agency (EPA). The project may require Pre-Construction Notification under Section 10 and Section 404 from the Army Corps of Engineers (ACOE) in accordance with the General Permits for Massachusetts. The project may require Federal Consistency Review by the Office of Coastal Zone Management (CZM).

Because the project involves Financial Assistance, MEPA jurisdiction is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

Review of the FEIR

The FEIR provided a description of existing and proposed conditions, conceptual project plans, alternatives discussion and identified measures to avoid, minimize and mitigate environmental impacts. The project will support 29,150 net new sf of academic research and teaching space, meeting spaces, office and support space. The FEIR disclosed the project site's vulnerability to coastal flooding at Canoe Beach and indicated that while the Proponent acknowledges the need to address these vulnerabilities, it does not have immediate plans to do so; the Proponent intends to undertake these efforts within the next ten years.

[7] The threshold at 301 CMR 11.03(3)(b)(1)(f) (alteration of ½ or more acres of other wetlands) was not identified in the NPC form. The threshold at 301 CMR 11.03(3)(b)(1)(a) (alteration of coastal dune, barrier beach or coastal bank) is no longer exceeded because wetlands impacts were refined from the ENF submission.

There continues to be significant public concern about this project. I received more than 450 comment letters on the FEIR including from the Town of Nahant, the Massachusetts Lobstermen's Association (MLA), and residents, most of which were opposed to the project. The MLA and fishermen continue to express concerns over the seawater system's potential to increase temperatures and entrainment which could impact local fisheries. The Town of Nahant and residents continue to express concerns over the scale of the project and its potential impacts to municipal resources including roadways, water mains and sewer infrastructure, visual impact, archaeological impacts as well as land alternation and vegetation removal at East Point. I encourage the Proponent to continue to engage with the Town and neighboring residents to address these concerns in future permitting. Comments from State Agencies identify information that should be provided during permitting and do not request additional analysis in the form of a Supplemental FEIR.

Since the NPC/DEIR was issued, the Propone has undertaken testing for the geothermal well proposed east of the Murphy Bunker. Drilling indicated shallow bedrock in the location of the proposed geothermal wellfield.[8] Several comment letters raised concerns with the fact that this information was not provided in the FEIR. In response, the Proponent, in an e-mail to the MEPA Office on June 16, 202, indicated that these factors do not determine the ground's ability to store/deposit thermal energy. That analysis will be determined by the results of conductivity testing that was conducted June 10 – June 12, 2020. Results of that testing are pending. As noted, to the extent the results of this geothermal well testing lead to material design changes to the project prior to the taking of any State Agency Action, the Proponent should consult with the MEPA office to determine the need for any additional MEPA review.

Alternatives Analysis

The alternative analysis for the CSI building has not changed since the NPC/DEIR. Alternative 1 would construct the CSI building north of the existing Edwards Laboratory in the area currently occupied by two modular trailers. This alternative was dismissed because it was proximate to LSCSF which would require a taller building height, increase its vulnerability to coastal storms and sea level rise, and prevent efficiencies of adjacency associated with the Preferred Alternative's location on top of the Murphy Bunker. Additionally, this alternative would not allow for the development of a geothermal well system. Alternative 2 would construct the CSI building southwest of the Murphy Bunker, connected at the south entry port. Alternative 3 would construct the CSI building east of the Murphy Bunker in the meadow adjacent to Lodge Park. Similarly, these alternatives were dismissed because of the flooding risks associated with siting the building in a low-lying area, efficiencies of adjacency and inability to develop a geothermal well system.

The Preferred Alternative was selected because, according to the Proponent, it best meets program design goals and minimizes the amount of new construction required by making use of available underutilized space within the Murphy Bunker; places the CSI outside areas subject to flooding and future sea level rise; it allows for the incorporation of geothermal heating and cooling to reduce greenhouse gas emissions; and it will allow for habitat restoration in the East Point meadow to remove invasive species. The project will not affect access to Lodge Park.

[8] An e-mail was sent to the MEPA Office on March 18, 2020 which indicated that shallow bedrock was discovered during geotechnical work for the geothermal well and additional borings were required.

As discussed below, the FEIR indicated that the key alternative (Alternative 1) that would involve less new land alteration (2.27 acres) was ultimately dismissed based not only on the efficiencies and reduced impacts associated with expanding an existing building rather than constructing a standalone building, but also on the increased flooding risks associated with Alternative 1, as compared to the Preferred Alternative.

The FEIR provided additional discussion of the Preferred Alternative's efficiencies of adjacency associated with its location on top of the Murphy Bunker. As described in the FEIR, physically connecting the new CSI building with the Murphy Bunker offers numerous space and operational efficiencies including the utilization of existing loading, receiving, entry and lobby spaces that serve the Bunker today which would need to be duplicated with a standalone alternative. The existing HVAC systems supporting the Bunker have capacity to support the additional renovated program space within the Bunker. By utilizing these existing systems, reductions of enclosed mechanical spaces within the new building can be realized. In total, these efficiencies result in a nearly 5,500 gross square foot reduction of new construction over a standalone alternative. Additionally, the Preferred Alternative allows the seawater piping to be replaced in the same location as it exists today, thus limiting areas of new impact.

While the Proponent maintains that there is no plan to fortify Canoe Beach immediately, the FEIR identified several alternatives that were considered to increase the resiliency of Canoe Beach which is located adjacent to the project site's entrance. In 2018, the Proponent received a CZM Coastal Resilience grant to design a mixed sediment dune and beach nourishment project to address the significant erosion and storm damage occurring along Canoe Beach to provide protection for infrastructure landward of the beach. That project sought a design to address the loss of sediment and reduction of volume from the upper beach profile that limits the ability of the beach system to function well to dissipate storm energy and minimize storm damage to Nahant Road, the MSC facilities, and the utilities that run beneath it. Alternatives to address the loss of sediment included a No-action Alternative which would leave the beach in its current condition and allow it to evolve without any stabilization or erosion control measures; a Seawall Extension Alternative which would extend the existing vertical seawall eastward along the edge of Nahant Road until it connects with the stacked stone wall at the eastern end of Canoe Beach; a Sand Nourishment Alternative which would add sand along the upper beach profile with a sand nourishment program; and a Mixed Sediment Nourishment which would add a mixture of sand, gravel, and cobble along the beach.

As described in the FEIR, the No-action Alternative is likely not a viable long-term solution as erosion is expected to continue to occur and eventually lead to damage of the seawall and Nahant Road. While the exact timeframe is unknown, such damage could occur in under ten years. The Seawall Extension Alternative has a number of drawbacks. Wave reflection would be expected to increase as a result of the seawall, which could in turn lead to a further lowering of the upper beach/dune. Reductions in beach height would increase the potential for overtopping and increased storm damage. This alternative may also face permitting challenges because it is a hard structure. The Sand Nourishment Alternative would provide a very low level of shore protection and is likely to be washed away in a significant storm. The Proponent attempted a similar project in the fall of 2016, which was unsuccessful. It was washed away in January 2017

by the first storm following its implementation. The Mixed Sediment Nourishment Alternative represents a reasonable option to restore and provide some level of nature based coastal protection. According to the Proponent, this alternatives analysis demonstrates that efforts to fortify Canoe Beach would be difficult and most likely would lead to the use of nature-based solutions that, while less environmentally impactful than hard structures, may not provide the level of flood protection that would be needed protect the campus. In light of these factors, the Proponent continues to dismiss Alternative 1 as a viable alternative because of its proximity to the floodplain and lower elevation, which would subject any new buildings sited in this low-lying area to flooding risks.

The FEIR also considered several alternatives which would relocate the site's entrance away from Canoe Beach, making it less vulnerable to flooding and wave overtopping. Alternative access drive locations were considered off of Swallow Cave Road. The Proponent has considered the potential to relocate the entrance drive by moving it southward. One possible alternative would make a connection from Swallow Cave Road due east, passing immediately north of the Edwards Laboratory, to connect with the current access drive through the site. This option would require relocating the two trailers currently located adjacent to the Edwards Laboratory. A second alternative would move the connection further south on Swallow Cave Road, just past its intersection with Vernon Street. The new entrance drive would pass south of the Edwards Laboratory in the vicinity of Bathing Beach to reach the driveway leading to Lodge Park. The Proponent does not plan to relocate the roadway at this time. While relocation is feasible, the Proponent indicated that conversations with abutters[9] revealed residents were not in favor of relocating the access way closer to the residential neighborhood and wish to limit traffic impacts on the residential Swallow Cave Road. The Proponent recognizes that leaving the roadway in its existing location will lead to access issues during storms. However, the FEIR notes that the entire Town faces similar concerns due to the potential for flooding at the Nahant Rotary in Lynn and the potential for the causeway to be closed due either directly to flooding or due to debris being deposited in the roadway by wave action. Additional resiliency analysis is provided below.

Land Alteration

As described in the FEIR, land alteration impacts have not changed since the DEIR. The project will result in approximately 0.8 acres (34,905 sf) of new building footprint; a reduction of internal roadways by 0.08 acres (3,657 sf); and an increase in parking and other paved areas by 43,435 sf (0.99 acres). This results in a total of 1.71 acres of new impervious surface. Additionally, the project will result in the new alteration of 2.39 acres (104,194 sf) for a total of 4.1 acres of new land alteration, which is below MEPA review thresholds for land impacts. As described in the FEIR, "other altered areas" includes all other altered pervious areas such as landscaped areas, mowed paths, mowed lawns, and the geothermal wellfield area. The FEIR included site plans that clearly identified and delineated areas proposed for development and those that will not be altered or disturbed, including areas for the geothermal wellfield.

The FEIR also provided an update on pending litigation regarding the status of the project site under article 97 of the amendments to the state constitution. As noted above, to the extent

[9] E-mail from the Proponent to MEPA Office on 6/16/2020 clarified that the statement in the FEIR indicating that this alternative was not supported locally based on conversations with abutters early in the project design.

this litigation results is material changes to the project—such as a need for article 97 legislation and compliance with EEA's Land Disposition Policy—the Proponent is directed to consult with the MEPA Office about the need for any additional MEPA review.

As directed by the Scope in the DEIR, the FEIR evaluated additional measures to reduce land alteration and creation of impervious area. While the Proponent asserts that reducing the building and development size would be inconsistent with project goals, it indicates that all roadways and parking will be compliant with Nahant zoning requirements. The Proponent will work with the Town to further reduce parking. Pervious pavement will be incorporated where possible. I encourage the Proponent to consider all available means to reduce impervious surfaces on site and consider ecosystem-based adaptation measures to reduce heat island effect and mitigate stormwater runoff, such as integration of tree canopy cover, rain gardens, and low impact development (LID) stormwater management techniques.

The DEIR requested that the Proponent consider placing a conservation restriction (CR) on a portion(s) of the site designated as open space, including areas containing wetlands, to ensure their permanent protection. The Proponent has declined to consider this proposal. Placement of a CR to permanently protect open space is a widely accepted land conservation measure and would be a beneficial way to offset the land and vegetation clearing associated with siting the campus expansion at the Murphy Bunker location. I strongly encourage the Proponent to continue to consider this mitigation option.

The FEIR included conceptual plans that identify proposed areas of cut and fill. As described in the FEIR, approximately 8,300 cy of soil material will be cut and reused on site for grading. The FEIR provided details on the proposed vegetation restoration plan, including proposed invasive species best management practices (BMPs), and described how vegetation restoration will be implemented, including vegetation types. All invasive species along with any soil material that may contain roots, propagules, and/or seed stock shall be removed/excavated via manual and mechanical control, bagged as necessary, and brought to an approved facility for proper disposal. Removal of invasive vegetative material is preferred during the dormant season (e.g., November – March) to minimize the potential for the spread of invasive species through seed dispersal.

The FEIR included figures depicting the proposed planting plan and for areas surrounding the proposed building, parking lots, and bioretention basins. The proposed native species east of the Murphy Bunker will restore and/or enhance natural communities at East Point, including Maritime Shrubland and Grassland/Meadow habitat. Selected tree species will serve to diversify the limited existing native species and provide screening for the proposed new building. Areas surrounding the building will be planted with the selected tree and shrub species, along with groundcover species. Native Grassland/Meadow will be re-established within the Limit of Work east of the building ("East Meadow"), including the geothermal well area and construction access/staging areas will result in temporary disturbance). The planting plan identifies the following species: Trees: Red Maple (*Acer rubrum*), Shagbark Hickory (*Carya ovata*), American Holly (*Ilex opaca*), Eastern Red Cedar (*Juniperus virginiana*), Tamarack (*Larix laricina*), Tupelo (*Nyssa sylvatica*), Pitch Pine (*Pinus rigida*), Black Cherry (*Prunus*

serotina), White Oak (*Querus alba*), Red Oak (*Quercus rubra*), Scrub Oak (*Quercus ilicifolia*), Sassafras (*Sassafras albidum*), and American Elm (*Ulmus americana*).

The FEIR also included an adaptive monitoring plan to prevent re-establishment of invasive species and ensure long-term effectiveness of the native species restoration. The management plan includes monitoring following the first month of planting; and at the beginning and end of the first and second full growing seasons to observe vegetation, propagation, and development. Long-term manual, mechanical, and/or chemical control BMP's will be implemented as feasible to manage any encroaching invasive species and ensure the successful establishment of native species.

Wetlands and Waterways

The installation of the new seawater system will permanently impact 2,038 sf of overlapping LUO and LCSF. Removal of the remnant system will temporarily impact approximately 175 sf of LUO and LCSF. The project will result in a total of 23,759 sf of LSCSF of which 6,667 sf will be permanent impacts associated with the construction of the parking for the CSI and 17,092 sf will be temporary impacts[10] associated with construction, landscaping, roadway and utility work, and installation of the seawater intake system. The FEIR indicates that the changes to the project since the NPC/DEIR, including proposed utility relocation, will increase impacts to Coastal Bank Buffer Zone from 23,164 sf to 23,925 sf[11] and increase impacts to BVW buffer zone from 15,381 sf to 15,724 sf.[12] The Nahant Conservation Commission will review the project for its consistency with the Wetlands Protection Act (WPA), associated regulations (310 CMR 14.00) and local wetlands bylaws. The seawater intake system will require a c.91 License because it partially located within flowed tidelands. MassDEP will review the project for its consistency with the Waterways Regulations. Comments received on the FEIR indicate that the project appears to be a water dependent use pursuant to 310 CMR 9.12(2)(a)(5).

The FEIR included an updated *Best Practices for Seawater Use* document and noted additional consultation with the Marine Invasive Species Program (MISP). The FEIR indicated that the Proponent has worked with MISP to further refine language regarding species allowed in the flow through system and annual MISP consultation. The FEIR indicated that the proposed seawater system will include a controls system which will verify flow rates in real time once the system is operational. The FEIR clarified that the proposed seawater system includes two 1,200 gpm pumps (total capacity of 2,400 gpm). However, only one will be in operation at any given time. Additionally, the Proponent is committing to operate the system at no more than 600 gpm including once the CSI is operational.

Comments from MLA and other local fisherman and lobstermen express concerns with the increase in operation of the seawater intake system. As described in MassDEP's comment letter, EPA/MassDEP recommends a standard intake velocity no greater than 0.5 feet per second (fps) to ensure that the majority of aquatic organisms can avoid becoming trapped against intake

[10] Of this total, 2,443 sf of impact will occur on Town owned land to allow for utility work in Nahant Road. E-mail from Proponent dated 06/19/2020 corrected an error in the FEIR which stated that 7,290 sf of these impacts would include work in on Town owned land.
[11] Of this total, 1,782 sf of impact will occur on Town owned land to allow for utility work in Nahant Road. E-mail to the MEPA Office dated 06/19/202 corrected an error in table 4.1 of the FEIR which indicated 2,228 sf of impacts to Town owned land.
[12] The FEIR identified wetlands impacts (including buffer zone) in table 4.1 of the FEIR. An e-mail to the MEPA Office on 06/16/2020 confirmed these changes included proposed utility work.

screens. The intake velocity has been calculated at 0.011 fps, well below the 0.5 fps standard. Northeastern has indicated in the FEIR that this intake velocities will be verified once the system is operational. As described in MassDEP's comment letter, MassDEP and EPA will work with Northeastern to ensure that the velocity verification method is acceptable.

As described in MassDEP's comment letter, MassDEP and EPA reviewed the FEIR, the operation of the facility, available sampling data, and the Seawater Advisory Committee's Best Practices for Seawater Use. Review of available sampling data suggests that the quality of the seawater discharge is substantially similar to the intake water. Based on this information, the Agencies' preliminary assessment is that the proposed intake and discharge will not be adding pollutants (such as chlorine, medications, heat, or nutrients) to the receiving water and would not, on a case-by-case basis, be a significant contributor of pollutants. The available information also indicates that the temperature of the discharge is consistent with water quality standards and will be protective of the designated uses of the receiving water. These assessments remain valid provided the levels of biomass held at the facility remain under the threshold defined in the Concentrated Aquatic Animal Production (CAAP) Facilities regulations (314 CMR 3.16, Appendix A and 40 C.F.R. § 122.24, and 40 C.F.R. Part 122, Appendix C), the facility continues to operate as described in the FEIR, and the proposed intake and discharge are built as described in FEIR. This includes the volume of intake and the prohibition on use of medications or chemicals, and the commitment to isolate non-indigenous species from the flow-through system.

The FEIR indicates that the proposed lobster hatchery design cannot proceed without collaboration with local lobstermen. Once the Proponent has greater clarity on the potential of this collaboration and the goals of local lobstermen, MSC personnel and the design team will consult with DMF officials on the hatchery design.

The FEIR did not quantify impacts associated with alternatives to fortify Canoe Beach which will likely be required within the next ten years. If the Proponent intends to move forward with this component of the project, additional MEPA review will likely be required in the form of an NPC or ENF.

Historic and Cultural Resources

The project site is located within and adjacent to historic and archaeological resources identified in MHC's Inventory and/or the State and/or National Registers of Historic Places. The project is subject to review by the MHC acting as State Historic Preservation Office (SHPO) in accordance with Section 106 of the NHPA (as amended) and MGL c. 9 § 26-27C (950 CMR 70-71). The scope and purpose of this review process is focused on preserving historic and archaeological resources.

Comments received by MHC identify concerns related to potential project impacts to historic and archaeological resources associated with the former East Point Military Coastal Defense site during Word Wars I and II and the Cold War, as well as earlier historic period and Native American archaeological resources. The proposed new CSI structure will include partial demolition of the Battery Murphy bunker and burial of significant portions of the Murphy (South) and North Bunkers. The MHC has previously determined that the proposed CSI project will have an "adverse effect" on the No1th and South (Murphy) Batteries through the physical

destruction and alteration of parts of historic prope1ties that are included in MHC's Inventory (950 CMR 71.05(a)) The Proponent is currently undertaking intensive (locational) archaeological surveys and will provide the results to MHC upon completion. Comments from MHC indicate that the results of the surveys will be used to avoid, minimize, or mitigate adverse effects to significant historic and archeological resources through the consultation process.

Because the Proponent has submitted the FEIR prior to the completion of the archaeological surveys, additional project design changes may be required to avoid, minimize and mitigate impacts to archaeological resources. The Proponent should consult with the MEPA office if the results of the archeological survey require material project design modifications such that additional MEPA review may be required prior to the taking of Agency Action.

Climate Change

Executive Order 569: Establishing an Integrated Climate Change Strategy for the Commonwealth (EO 569; the Order) was issued on September 16, 2016. EO 569 recognizes the serious threat presented by climate change and directs Executive Branch agencies within the administration to develop and implement an integrated strategy that leverages state resources to combat climate change and prepare for its impacts. The Order seeks to ensure that Massachusetts will meet GHG emissions reduction limits goals established under the Global Warming Solution Act of 2008 (GWSA) and will work to prepare state government and cities and towns for the impacts of climate change. The MEPA statute directs all State Agencies to consider reasonably foreseeable climate change impacts, including additional greenhouse gas emissions, and associated effects, when issuing permits, licenses and other administrative approvals and decisions. M.G.L. c. 30, § 61.

The Scope on the NPC/DEIR requested a response to DOER's comments, including clarifications and details on the proposed geothermal system and required additional analysis on measures to increase the resiliency of the project site, including Canoe Beach and the site's access and egress.

Greenhouse Gas Emissions

The geothermal heat pump system proposed for the CSI building exchanges energy with the earth by circulating water or other solution through pipes buried beneath the earth's surface (geothermal wellfield). A vertical closed loop geothermal wellfield, such as the one proposed for this project, typically consists of multiple vertical heat exchangers (VHEs). VHEs are constructed by drilling holes generally ranging from 50 to 400 feet deep in the earth and then inserting two pipes with a fitting joining the two pipe ends at the bottom. During colder periods, the solution circulating through the system's vertical wellfield absorbs stored heat from the ground and carries it indoors. The geothermal heat pump transfers the heat from the wellfield and distributes it throughout the building. During warmer months, the geothermal heat pump system takes heat from the building and transfers it to the VHEs, which deposits the heat into the ground.

As described above, the proposed geothermal wellfield for the CSI will consist of approximately 80 wells in total that are spaced approximately 25 feet (ft) apart. The wells will be

arranged along seven parallel lines that are generally oriented north-south and will be connected to the CSI via a central pipe.

A propane boiler will be utilized to balance (charge) the geothermal system. It is anticipated that the boiler will be utilized to balance the system for approximately 24 to 48 months. The actual duration of boiler use will be determined as the building's load profile is developed and geothermal modeling is advanced. The FEIR notes that the use of the propane boiler for geothermal balancing could exceed 48 months if process heating loads exceed the design team's current estimates. Comments from DOER recommend that the Proponent terminate the use of the propane boiler at the earliest feasible date within 48 months.

The FEIR indicates that because the Proponent would like to minimize the visual impact of the project ground mounted solar photovoltaic (PV) and/or canopy mounted solar arrays are not currently proposed. However, 60% of the CSI rooftop will be solar ready.

In summary, GHG emissions from the Base Case are calculated to be 954 tons per year (tpy) compared to the mitigation case which will generate 449 tpy (505 tpy or 52 percent reduction). DOER indicates that actual baseline emissions (compliant with the building code) are closer to 856 tpy and the mitigation case emissions are 466 tpy (390 tpy or 46 percent reduction). Comments from DOER indicate that the project's planned 46% reduction in emissions will become more significant in 2050 as a result of Massachusetts' improving electric grid emissions rates. By the year 2050, the ground source geothermal could achieve a mitigation level of 76% compared to a natural gas-heated baseline building because it is powered by electricity.

Measures which will result in significant GHG emissions include:

- Efficient electric space heating and cooling: A ground source geothermal heat pump system will be utilized for both heating and cooling the CSI building.
- Efficient envelope: Aggregate vertical area weighted U value: 0.145. (Vertical assembly consisting of 44% framed, insulated wall having R-24c.i. and 56% window having U-0.25);
- Solar readiness: 60% of the rooftop will be solar PV ready;
- Heat recovery ventilation decoupled from the space conditioning system.

According to the Proponent, the significant GHG benefits associated with the use of geothermal wells weighs heavily in favor of locating the Preferred Alternative above the Murphy Bunker.

Adaptation and Resiliency

The Scope in the NPC/DEIR requested that the FEIR address vulnerabilities of the project site at Canoe Beach which offers minimal protection against hazards associated with storm induced wave action. The MSC campus entrance roadway and utilities which run beneath it are located within a VE Zone directly adjacent to Canoe Beach and are subject to over wash and erosion during coastal storm events. This roadway provides the sole means of access/egress to the site and is vulnerable to flooding, which could prevent emergency and vehicular access to

the site. The Scope requested that the Proponent assess the feasibility of climate resiliency measures together with continued consideration of alternative site locations near the Canoe Beach location.

The FEIR identified sea level rise projections by the National Ocean and Atmospheric Administration (NOAA) published in 2017.[13] To assess the potential risk to the project due to sea level rise, the Proponent elected the intermediate-high GHG emissions scenarios as a conservative, i.e., more severe, scenario predictions. Under the intermediate-high rates of GHG emissions pathways, projected sea level rise would be approximately 31.1 inches (2.59 ft) in 2070. The FEIR indicates that these projections would affect low-lying areas of the campus between Canoe Beach and Bathing Beach. The FEIR described the impacted areas as the proposed parking area and landscaping immediately east of the Edwards building and the wetland area to the south of the Edwards building. The FEIR did not quantify this area or support the analysis with any figures which overlay the future conditions over the project site or work area. The analysis did not include storm surge elevations. These additional analyses should be incorporated into future resiliency planning, along with the most updated climate change predictions for coastal areas. The FEIR maintains that flooding, at a minimum, would not affect the proposed CSI building itself which is proposed outside the floodplain. The proposed CSI basement floor elevation is at EL. 24' with critical infrastructure at EL. 33', which are above currently projected flood levels even when considering 2.59 ft of SLR by 2070. As discussed above, the Proponent's analysis suggests that resiliency measures at Canoe Beach, even if cost effective, would likely not be sufficient to ensure smooth and continuous campus operations at an alternative location near the Edwards Laboratory, given the high risk of flooding in that low-lying area.

As described above, the Proponent has altered plans for the Project to include the relocation of the water and electric lines out of the roadway although the gravity sewer line will remain adjacent to Canoe Beach; it will be encased in concrete to increase resilience.
As described in the FEIR, the Proponent will continue to monitor conditions at Canoe Beach carefully and will undertake a plan to provide shore protection as it becomes necessary to protect Nahant Road and the MSC property. The FEIR maintains that such a project is not necessary for the CSI building, which will be well protected from coastal flooding, or the seawater system upgrade which draws and discharges seawater from the opposite side of the Island.

Comments from CZM note that because the velocity flood elevation at the location of the roadway is mapped at 18 feet NAVD88, and the elevation of the road is approximately 15 feet, the FEMA flood maps predict that there would be approximately 3 feet of water and waves during the 100-year storm under current conditions. As noted in the study conducted for CZM's Coastal Resiliency Grant Project, the volume of sediment at Canoe Beach is depleted such that minor to moderate storms have caused overwash onto and undermining of Nahant Road in the past. Because predicted sea level rise and more significant and frequent coastal storms could jeopardize the sewer line over time, a more detailed vulnerability analysis that includes an eroded profile assessment should be conducted to determine whether the projected lifespan of the sewer line in this location meets the goals of the project and minimizes potential impacts to the adjacent coastal resource areas. For critical infrastructure such as sewer lines, it is important to

[13]https://tidesandcurrents.noaa.gov/publications/techrpt83_Global_and_Regional_SLR_Scenarios_for_the_US_final.pdf

use the best available information to determine the potential hazards that may impact the project components for the life of the infrastructure. In addition to using the most recent FIRMs and data available from the FEMA Map Service Center, consulting the Sea, Lake, and Overland Surge from Hurricanes (SLOSH)[14] maps produced by the ACOE to determine areas that may be inundated by hurricanes, as well as the most recent information regarding projections of sea level rise for Massachusetts available through the Massachusetts Climate Change Clearinghouse website, reslientma.org is recommended.

As described in CZM's comment letter, given the vulnerability of the road to moderate and major coastal storms discussed above, the Proponent should reconsider the feasibility of moving the sewer line out of the velocity zone in the future and consider moving forward with the mixed sediment nourishment at Canoe Beach in the short term to reduce impacts from coastal storms to the site.

Construction Period Impacts

The FEIR included a draft construction management plan (CMP). As described in the CMP, the construction period is expected to last approximately 24-27 months, including time required for design, permitting, procurement and construction. The typical construction work hours will be 7:00 a.m. to 6:00 p.m., Monday through Friday, with most shifts ordinarily ending at 4:30 p.m. Some activities such as finishing activities could run beyond 6:00 p.m. to ensure the structural integrity of the finished product, for example concrete pours. No substantial sound-generating activity will occur before 7:00 a.m.

Drilling will be required for the geothermal well, but no blasting will be required. The contractor will comply with the requirements of the National Pollution Discharge Elimination System (NPDES) permit once issued and conform to the regulations and requirements of MassDEP, the Town of Nahant, and the U.S. Environmental Protection Agency (EPA) for the quantity and quality of water discharged to the storm drain system during drilling. Geotechnical monitoring will be implemented at the Site and at the surrounding properties. Ground vibration levels will be measured at the Site and adjacent facilities. The actual location of the monitors will be dependent on the Contractor's work areas, and locations may shift based on site observations throughout construction. The monitors will be capable of recording data continuously and will be deployed through the duration of vibration generating activities.

Environmental monitoring will be implemented during construction. The program will include air and dust monitoring, and provide action levels which, if exceeded, will trigger mitigation of dust, vapor migration and/or odors. Air monitoring stations will be equipped with real-time dust monitors and photoionization detectors (PID) to monitor the level of total volatile organic compounds (VOCs) in ambient air.

The contractor will develop and submit a Project-specific Stormwater Pollution Prevention Plan (SWPPP) for the Project prior to starting construction in the field. The SWPPP plan will be submitted for approval to MassDEP. The onsite Sitework Subcontractor will be

[14]http://memamaps.maps.arcgis.com/home/webmap/templates/OnePane/basicviewer/embed.html?webmap=45e2419bf23e40eca0b94a9bfe815fbf&gcsextent=-72.5308,41.7353,-69.2926,42.9091&displayslider=true&displayscalebar=true&displaylegend=true&displaysearch=true&searchextent=true&displaybasemaps=true

responsible for maintaining compliance with the SWPPP, including all requirements in the CGP and will maintain erosion and sediment control Best Management Practices (BMPs) in all areas of the site under its day-to-day control. As described in the FEIR, BMPs will be implemented to reduce the potential for spread of invasive species during construction, including, but not limited to: contractor education; clean vehicles and equipment entering project site; installation of washing station for equipment and personnel conducting invasive species management; and use of clean, weed-free soil supplements, etc.

All construction traffic, including deliveries, will be routed via the roundabout in Lynn and will follow Nahant Road directly to the Project site. No traffic will be allowed to traverse the residential streets off of Nahant Road. All construction personnel will be made aware of the posted speed limit along the Nahant Road. Deliveries will be scheduled to avoid peak morning and evening hours to minimize the impact on local traffic. Delivery of any oversize load will be coordinated via the Town Manager and Nahant Police Department.

The contractor will use an off-site parking lot located in Lynn and construction workers will be shuttled to the Site to minimize traffic impacts on Nahant. The contractor will use one to two shuttles making trips in the morning and afternoon depending on the number of construction workers on site for the duration of the construction period. The projected peak manpower for construction is approximately 100 to 125 workers.

Mitigation and Draft Section 61 Findings

The FEIR identifies measures to avoid, minimize and mitigate Damage to the Environment and includes draft Section 61 Findings. The Section 61 Findings include a commitment to provide a GHG self-certification. Following completion of construction of the project, the Town or future tenant must provide a certification to the MEPA Office signed by an appropriate professional (e.g., engineer, architect, transportation planner, general contractor) indicating that all of the mitigation measures proposed in the FEIR have been incorporated into the buildings. Alternatively, the Town or future tenant may certify that equivalent emissions reduction measures have been adopted that collectively are designed to reduce GHG emissions by the same percentage and volumetric measure (tpy) as the measures outlined in the FEIR and based on the same modeling assumptions. The certification should be supported by plans that clearly illustrate where GHG mitigation measures have been incorporated. Any material reduction in mitigation commitments will result in the need to file a Notice of Project Change.

The current mitigation commitments and Section 61 Findings submitted by the Proponent are as follows:

Transportation

- To reduce project related trips and required parking, the Proponent will continue to provide remote shuttle service for employees and students from its Boston campus.

Land Alteration

- The Proponent will continue to incorporate the use of pervious pavement and reinforced grass parking pavers in low traffic areas to further reduce stormwater runoff.

- The Proponent will seek means to further reduce parking, in accordance with local approvals, including land banking parking areas until such time as there is documented demand.
- The Proponent will implement a habitat restoration plan to remove invasive species and enhance ecological functioning to the area east of the Murphy Bunker including a monitoring plan.

Wetlands and Stormwater

- The Project includes the installation of a stormwater management system that will comply with MassDEP's Stormwater Management Guidelines.
- The Proponent will submit a NOI to the Nahant Conservation Commission for work within wetland resource areas as required.

Seawater Intake System

- Intake and discharge pipes will be directionally drilled under the seawall and beach and will emerge just seaward of mean low water to minimize disturbance to Bathing Beach and seawall.
- The intake pipes are designed to prevent entrainment of aquatic organisms. The intake velocity at the mesh screen has been calculated to be 0.011 feet per sec (fps) which is 45 times slower than the maximum allowable intake velocity of 0.5 fps. These velocities will be verified by MassDEP/EPA once the system is operational.
- The existing seawater system components will be removed.
- The Proponent will conduct additional temperature sampling and CORMIX model runs once the new system is operational. Results of the modeling will be submitted to MassDEP/EPA for verification.
- As mitigation to offset the potential loss of five mature lobsters per year attributable to the new seawater system, NU proposes to construct an onsite lobster hatchery to produce approximately 90,000 Stage IV larvae per year in coordination with DMF and local fishermen. The larvae will be released in Bathing Beach Cove or in nearby Nahant waters as recommended by lobstermen that are willing to collaborate on this effort and will result in the addition of an estimated 45 market sized lobsters per year.

Historical Resources

- Historical and archaeological impacts will be avoided, minimized and mitigated in consultation with MHC.

GHG Emissions

- Efficient electric space heating and cooling: A ground source geothermal heat pump system will be utilized for both heating and cooling the CSI building.
- The lighting system will use all LED fixtures to achieve a low lighting power density (LPD), estimated at 25% lower than ASHRAE 90.1-2013 allowances.
- Efficient envelope: Aggregate vertical area weighted U value: 0.145. (Vertical assembly consisting of 44% framed, insulated wall having R-24c.i. and 56% window having U-0.25);
- Solar readiness: 60% of the rooftop will be solar PV ready;
- The CSI building will include heat recovery ventilation decoupled from the space conditioning system.

Adaptation and Resiliency

- Water and electric lines will be relocated away from the Canoe Beach area.
- The sewer main will be encased in cement to increase resiliency.
- The CSI Building will be situation outside of the flood plain and future flood plain based on 2070 SLR projections.

Construction Period

- The University will maintain the public easement to Lodge Park during the construction period. During temporary interruptions during construction, persons seeking to go to Lodge Park will be rerouted along the driveway in front of the Edwards Laboratory. Appropriate signage will be posted at the entrance to the site and along the path to direct pedestrian and vehicle traffic. The Proponent will notify the Town Manager well in advance of the dates and expected duration of any disruption so that they can be posted on the Town's Website.
- The contractor will be required to manage the water from drilling activities in accordance with a NPDES Remediation General Permit (RGP) issued for construction.
- The contractor will implement measures to minimize air quality impacts during the construction period including using equipment retrofitted with diesel emissions control devices; maintaining an "idle free" work zone of fossil fuel trucks and equipment by Efficient electric space heating and cooling: Ground source "geothermal" heat pump for both heating and cooling providing supplemental hoisting and pumping equipment along with "just-in-time" delivery methods; on-site idling will be limited to five minutes; "Do Not Idle" signs will be posted at appropriate locations; using ultra low sulfur diesel for all trucks and construction machinery as required by the EPA; using wetting agents as needed to minimize dust; locating combustion engines away from sensitive receptors such as fresh air intakes, air conditioners and windows.
- The contractor will monitor and track materials being recycled and disposed of to achieve 75 percent recycled materials by weight. For those materials that cannot be recycled, solid waste will be transported in covered trucks to an approved solid waste facility, per MassDEP Regulations for Solid Waste Facilities, 310 CMR 16.00. This requirement will be specified in the disposal contract.
- The contractor will develop and submit for approval to MassDEP a Project-specific Stormwater Pollution Specific Prevention Plan (SWPPP) for the Project prior to starting construction in the field. The onsite Sitework Subcontractor will be responsible for maintaining compliance with the SWPPP, including all requirements in the Construction General Permit (CGP) and will maintain erosion and sediment control Best Management Practices (BMPs) in all areas of the Site under its day-to-day control.

<u>Conclusion</u>

Based on a review of the FEIR, comments letters, and consultation with State Agencies, I find that the FEIR adequately and properly complies with MEPA and its implementing regulations. As noted above, the Proponent is directed to consult with the MEPA Office if

material changes to the project are made prior to the taking of Agency Action such that additional MEPA review may be needed. Outstanding issues can now be addressed during State

and local permitting and review. State Agencies should forward copies of the final Section 61 Findings to the MEPA Office for publication in accordance with 301 CMR 11.12.

June 19, 2020
Date

K. Theoharides
Kathleen A. Theoharides

Comments Received:

3/18/2020 James Dolan
4/7/2020 Anne Bromer
4/9/2020 Town of Nahant
4/10/2020 Fred Fiducia
4/13/2020 Cynthia Fiducia (2)
4/15/2020 Anne Bromer
4/15/2020 Peter Foukal
4/15/2020 Vi Patek
4/16/2020 Massachusetts Lobstermen's Association (MLA)
4/16/2020 Christoph Wald Tanya Blaich
4/16/2020 Claire Flebbe
4/17/2020 Brookline Bird Club
4/18/2020 Patricia and Dave Aldrich
4/18/2020 Nahant SWIM
4/19/2020 William Mahoney
4/19/2020 Judy Walsh
4/20/2020 William Mahoney
4/20/2020 Nahant Fishermen’s Alliance
4/20/2020 Brendan Mahoney
4/20/2020 Ryan Mahoney
4/20/2020 Marilyn Mahoney
4/20/2020 Division of Marine Fisheries (DMF)
4/21/2020 Charles H Patterson
4/21/2020 William Mahoney (2)
4/21/2020 Madeline Piccolo
4/21/2020 Robin M Joyce
4/21/2020 Linda Ferraresso
4/21/2020 Christian Bauta
4/21/2020 Richard R Veit
4/21/2020 Christian Gras
4/21/2020 Mark Patek
4/21/2020 Lurie Friedman LLP
4/21/2020 Glenn Williams
4/22/2020 Andrew Fowlie
4/22/2020 Margaret Goetschkes
4/22/2020 Erin DiLisio (2)
4/22/2020 Mary Lou Kaufman
4/22/2020 Donna Cooper
4/22/2020 Paul E Kinnaly
4/22/2020 Dan Fiore
4/22/2020 Chris Martone
4/22/2020 Nancy Given
4/22/2020 Jill Mathieu
4/22/2020 Leslie Kramer
4/22/2020 Heidi Harding
4/22/2020 Fred Bouchard
4/22/2020 Becky Briesacher
4/22/2020 Nahant Historical Society
4/22/2020 Shilo McDonald
4/22/2020 Greg Dysart
4/22/2020 Ray Orfan
4/22/2020 Robert A Parker
4/23/2020 Jonathan Glover
4/23/2020 Debra Kriensky
4/23/2020 Amy Lummen
4/24/2020 Joanne O'Brien
4/26/2020 John Nelson Chair, Association of Massachusetts Bird Clubs
4/28/2020 Jeffrey Flebbe
4/28/2020 Carl and Linda Jenkins
5/29/2020 Stephen O'Leary
5/31/2020 Timothy Smith
6/1/2020 Ellen Antrim (4)
6/2/2020 Margaret Hinrichs
6/3/2020 Elizabeth Berman (2)
6/4/2020 Nahant Open Space Committee
6/5/2020 Esther Johnson
6/6/2020 Katharina Radlberger
6/6/2020 Elizabeth Berman (5)
6/7/2020 John, Katy and Susan Dolhun
6/7/2020 Ellen Dickenson
6/8/2020 Claus Radlberger

6/8/2020 Chett Hopkins
6/8/2020 Gerard Dalpe
6/8/2020 Cynthia Dalpe
6/8/2020 Dr Katie Lotterhos
6/8/2020 Edith Roland
6/8/2020 Dennis M Maroney
6/8/2020 Ruthie Merrell
6/9/2020 Linda Pivacek (5)
6/9/2020 Margaret Silva
6/9/2020 Robert A Silva
6/9/2020 Rebekah Richardson
6/9/2020 Amy Lowell
6/9/2020 Mary Dickenson
6/9/2020 John Mackey
6/9/2020 Joseph E Mellen
6/10/2020 Nancy O'Brien
6/10/2020 Bonnie D'Orlando
6/10/2020 Elizabeth Stubbs (11)
6/10/2020 Janet and James Dolan
6/10/2020 Winifred B Hodges
6/11/2020 Office of Coastal Zone Management (CZM)
6/11/2020 Department of Energy Resources (DOER)
6/11/2020 Massachusetts Department of Environmental Protection (MassDEP)
6/11/2020 Roger Pasinski
6/11/2020 Patrick O'Reilly
6/11/2020 Maryliz Cort
6/11/2020 Williane Tomas
6/11/2020 Ron Cameron
6/11/2020 Meaghan Welch
6/11/2020 Nancy Cantelmo
6/12/2020 Anonymous
6/12/2020 Massachusetts Historical Commission (MHC)
6/12/2020 Lurie Friedman LLP
6/12/2020 Town of Nahant
6/12/2020 Susan Solomon
6/12/2020 Brendan Mahoney
6/12/2020 Ann T McNulty
6/12/2020 Marie Pasinski (2)
6/12/2020 Nahant Preservation Committee
6/12/2020 Lynne Spencer
6/12/2020 Austin Antrim
6/12/2020 Robert Vanderslice
6/12/2020 Diane Dunfee
6/12/2020 Nahant Preservation Trust
6/12/2020 Michael Rauworth
6/12/2020 Susan Tracy
6/12/2020 Marilyn Mahoney
6/12/2020 Joshua Antrim (2)
6/12/2020 Deborah Vanderslice (9)
6/12/2020 Marny von Aschwege
6/12/2020 Tess Bauta
6/12/2020 Anne and Paul Spirm
6/12/2020 Christian Bauta
6/12/2020 Jeanne A Fiore
6/12/2020 Emily Potts
6/12/2020 Eric Pasinski
6/12/2020 Karen M Falat
6/12/2020 Thomas Hambleton
6/12/2020 Leonard G Kavanagh
6/12/2020 Joan B Kavanaugh
6/12/2020 Rick Capozzi
6/12/2020 Stacey O'Brien
6/12/2020 Johnny Zimmerman-Ward
6/12/2020 Alice Cort
6/14/2020 Diane Monteith

12 Form Letters Regarding: Rising sea level effects
13 Form Letters Regarding: Natural Resource district zoning
11 Form Letters Regarding: Parking Impact
15 Form Letters Regarding: Traffic Study
16 Form Letters Regarding: Coastal Management Plans
16 Form Letters Regarding: Geothermal Wellfield Drilling
20 Form Letters Regarding: Utility Relocation
20 Form Letters Regarding: Entrance Alterations
17 Form Letters Regarding: No Build Alternatives
22 Form Letters Regarding: Restoration of disturbed areas
20 Form Letters Regarding: Article 97 Parkland
16 Form Letters Regarding: Canoe Beach
16 Form Letters Regarding: Geothermal Wells
18 Form Letters Regarding: Town Resources
3 Form Letters Regarding: Complete Traffic Study
7 Form Letters Regarding: MHC Survey
7 Form Letters Regarding: Alternative Building Sites
5 Form Letters Regarding: Out of Scale
16 Form Letters Regarding: Concern with Site Disruption
8 Form Letters Regarding: Forty Steps Beach
21 Form Letters Regarding: Offsite and No Build Alternatives
10 Form Letters Regarding: Eastern Cottonwood Tree
4 Form Letters Regarding: Complete Archaeological Consultation

Agency MEPA Comment Letters

NEU FEIR

Frew, Katelyn (FWE) <Kate.Frew@mass.gov>

Mon 4/20/2020 9:03 AM

To: Flaherty, Erin (EEA) <erin.flaherty@mass.gov>

Hi Erin,
We've received and reviewed the FEIR for NEU's Coastal Sustainability Institute. The applicant addressed our comments submitted previously. We have no additional comments or concerns at this time.
Thanks
Kate

Kate Frew
Environmental Analyst
MA Division of Marine Fisheries
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Gloucester, MA 01930
phone: 978-282-0308 x157

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Mary-Lee King
Deputy Commissioner

January 3, 2020

Secretary Kathleen Theoharides
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, Erin Flaherty
100 Cambridge Street, suite 900
Boston, MA 02114

Re: EEA # 16046 Northeastern Universities (NU) Coastal Sustainability Institute (CSI)

Dear Secretary Theoharides:

The Massachusetts Division of Marine Fisheries (MA DMF) has reviewed the Draft Environmental Impact Report (DEIR) / Notice of Project Change (NPC) submitted by NU for the proposed Coastal Sustainability Institute (CSI) project which includes expansion of the Murphy Bunker, seawater system upgrades, and associated site improvements at 430 Nahant Road in Nahant. MA DMF initially provided comments in July 2019 on the ENF submitted by NU for the proposed seawater system upgrades. NU has included a NPC and Phase I waiver request to allow for the seawater system upgrade phase of the project to move forward while the EIR process for the CSI building is completed.

According to the proponent, the existing seawater system can pump a maximum of 500 gallons per minute (gpm) and contains two 6" diameter intake pipes, a pump house, and one 15" diameter discharge pipe that ends at the face of the seawall along Pump House Beach. The intake pipe extends 350' into Nahant Bay and is secured to the sea floor with anchor blocks and rock clamps. The system is continuously clogged by biofouling of blue mussels (*Mytilus edulis*) and other benthic organisms, further reducing the amount of water that reaches the marine research lab to an average of 350 gpm. The proponent claims this level is insufficient for the current and predicted future needs of the facility.

The proponent is proposing to replace the existing seawater system with a new seawater system that includes a maximum pump flow rate of 600 gpm, two 14" HDPE intake pipes, a new pump house, and two alternating 16" diameter discharge pipes and subsurface diffusers. The new intake pipes will be located slightly to the east of the existing pipes. The intake pipes will be buried under the existing seawall and beach, daylight to the surface at Mean Low Water (MLW), then extend 400' past the seawall into Nahant Bay. The intake pipes will be anchored securely to the seafloor, with the end of the pipes secured by concrete ballast blocks. The new discharge pipes will also be buried under the seawall and beach and will extend 275' past the seawall into Nahant Bay, and secured to the seafloor by concrete ballast blocks. The intake and discharge pipes will have a combined net impact of approximately 2,000 sf of Land Under the Ocean. Once replaced, the existing intake lines and anchor blocks will be removed. Additionally, NU submitted a proposed Seawater Best Practices document that includes protocols to prevent accidental releases of pollutants (antibiotics, cleaners, hazardous chemicals and non-native and invasive species) to receiving waters around the facility.

The proposed CSI project identifies impacts to areas jurisdictional to the Wetlands Protection Act including Bordering Vegetated Wetland (BVW), Coastal Bank, Coastal Beach, Land Subject to Coastal Storm Flowage (LSCSF), and associated buffer zones.

Nahant Bay supports recreationally and commercially significant marine fisheries resources, including the spawning, larval settlement and juvenile development of winter flounder(*Pseudopleuronectes americanus*). Winter flounder spawn from January through May, laying clumps of eggs directly on the substrate (Pereira et al. 1999). Additionally, lobster (*Homarus americanus*) are commonly found burrowing between rocks and are commercially and recreationally fished in this area. Nahant Bay is habitat for the larval settlement and juvenile development of lobster. Lobster larvae are present in surface waters and subject to currents and wave action, from roughly the middle of June through early September in this region. Individual larvae spend several weeks developing in the water column before settling to the bottom, where they are then cryptic and restricted in their movements for the first few years of life. Several diadromous species can also be found within the project area as they travel to and from the Saugus River and the Charles and Mystic Rivers in Boston Harbor. These include alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), American shad (*Alosa sapidissima*), rainbow smelt (*Osmerus mordax*), American eel (*Anguilla rostrata*), white perch (*Morone americana*), and Atlantic tomcod (*Microgadus tomcod*). Finally, eelgrass (*Zostera marina*) can be found along the coves to the west of the proposed location.

MA DMF offers the following comments on the project's potential impact to marine fisheries resource and habitats. For the proposed seawater system upgrades covered under the NPC:

- We have reviewed the applicants changes to the proposed seawater system, including reducing the seawater intake flow rate from 2,400 gpm to 600 gpm, eliminating the use of a portion of the seawater flow to indirectly cool or heat the new CSI building, and adding offshore subsurface outfall diffuser system with screening. We have also reviewed the Massachusetts Department of Environmental Protection's (MassDEP) Surface Water Discharge Permitting Program and Wetlands Program comments submitted July 23, 2019 addressing the applicants initial ENF submittal. Based on this information, we agree the proposed modifications to the seawater system further minimize potential impacts to marine resources. We also agree with MassDEP that the proposed subsurface diffusers will further facilitate mixing and eliminate beach scour associated with the existing outfall and are improvements over the existing system.

- To ensure the diffuser design of the new system will minimize the effects of effluent temperature increases, mixing zone modeling of thermal effluent dissipation should be conducted once the new discharge system becomes operational.

- Control measures developed by NU to prevent invasive species introductions into Nahant Bay should be required as a condition of permitting.

- It is unclear if any work will need to be done from the water, e.g. installing and removing pipes. If barges are to be used, they should not be permitted to ground on the beach, intertidal flats, or any subtidal bottom.

- MA DMF recommends a time-of-year (TOY) restriction on all in-water work from **February 15th through June 30th** to protect the winter flounder (Evans et al. 2011).

- We recommend that NU continue to monitor any entrainment by the seawater intake system.

- MA DMF anticipates that the benefits of the marine fisheries and marine habitat research as well as the genomics, geochemical, and ecological research conducted at the MSC will contribute to fisheries management and improve our understanding of fisheries resources.

For the proposed CSI expansion and associated site improvements covered under the DEIR:

- Given the proposed temporary and permanent alterations to more than 2 acres of lands, stormwater management for the site should include controls for stormwater runoff from impervious surfaces into the Nahant Bay. Green solutions such as rain gardens and biofiltration swales should be considered as part of the treatment train.

- Impacts such as smothering and turbidity can occur if disturbed sediment is not stabilized prior to flood tides and extreme storm events. The applicant should ensure that any sediment that is disturbed, stockpiled or reset is properly contained and stabilized to avoid sediment runoff and associated turbidity impacts.

MA DMF appreciates the opportunity to comment on this proposed project. Please contact Mark Rousseau@mass.gov at (978) 282-0308 x162 if you have any questions on comments.

Sincerely,

Daniel McKiernan
Acting Director

DM/mr/kf/sd

cc:
T. Evans, K. Ford, T. Pugh, K. Whitmore, MA DMF
K. Glenn, B. Boeri, T. Callaghan, MA CZM

References

Pereira, J.J., R. Goldberg, J.J. Ziskowski, P.L. Berrien, W.W. Morse, and D.L. Johnson. 1999. Winter Flounder, *Pseudopleuronectes americanus*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-138. http://www.nefsc.noaa.gov/publications/tm/tm138/tm138.pdf.

Evans N.T., K.H. Ford, B.C. Chase, and J. Sheppard. 2011. Recommended Time of Year Restrictions (TOYs) for Coastal Alteration Projects to Protect Marine Fisheries Resources in Massachusetts. Massachusetts Division of Marine Fisheries Technical Report, TR-47.

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Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

June 11, 2020

Kathleen A. Theoharides
Secretary of Environment and Energy
Executive Office of Environmental Affairs
100 Cambridge Street, Suite 900
Boston, MA 02114
ATTN: Erin Flaherty, MEPA Office

RE: FEIR
EEA# 16046
Northeastern University
Coastal Sustainability Institute
Nahant

Dear Secretary Theoharides,

The Massachusetts Department of Environmental Protection's (MassDEP) Surface Water Discharge Permitting Program has reviewed the Final Environmental Impact Report (FEIR) dated March 16, 2020 for Northeastern University Marine Science Center's (MSC) Coastal Sustainability Institute (CSI) Project.

As described in the MassDEP comment letters dated July 23, 2019 on the Environmental Notification Form (ENF) and January 3, 2020 on the Notice of Project Change (NPC)/Phase I Waiver Request and Draft Environmental Impact Report (DEIR), we have been working with the U.S. Environmental Protection Agency (EPA) ("the Agencies") to evaluate whether Northeastern's proposed upgrade of its seawater system is subject to a National Pollutant Discharge Elimination System (NPDES) surface water discharge permit. Under the NPDES program, a point source that discharges pollutants into the Waters of the United States is required to obtain a NPDES permit. In Massachusetts, EPA is the permitting authority and MassDEP collaborates with EPA in the permitting process. This comment letter reiterates several comments included in the previous letters since Northeastern states in the FEIR "the proposed [seawater] system has not changed."[1]

As described in the FEIR, Northeastern's MSC is "proposing to upgrade the seawater system at the MSC, which uses ocean water to support its ongoing research experiments as well as to study how different conditions, such as ocean warming and acidification affect marine life. The seawater system is critical for

[1] FEIR page 1-13

ongoing and future research, and the proposed upgrade must be achieved even if the CSI building is not expanded."[2] The FEIR describes how the current intake system, which consists of two 6-inch outside diameter pipes, experiences significant biofouling, which results in a severe reduction in seawater volumes and pump damage due to cavitation.

If the construction of the new intake and discharge is allowed to proceed, MassDEP reiterates its requests that Northeastern consider and/or provide the following:

- **Verification of intake velocity.** EPA recommends a standard intake velocity no greater than 0.5 feet per second (fps) to ensure that the majority of aquatic organisms can avoid becoming trapped against intake screens. See, for example, 40 C.F.R. §§ 125.94(c)(2) and (3). The intake velocity has been calculated at 0.011 fps, well below the 0.5 fps standard. MassDEP requests that Northeastern verify the velocity if and when the proposed intake becomes operational. Northeastern has indicated in the FEIR that "[Northeastern] will verify these velocities upon operation of the new system."[3] Northeastern also noted "(i)t may not be technically feasible to measure such low water velocities (0.011 feet per second) in the open ocean environment; however, the University will research and attempt to confirm the velocities. One means to evaluate and determine the velocity at the intake screens is to monitor the flow rate pumped by the seawater pumps with a flow meter. If the seawater flow meter is less than 600 gpm, the intake velocity will be well below the MassDEP limit of 0.5 FPS."[4] MassDEP and EPA will work with Northeastern to ensure that the velocity verification method is acceptable.

- **Best Practices for Seawater Use Plan.** As described in the Supplemental Memorandum, Northeastern has a Seawater Advisory Committee (SAC) that maintains and updates the document entitled Best Practices for Seawater Use. This plan prohibits the addition of chemicals (including antibiotics, cleaning agents, and other chemicals) and invasive/non-native and potential injurious species into the return seawater. In addition, the Best Practices for Seawater Use plan provides information and instructions on: managing return seawater; returning animals to the wild; maintaining non-native species in closed tanks and requiring consultation with the Massachusetts Invasive Species Program (MISP); managing disposal of organisms in closed tanks landside to wastewater treatment plant or solid waste disposal; and filing a mandatory Emergency Spill Response Plan with the SAC. In addition, researchers must apply for collection permits with the Massachusetts Division of Marine Fisheries, and Northeastern consults with the MISP annually to discuss what species will be used in experiments in the upcoming year. This document also includes a Seawater Plan Form with a detailed questionnaire that Principal Investigators are required to fill out for review by the SAC. MassDEP reiterates approval of this approach and believes that the Best Practices for Seawater Use should continue to be a "living" document that is maintained and updated by the SAC over time. Oversight of research conducted at the facility by the SAC is important and must be considered a priority by Northeastern. Northeastern provided an updated Best Practices for Seawater Use document in the FEIR.[5]

[2] FEIR page 1-1
[3] FEIR page 1-14
[4] FEIR page 10-20
[5] FEIR Appendix B

- **Temperature of the discharge.** The waters of Bathing Beach Cove are classified by MassDEP as SA. According to the Massachusetts State Water Quality Standards (SWQS), discharges to SA waters "Shall not exceed 85°F nor a maximum daily mean of 80°F and rise in temperature due to a discharge shall not exceed 1.5°F" (314 CMR 4.05(4)(a)(2)). The average temperature differential calculated by Northeastern during March through October 2018 was +0.367°F. Since Northeastern is no longer proposing to use seawater to cool the proposed new CSI building, the temperature differential should be similar to the current conditions and therefore it is not anticipated that the discharge from the flow-through seawater system would violate the Massachusetts SWQS. MassDEP had requested that Northeastern provide more information on sources of temperature increases. Northeastern explained in the FEIR that "researchers may elevate water temperatures by two or three degrees Celsius to represent future predicted increases in sea surface temperatures."[6] The FEIR also explains that "(b)efore seawater is discharged back into the ocean it will pass through an energy recovery heat exchanger that helps to further reduce any temperature differential of the effluent. The energy recovery heat exchanger also significantly reduces the energy consumption of the CSI facility, making it more sustainable and energy friendly."[7] Based on previous information provided to the Agencies as well as this additional new information, the Agencies maintain that the proposed discharge would not exceed the Massachusetts State Water Quality Standards for SA waters for temperature. The FEIR states that "[Northeastern] is also committed to conducting additional temperature sampling CORMIX model runs once the new system is operational."[8] Temperature data and modeling results should be made available to the public on an easily accessible website.

- **Modeling.** MassDEP requested in previous comment letters that Northeastern conduct additional temperature sampling and CORMIX model runs if and when the new discharge is operational. As mentioned above, Northeastern has agreed to conduct this additional modeling as well as collect additional temperature data once the new system is operational.

MassDEP and EPA reviewed the FEIR, the operation of the facility, available sampling data, and the Seawater Advisory Committee's Best Practices for Seawater Use. Review of available sampling data suggests that the quality of the seawater discharge is substantially similar to the intake water. Based on this information, the Agencies' preliminary assessment is that the proposed intake and discharge will not be adding pollutants (such as chlorine, medications, heat, or nutrients) to the receiving water and would not, on a case-by-case basis, be a significant contributor of pollutants. The available information also indicates that the temperature of the discharge is consistent with water quality standards and will be protective of the designated uses of the receiving water. These assessments remain valid provided the levels of biomass held at the facility remain under the threshold defined in the Concentrated Aquatic Animal Production (CAAP) Facilities regulations (314 CMR 3.16, Appendix A and 40 C.F.R. § 122.24, and 40 C.F.R. Part 122, Appendix C), the facility continues to operate as described in the FEIR, and the proposed intake and discharge are built as described in FEIR. This includes the volume of intake and the

[6] FEIR page 1-9
[7] FEIR page 1-15
[8] FEIR page 1-17

prohibition on use of medications or chemicals, and the commitment to isolate non-indigenous species from the flow-through system.

Should the construction of the new intake and discharge be allowed to proceed, the Agencies will make a determination as to whether a NPDES permit is needed.

MassDEP notes that Northeastern obtained coverage under the NPDES Remediation General Permit (RGP), permit number MAG910868, for temporary dewatering discharges during the installation of a geothermal test well. The FEIR lists how Northeastern's drilling contractor planned to fulfill the requirements of the RGP and meet the permit limits.[9] Test well drilling was completed in March 2020 and all dewatering was recharged onsite. No surface water discharges or effluent sampling occurred under the RGP. Northeastern will reapply for coverage under the RGP for the installation of the geothermal wellfield and will also be applying for coverage under the NPDES Construction General Permit (CGP) for stormwater management if and when construction moves forward. Northeastern plans to prepare a Stormwater Pollution Prevention Plan (SWPPP) as required by the CGP.[10]

MassDEP appreciates the opportunity to comment on this Final Environmental Impact Report. If you have any questions, please contact Catherine.Vakalopoulos@mass.gov at (617)348-4026.

Sincerely,

Lealdon Langley, Director
Division of Watershed Management
Bureau of Water Resources

Cc: Eric Worrall, MassDEP Northeast Regional Office
John Viola, MassDEP NERO
Damien Houlihan, EPA
Danielle Gaito, EPA
Kathryn Glenn, CZM
Todd Callaghan, CZM

[9] FEIR pages 9-7 and 9-8
[10] FEIR page 1-16

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
OFFICE OF COASTAL ZONE MANAGEMENT
251 Causeway Street, Suite 800, Boston, MA 02114-2136
(617) 626-1200 FAX: (617) 626-1240

MEMORANDUM

TO: Kathleen A. Theoharides, Secretary, EEA
ATTN: Erin Flaherty, MEPA Office
FROM: Lisa Berry Engler, Director, CZM
DATE: June 11, 2020
RE: EEA-16046, Northeastern University Coastal Sustainability Institute; Nahant

The Massachusetts Office of Coastal Zone Management (CZM) has completed its review of the above-referenced Final Environmental Impact Report (FEIR), noticed in the Environmental Monitor dated March 25, 2020, and offers the following comments.

Project Description

The project proposes the development of the Coastal Sustainability Institute (CSI) at the Northeastern University (NU) Marine Science Center (MSC), including an expansion of the existing Murphy Bunker, a seawater system upgrade, and associated site improvements. The seawater system upgrade was the subject of an initial Environmental Notification Form (ENF) in January 2018, which was subsequently withdrawn. After the withdrawal of the 2018 ENF and before submitting the ENF for the current proposal, NU conducted water temperature monitoring in Bathing Beach Cove, developed larval lobster entrapment estimates for various flow rates, and developed a model to assess existing and proposed water temperature impacts to the receiving water from seawater discharge. Based on the results of these efforts, the seawater intake system design included in the ENF reduced the seawater intake flow rate from 2,400 gallons per minute (gpm) to 600 gpm; eliminated a proposal to use seawater flow to cool or heat the new CSI building; modified the seawater outfall system to eliminate beach erosion; eliminated a temporary impact to bordering vegetated wetland (BVW) for seawater piping; and proposed construction of an onsite lobster hatchery to release stage IV lobster larvae into the source water to mitigate for potential lobster larvae mortality due to the proposed seawater intakes. The proposed building for the CSI development includes construction of a building with approximately 55,000 square feet (SF) of research, meeting, and office space, to be integrated with the existing Murphy Bunker facility. The DEIR design moved the footprint of the CSI facility entirely outside of areas subject to Nahant's Wetlands Bylaw, changed the proposed roof and walls to improve energy efficiency and reduce visual impacts, and added low impact development (LID) features to reduce stormwater impacts. In addition, the pump house associated with the seawater system was proposed to be moved outside of the existing velocity zone. Proposed roadway and parking continue to include a reconfigured entrance from Nahant Road, reconstruction and realignment of existing driveways, and three new onsite parking areas with 125 spaces. The project results in a net increase in overall impervious area of 74,683 SF. The project also includes upgrades to water, sewer, gas, electric and telecommunication systems and stormwater management, and the removal of invasive plants and restoration of native species in the vicinity of the new CSI development.

The FEIR does not propose any significant changes to the design of the CSI building or to the proposed seawater system since the filing of the DEIR. Relocation of the water and electric lines, previously proposed to be located in the access roadway on the north side of the site near Canoe Beach, is proposed to reduce the vulnerability of these utilities to coastal storm damage. The new

water line connection will be made from Swallow Cave Road along the south site of the site to the new CSI building, and the existing water line will be abandoned in place. The existing electrical duct bank in the access road will be also be abandoned in place and a new electric duct bank connection will be installed on the south side of the site to service the CSI. Existing overhead electrical lines that run from a point just beyond the access gate adjacent to Canoe Beach to the rear of the Edwards Building will be removed. According to the FEIR, the existing sewer line within the access roadway cannot practicably be relocated because it is gravity fed and the low point leaving the site is in the roadway near Canoe Beach, so relocation would require the construction of new pump station. Approximately 200 feet of the existing sewer pipe is within FEMA flood Zone VE (elevation 18 NAVD88). The current proposal will replace the sewer pipe in its existing location and armor it by placing it in a concrete vault to protect it from potential storm induced erosion.

Project Comments

Proposed mitigation for impacts associated with the new intake system include developing a lobster hatchery and releasing 90,000 Stage IV lobster larvae per year to offset lobster larvae potentially entrained into the system. The FEIR states that NU must collaborate with the local lobster fishermen before committing to a design for the proposed lobster hatchery. Once this collaboration has occurred, the applicant has agreed that the proposal will be fully reviewed and approved by the Massachusetts Division of Marine Fisheries.

Additional mitigation proposed to offset impacts associated with the new intake system include removing the existing and former intake lines, increasing the diameter of the intake lines from the existing six inches to fourteen inches, and environmental monitoring of the new system. These are appropriate forms of mitigation that should improve the receiving water body and assist in any future adaptive management of the seawater intake/discharge system. In comments on the NPC/DEIR, CZM requested that the FEIR describe how work to remove the existing and former intake pipes and associated infrastructure from the beach and near shore areas will be conditioned to ensure protection of the resource area during removal. The FEIR states that this information will be submitted for review by the Nahant Conservation Commission with the filing of a Notice of Intent. This information will also be required for CZM Federal Consistency review of the project.

The proposed NU Seawater Best Practices document helps ensure that all NU researchers, staff, and visitors utilize methods to prevent accidental releases of pollutants (including non-native, invasive species) to the receiving waters around the facility. The document requires researchers at the MSC working with a variety of species from the Gulf of Maine/Massachusetts Bay ecosystem to use their best professional judgment regarding which species should be permitted in the flow-through system, with particular attention to potentially injurious species (e.g., recently invasive predators, potential disease vectors). Since the filing of the NPC/DEIR, NU has worked closely with CZM staff to modify the NU Seawater Best Practices document to incorporate internal checks and balances to ensure that research organisms do not escape the lab tanks.

Existing and proposed conditions plans at a reasonable scale that clearly depict the proposed project relative to the regulated resources on the site, including the extent and location of project components and resource areas, should be provided in order to facilitate review of potential resource impacts. Figures 4-1 (A-D) and 4-2 (A-D) of the FEIR do not adequately address this need, as they do not indicate the boundaries of individual coastal resource areas. As each resource area has different standards, a clear breakdown of the boundaries of each and the associated impacts from project

components is necessary to determine that the project minimizes impacts to each. The FEIR identifies specific areas of impact, suggesting that an on the ground delineation has been completed. The project plans should reflect this specific, on the ground delineation detail, and specific detail of project impacts within each. This level of detail will be required for CZM Federal Consistency Review of the project. At a minimum, these plans should clearly depict the correct delineations of all flood zones, boundaries of each resource area, mean high and low water, and the high tide line. The resource areas identified at Canoe Beach do not include the cobble dune previously identified as part of the Canoe Beach Coastal Resiliency Grant Project. This resource area should be added to the project plans.

A description of how work to remove the existing and former intake pipes and associated infrastructure from the beach and near shore areas will be conditioned to ensure protection of the resource area during removal should be provided. The FEIR states that this information will be submitted for review by the Nahant Conservation Commission with the filing of a Notice of Intent. This information will also be required for CZM Federal Consistency review of the project.

Previous comments on the DEIR expressed concern regarding the vulnerability of the entrance roadway, which is within a velocity flood zone directly adjacent to Canoe Beach and is subject to overwash and erosion during current coastal storm events. In 2018, NU received a CZM Coastal Resilience grant to design a mixed sediment dune and beach nourishment project to address the significant erosion and storm damage occurring along Canoe Beach to provide protection for infrastructure landward of the beach. That project sought a design to address the loss of sediment and reduction of volume from the upper beach profile that limits the ability of the beach system to function well to dissipate storm energy and minimize storm damage to Nahant Road, the MSC facilities, and the utilities that run beneath it. The FEIR proposes to move most utilities out of the roadway alignment, but will leave the sewer line within Nahant Road, encased in concrete to reduce its vulnerability to storm damage. Because the velocity flood elevation in this location is mapped at 18 feet NAVD88, and the elevation of the road is approximately 15 feet, the FEMA flood maps predict that there would be approximately 3 feet of water and waves moving across the road in a 1% chance storm. As noted in the study conducted for the Coastal Resiliency Grant Project, the volume of sediment at Canoe Beach is depleted such that minor to moderate storms have caused overwash onto and undermining of Nahant Road in the past. Because predicted sea level rise and more significant and frequent coastal storms could jeopardize the sewer line over time, a more detailed vulnerability analysis that includes an eroded profile assessment should be conducted before plans to locate the sewer in this roadway are finalized to determine whether the projected lifespan of the sewer line in this location meets the goals of the project and minimizes potential impacts to the adjacent coastal resource areas. For critical infrastructure such as sewer lines, it is important to use all available information to determine the potential hazards that may impact the project components for the life of the infrastructure. In addition to using the most recent Flood Insurance Rate Maps and data available from the FEMA Map Service Center, consulting the Sea, Lake, and Overland Surge from Hurricanes (SLOSH) maps produced by the U.S. Army Corps of Engineers to determine areas that may be inundated by hurricanes, as well as the most recent information regarding projections of sea level rise for Massachusetts available through the Massachusetts Climate Change Clearinghouse website, reslientma.org is recommended. Given the vulnerability of the road to moderate and major coastal storms discussed above, NU should reconsider the feasibility of moving the sewer line out of the velocity zone in the future and consider moving forward with the mixed sediment nourishment at Canoe Beach in the short term to reduce impacts from coastal storms to the site.

Federal Consistency Review

The proposed project is subject to CZM federal consistency review and must be found to be consistent with CZM's enforceable program policies. For further information on this process, please contact Robert Boeri, Project Review Coordinator, at 617-626-1050, or visit the CZM web site at www.mass.gov/czm.

LE/kg

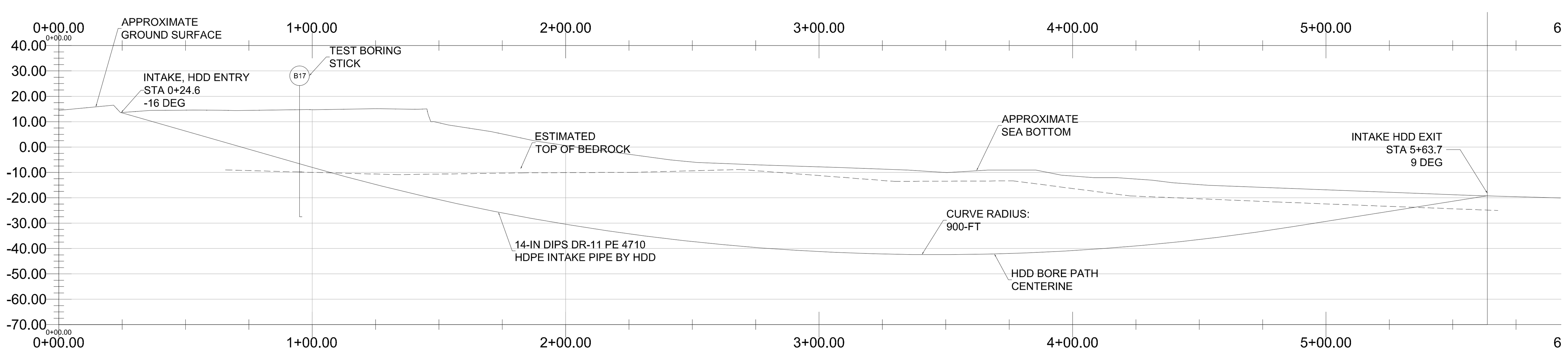
cc: Kathryn Glenn, CZM
Eric Carlson, DCR Flood Hazard Mitigation
Frank Taormina, DEP Waterways
Barbara Newman, USACE NED

Stormwater Report
(Separate Volume)

SECTION 14

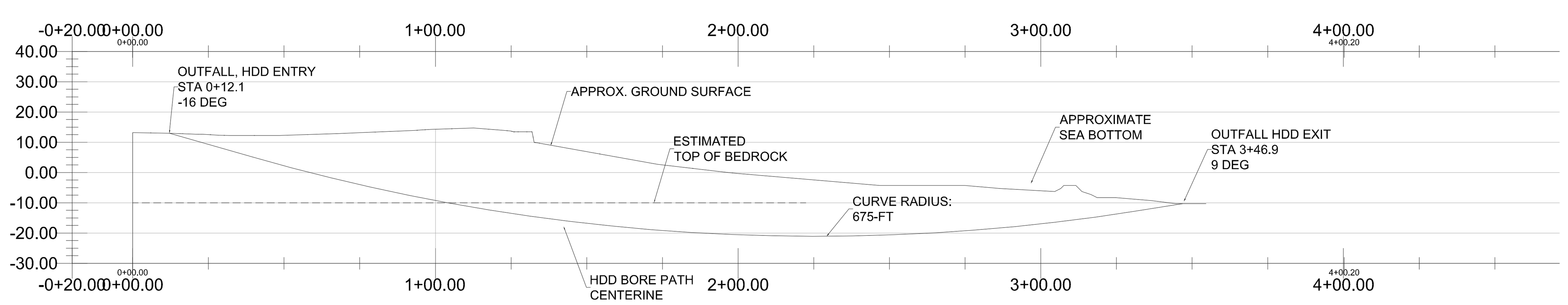
Project Plans
(Separate Volume)
and
HDD Profile Sheets

PLAN VIEW



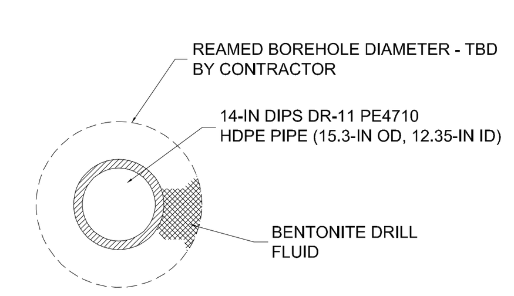
* BOTH INTAKES ASSUMED AT SAME PROFILE

INTAKE PROFILE



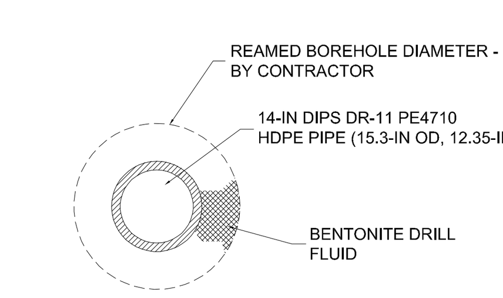
* BOTH OUTFALLS ASSUMED AT SAME PROFILE

OUTFALL PROFILE



OUTFALL HDD PROFILE
NTS

NOT FOR CONSTRUCTION



OUTFALL HDD PROFILE
NTS

NOTES:
1. BASE PLAN OBTAINED FROM ELECTRONIC FILE ENTITLED: NEW NAHANT SW INTAKES AND DISTRIBUTION REVISION II DEC 27 2017.dwg", PREPARED BY NITCH ENGINEERING, 2017.
2. BATHYMETRIC SURVEY DATA OBTAINED BY CLE ENGINEERING, OCTOBER, 2017.
3. DETAILS SHOWN FOR PLANNING PURPOSES ONLY. THIS DRAWING DOES NOT REPRESENT FINAL DESIGN.
4. DIMENSIONS APPROXIMATE.
5. STATIONING FOR REFERENCE ONLY.
6. TOP OF BEDROCK ESTIMATED BASED ON RESULTS OF GEOPHYSICAL SURVEY COMPLETED BY WOODS HOLE GROUP DURING JULY 2020. THIS IS CONSIDERED APPROXIMATE.
7. PLAN PREPARED FOR PERMITTING.

SCALE
1"=20'
0 10 20 30 40-FEET

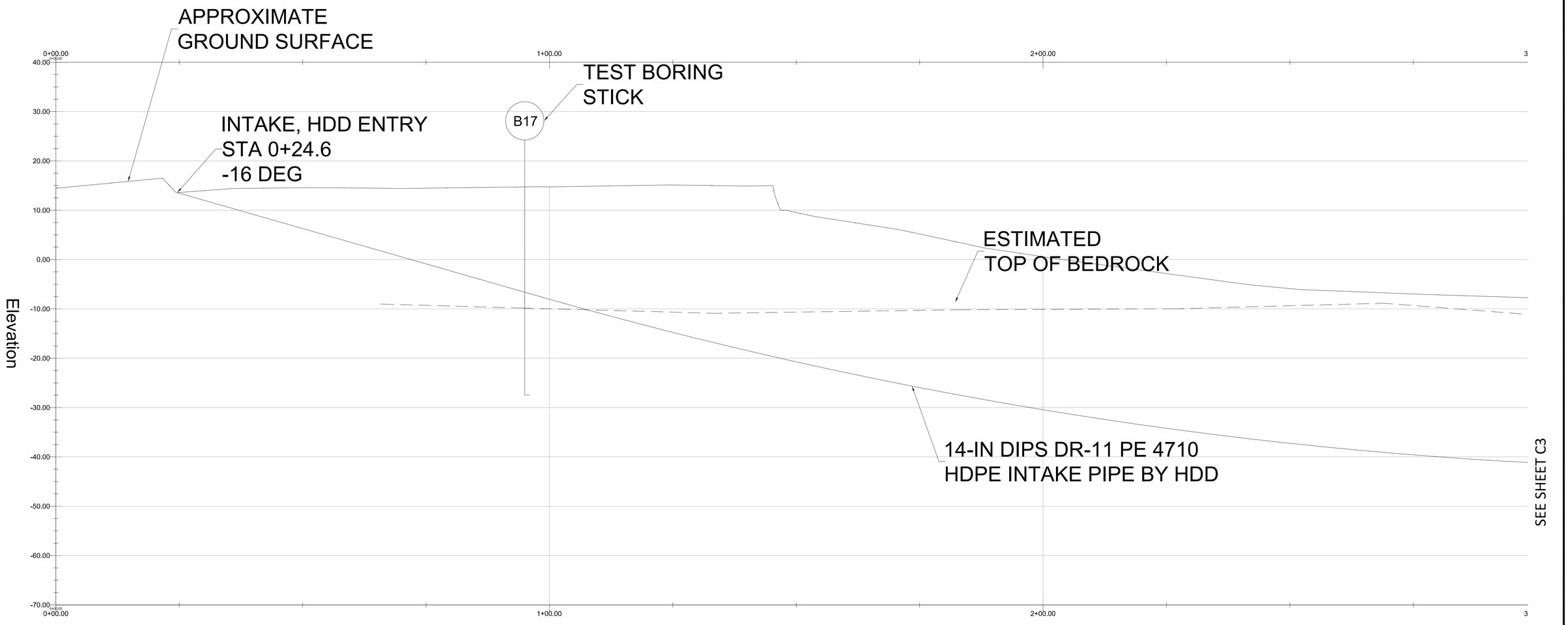
BRIERLEY ASSOCIATES
Creating Space Underground
167 S. RIVER RD, SUITE #8, BEDFORD, NH 03110
PHONE: 603-206-5775 FAX: 603-206-5748

DESIGNED FOR
NORTHEASTERN UNIVERSITY
NAHANT, MA
PROJECT LOCATION **NAHANT, MA**
SEAWATER SYSTEM UPGRADE

SHEET TITLE
CONCEPTUAL INTAKE, OUTFALL PLAN AND PROFILE

FIGURE
C1

NOVEMBER 2021



* BOTH INTAKES ASSUMED AT SAME PROFILE

SCALE
1"=10'
0 5 10 15 20-FEET

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DESIGNED FOR NORTHEASTERN UNIVERSITY
NAHANT, MA
PROJECT LOCATION **NAHANT, MA**
SEAWATER SYSTEM UPGRADE

SHEET TITLE
CONCEPTUAL INTAKE PROFILE

FIGURE
C2

NOVEMBER 2021

Station

3+00.00 4+00.00 5+00.00

APPROXIMATE
SEA BOTTOM

INTAKE HDD EXIT
STA 5+63.7
9 DEG

CURVE RADIUS:
900-FT

SEE SHEET C2

HDD BORE PATH
CENTERINE

3+00.00 4+00.00 5+00.00

Station

* BOTH INTAKES ASSUMED AT SAME PROFILE

SCALE
1"=10'
0 5 10 15 20-FEET

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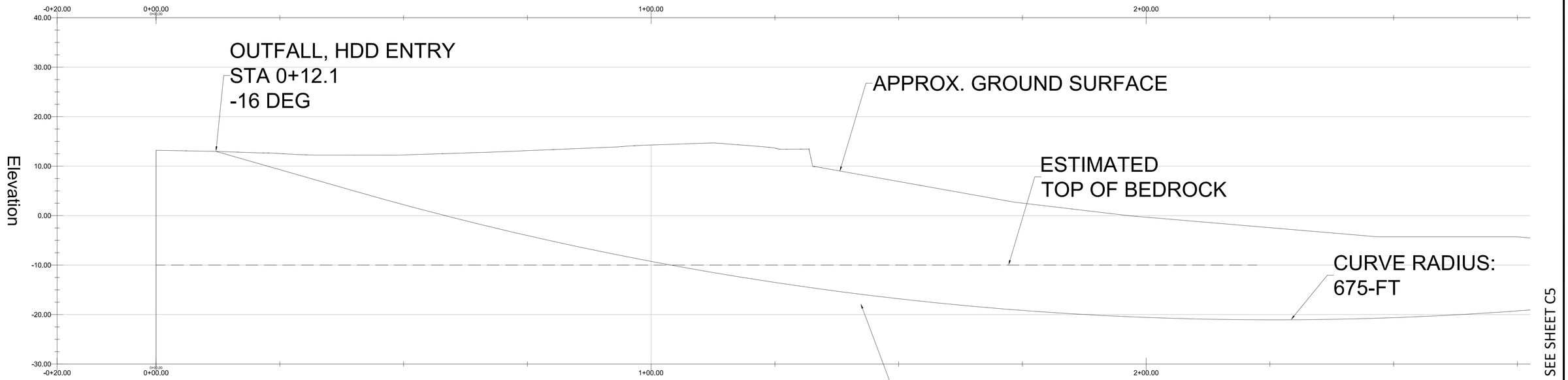
DESIGNED FOR NORTHEASTERN UNIVERSITY
NAHANT, MA PROJECT LOCATION **NAHANT, MA**
SEAWATER SYSTEM UPGRADE

SHEET TITLE
CONCEPTUAL INTAKE PROFILE

FIGURE
C3

NOVEMBER 2021

Profile View C



* BOTH OUTFALLS ASSUMED AT SAME PROFILE

SCALE
1"=10'
0 5 10 15 20-FEET

BRIERLEY ASSOCIATES
Creating Space Underground
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DESIGNED FOR NORTHEASTERN UNIVERSITY

NAHANT, MA PROJECT LOCATION **NAHANT, MA**

SEAWATER SYSTEM UPGRADE

SHEET TITLE

CONCEPTUAL OUTFALL PROFILE

FIGURE **C4**

NOVEMBER 2021

Station

2+00.00 3+00.00 4+00.00

APPROX. GROUND SURFACE

ESTIMATED
TOP OF BEDROCK

APPROXIMATE
SEA BOTTOM

OUTFALL HDD EXIT
STA 3+46.9
9 DEG

CURVE RADIUS:
675-FT

HDD BORE PATH
CENTERINE

2+00.00 3+00.00 4+00.00

Station

SEE SHEET C4

* BOTH OUTFALLS ASSUMED AT SAME PROFILE

SCALE
1"=10'
0 5 10 15 20-FEET

BRIERLEY ASSOCIATES
Creating Space Underground
197 S. RIVER RD, SUITE #8, BEDFORD, NH 03110
PHONE: 603-206-5775 FAX: 603-206-5748

DESIGNED FOR NORTHEASTERN UNIVERSITY
NAHANT, MA PROJECT LOCATION **NAHANT, MA**
SEAWATER SYSTEM UPGRADE

SHEET TITLE
CONCEPTUAL OUTFALL PROFILE

FIGURE
C5

NOVEMBER 2021