



RemBac Environmental LLC  
3140 Edgewood Rd  
Ellicott City, MD 21043

March 19, 2024

Bruce Webb  
Conservation Agent and Sustainability Coordinator  
Town of Fairhaven  
Fairhaven, MA 02719

Greetings,

RemBac Environmental LLC (RemBac) and the University of Maryland Baltimore County (UMBC) are happy to submit this Notice of Intent (NOI) for our proposed study in East Zone 4 (EZ4) of the New Bedford Harbor Superfund Site (NBHSS) in Fairhaven, MA. This study is being proposed on parcels owned by the Town of Fairhaven within EZ4, specifically Parcels 20-004 and 20-325. With this NOI comes our formal request to use these parcels for the proposed study with a signature of the attached WPA Form 3 in Section F.

The proposed study is funded by the National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program (SRP) as a Phase 2 Small Business Innovative Research (SBIR) project awarded to RemBac and UMBC on September 1, 2023. The two-year study aims to evaluate the efficacy of a cost-effective and environmentally sustainable technology that employs activated carbon (AC) and PCB-degrading microorganisms to both sequester and degrade sediment-associated PCBs in situ.

The study meets the requirements of, and will be permitted as, a Test Project under 310 CMR 10.05 (11) for wetlands, 314 CMR 9.03 (7) for water quality, and using Form BRP WW 25 for Chapter 91 waterways as a Test Project of a water-dependent, innovative technology with the potential for significantly beneficial environmental effects. A successful demonstration of the technologies in the NBHSS EZ4 will advance the use of these technologies as an alternative to current sediment remediation practices of dredging and disposing contaminated sediments, a process that is highly energy-intensive, costly, and ecologically destructive.

We have attempted to adapt the attached WPA Form 3 to fulfil the requirements of permitting a Test Project under 310 CMR 10.05 (11). The proposed Test Project does not include any of the activities typically associated with a NOI, such as excavations, construction of structures, or

creation of impervious areas, while also not neatly fitting the requirements for an ecological restoration project. We ask that you rely upon the attached project description to understand the intent of the proposed Test Project, which is to test the efficacy to two complimentary, innovative technologies in sequestering and degrading sediment-associated PCBs in-situ.

We hope the attached NOI will be sufficient for your review of this innovative technology research study, its potential for providing environmental benefits to both the Commonwealth and throughout the United States, and the absence of potential for harmful effects on the environment as demonstrated in several peer-reviewed publications.

This letter also comes with my gratitude for your assistance in proposing this study to the Town of Fairhaven.

Sincerely,

A handwritten signature in black ink, appearing to read 'CB Amos', with a stylized flourish at the end.

Bennett Amos  
RemBac Environmental LLC Principal Investigator



**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  
 Fairhaven, MA  
 \_\_\_\_\_  
 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):

<u>Rear Sycamore Street</u>	<u>Fairhaven</u>	<u>02719</u>
a. Street Address	b. City/Town	c. Zip Code
<u>Latitude and Longitude:</u>	<u>N 41.660613°</u>	<u>W -70.914577°</u>
	d. Latitude	e. Longitude
<u>20</u>	<u>20-325</u>	
f. Assessors Map/Plat Number	g. Parcel /Lot Number	

2. Applicant:

<u>Bennett</u>	<u>Amos</u>	
a. First Name	b. Last Name	
<u>RemBac Environmental LLC</u>		
c. Organization		
<u>3140 Edgewood Road</u>		
d. Street Address		
<u>Ellicott City</u>	<u>MD</u>	<u>21043</u>
e. City/Town	f. State	g. Zip Code
<u>978-302-4936</u>	<u>N/A</u>	<u>ben@sedimite.com</u>
h. Phone Number	i. Fax Number	j. Email Address

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

<u>N/A</u>	<u>N/A</u>	
a. First Name	b. Last Name	
<u>Town of Fairhaven</u>		
c. Organization		
<u>40 Center Street</u>		
d. Street Address		
<u>Fairhaven</u>	<u>MA</u>	<u>02719</u>
e. City/Town	f. State	g. Zip Code
<u>508-979-4023</u>	<u>508-979-4079</u>	<u>conservation@fairhaven-ma.gov</u>
h. Phone Number	i. Fax Number	j. Email address

4. Representative (if any):

_____	_____	
a. First Name	b. Last Name	
_____		
c. Company		
_____		
d. Street Address		
_____	_____	_____
e. City/Town	f. State	g. Zip Code
_____	_____	_____
h. Phone Number	i. Fax Number	j. Email address

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

<u>\$750</u>	<u>\$362.50</u>	<u>\$387.50</u>
a. Total Fee Paid	b. State Fee Paid	c. City/Town Fee Paid



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands

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

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## A. General Information (continued)

### 6. General Project Description:

The proposed project will be permitted as a Test Project under 310 CMR 10.05 (11). The Test Project aims to apply sediment amendments to small areas of PCB-impacted salt marsh and intertidal sediments of the New Bedford Harbor Superfund Site (NBHSS) East Zone 4 (EZ4) to evaluate their efficacy in sequestering and degrading PCBs in-situ. A detailed study plan is attached.

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

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

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

- 1.  Yes  No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

#### 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:

Bristol

a. County

20

c. Book

b. Certificate # (if registered land)

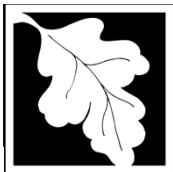
325, 326

d. Page Number

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

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

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



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Bureau of Resource Protection - Wetlands

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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. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet	2. square feet
	3. cubic yards dredged	

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet	2. square feet
	3. cubic feet of flood storage lost	4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet	
	2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input checked="" type="checkbox"/> Riverfront Area	Acushnet River, Coastal	

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: 5463 square feet

4. Proposed alteration of the Riverfront Area:

<u>5463</u>	<u>5463</u>	<u>5463</u>
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. <input checked="" type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. square feet 2. cubic yards dredged	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet	2. cubic yards beach nourishment
e. <input type="checkbox"/> Coastal Dunes	1. square feet	2. cubic yards dune nourishment

	Size of Proposed Alteration	Proposed Replacement (if any)
f. <input type="checkbox"/> Coastal Banks	1. linear feet	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet	
h. <input checked="" type="checkbox"/> Salt Marshes	995 1. square feet	995 2. sq ft restoration, rehab., creation
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet 2. cubic yards dredged	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet	
k. <input type="checkbox"/> 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. <input checked="" type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet	

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

a. square feet of BVW	b. square feet of Salt Marsh
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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](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**

Online, 11/27/2023

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 <https://www.mass.gov/endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

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







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

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.

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



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**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.

Attachments 4a - 4c

a. Plan Title

Bennett Amos

b. Prepared By

Test Project Exemption

c. Signed and Stamped by

d. Final Revision Date

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:

1059

2. Municipal Check Number

1060

4. State Check Number

RemBac Environmental LLC

6. Payor name on check: First Name

3/18/2024

3. Check date

3/18/2024

5. Check date

7. Payor name on check: Last Name



Massachusetts Department of Environmental Protection  
Bureau of Resource Protection - Wetlands

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

Provided by MassDEP:

MassDEP File Number

Document Transaction Number

Fairhaven, MA

City/Town

## F. Signatures and Submittal Requirements

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

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

1. Signature of Applicant

3/19/2024

2. Date

3. Signature of Property Owner (if different)

4. Date

5. Signature of Representative (if any)

6. Date

### 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:

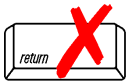
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

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.



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 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:

Rear Sycamore Street Fairhaven  
 a. Street Address b. City/Town  
 \_\_\_\_\_  
 c. Check number d. Fee amount  
 \_\_\_\_\_

2. Applicant Mailing Address:

Bennett Amos  
 a. First Name b. Last Name  
 RemBac Environmental LLC  
 c. Organization  
 3140 Edgewood Rd.  
 d. Mailing Address  
 Ellicott City MD 21043  
 e. City/Town f. State g. Zip Code  
 978-302-4936 ben@sedimite.com  
 h. Phone Number i. Fax Number j. Email Address  
 \_\_\_\_\_

3. Property Owner (if different):

N/A N/A  
 a. First Name b. Last Name  
 Town of Fairhaven  
 c. Organization  
 40 Center St.  
 d. Mailing Address  
 Fairhaven MA 02719  
 e. City/Town f. State g. Zip Code  
 508-979-4023 508-979-4079 conservation@fairhaven-ma.gov  
 h. Phone Number i. Fax Number j. Email Address  
 \_\_\_\_\_

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

**B. Fees**

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.



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**B. Fees** (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
Category 2, Activity J - Other: Test Project, with RFA Multiplier	1	\$500	\$750
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
<b>Step 5/Total Project Fee:</b>			\$750
<b>Step 6/Fee Payments:</b>			
Total Project Fee:			\$750
State share of filing Fee:			\$362.50
City/Town share of filing Fee:			\$387.50
			a. Total Fee from Step 5
			b. 1/2 Total Fee <b>less</b> \$12.50
			c. 1/2 Total Fee <b>plus</b> \$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.)

## **Attachment 1. Project Description**

The proposed study is a Test Project of innovative research to be conducted by the University of Maryland Baltimore County (UMBC) and RemBac Environmental LLC (RemBac). The study is funded by a National Institute of Environmental Health Sciences (NIEHS) Superfund Research Program (SRP) Small Business Innovative Research (SBIR) Phase 2 grant awarded to UMBC and RemBac on September 1, 2023 (Award # 2R44ES032365-02A1).

The proposed study aims to evaluate the efficacy of activated carbon and PCB-degrading microorganisms in sequestering and degrading sediment-associated PCBs, respectively, in-situ. The proposed Test Project will deploy activated carbon pellets with and without the PCB-degrading microorganisms to two plots of sediment. The sequestration and degradation of PCBs will be evaluated using data generated from pre- and post-application sampling events.

The activated carbon will be applied using SediMite, a pellet comprised of 50% powdered activated carbon (PAC) by weight. The remaining composition of the pellets is sand, which provides weight to the pellets such that they will sink to the sediment after application over the water's surface, and clay binders to form the pellets and maintain the PAC in a handleable state. Following application and hydration, the pellets will settle into a thin layer on the sediment surface for incorporation into the biologically active zone by bioturbation processes such as burrowing and plant root growth.

The PCB-degrading microorganisms are maintained within a fluid inoculum. This inoculum is applied directly onto the SediMite pellets just prior to application of the SediMite, which acts as the vehicle for getting the microorganisms through the water column and into surficial PCB-impacted sediments.

We present these technologies as water-dependent as: 1) SediMite activated carbon pellets are specifically designed for application over the water's surface and to sink to contaminated sediments to deliver PAC for sequestration of hydrophobic organic contaminants, such as PCBs; 2) the PCB-degrading microorganism inoculum is applied onto SediMite for delivery to PCB-contaminated sediments, and; 3) both amendments rely upon the SediMite being hydrated to release them for sequestering and degrading PCBs in-situ.

The proposed project is to be permitted as a Test Project under the following statutes:

- Wetlands: 310 CMR 10.05 (11)
- Water Quality: 314 CMR 9.03 (7)
- Chapter 91: Form BRP WW 25

While the proposed Test Project does include areas of EZ4 salt marsh, the footprint of salt marsh to be amended is less than 1,000 square feet. The proposed Test Project, therefore, does not exceed any thresholds requiring Massachusetts Environmental Protection Act review.

The proposed study area is located at the southern extent of the New Bedford Harbor Superfund Site (NBHSS) East Zone 4 (EZ4), an urban, intertidal saltmarsh located on the eastern shore of the Acushnet River in Fairhaven, MA. The study area is unused and is posted “No Trespassing” under institutional controls maintained by the NBHSS remediation program. Activities associated with the NBHSS remediation effort in EZ4 were completed in 2022, which included removal of marsh sediments with total PCB concentrations over 50 mg/kg followed by backfilling with clean fill and re-planting with native vegetation. The proposed study area will be located outside of the remediated areas of EZ4.

The Test Project’s proposed location is on parcels owned by the Town of Fairhaven and the Buzzards Bay Coalition, both of whom provided letters of grant support for the proposal to NIEHS, and both of whom have agreed to the use of their parcels to conduct the study with conditions such as submittal of a work plan and obtaining the required permits.

### **Technology Background and Maturity**

Activated carbon (AC) has been shown to significantly reduce the bioavailability of PCBs in sediment, with reductions in the porewater concentrations and biota often approaching 100% (Ghosh et al, 2011; Patmont et al 2015). The use of AC as a sediment amendment is recognized as a strategy for remediating sediments in-situ as an alternative to traditional methods such as dredging and/or capping, methods that are both costly and ecologically destructive (Ghosh et al 2011, USEPA 2013). Amending PCB-contaminated sediment with AC reduces the bioavailability of PCBs, in turn reducing the risk of toxicity to benthic organisms, as well as the bioaccumulation and trophic transfer of PCBs from sediment into the food chain. Amending sediments with AC is complicated by the fact that the most effective size of AC, powdered activated carbon (PAC), is difficult to handle in the field due to its small grain size and susceptibility to re-suspension by both wind and water. AC will be applied to the contaminated sediments at EZ4 using SediMite pellets, which are comprised of 50% PAC, with the remaining composition being sand for weight and clay binder to form the pellets. The pelletized product allows convenient handling of PAC during application by enabling application of the pellets over the water’s surface and allowing them to sink through the water column and settle onto the sediment. Following application, the pellets hydrate and settle further, releasing PAC for incorporation into the contaminated sediment by bioturbation processes such as burrowing, plant root growth, and natural marsh accretion. The PAC delivered via SediMite adsorbs freely-dissolved PCBs in the sediment porewater, chemically binding the PCBs in order to prevent both partitioning back into the porewater phase or uptake and subsequent trophic transfer by sediment biota.

UMBC in collaboration with RemBac Environmental LLC has developed a PCB-degrading consortium of microorganisms that can degrade and reduce the total PCBs in contaminated sediment. The consortium is comprised of two microorganisms: an anaerobic halo-respiring bacterium (DF-1) and an aerobic oxidizing/dechlorinating bacterium (LB400). Both microorganisms are ubiquitous in the environment and can be expected to exist in the EZ4

marsh, but not at levels that support effective dechlorination/degradation of PCBs. When grown to optimal levels ( $10^5$  cells/mL or higher), the consortium has the ability to significantly reduce the bulk PCBs in sediments through complimentary anaerobic dechlorination and aerobic degradation of PCBs (Payne et al 2011; Payne et al 2013; Payne et al 2017; Payne et al 2019). PCBs are degraded within a period of months or years rather than decades required if left untreated.

As with PAC, the use of the microbial consortium for sediment remediation is complicated by the challenges in delivering the organism slurry through the water column and into sediments where they are needed to perform PCB degradation. To overcome this, the consortium is inoculated onto SediMite pellets for delivery, providing a synergistic effect to reducing the bioavailability of PCBs while the PCBs are undergoing biological degradation over time. A field pilot study (Payne et al 2019) using the combined technologies of SediMite AC pellets and RemBac's PCB-degrader consortium showed reductions of PCB concentration in the surficial sediments by up to 52%, reductions in the aqueous concentrations of tri- to nonachlorobiphenyl PCB congeners by as much as 95%, and decreases in coplanar congeners by up to 80% in within one year. Subsequent pilot field studies have yielded 77% reduction of total PCBs and 99% of aqueous (bioavailable) PCBs within one year (Sowers and Ghosh, 2023). The SediMite will be inoculated with the microbial amendments that will result in  $10^5$  cells/gram sediment.

The process of inoculating SediMite with the PCB-degrading consortium was advanced during RemBac's Phase 1 SBIR study in 2021, where two systems were developed and tested to accommodate the continuous, high-volume inoculation of SediMite pellets with the PCB-degrader consortium, enabling rapid treatment of large areas of PCB impacted sediment. The Phase 2 SBIR, which is the study being proposed in the NBHSS EZ4, aims to demonstrate the engineering constructability of these systems at a PCB-contaminated site and the technologies efficacy in adsorbing and degrading PCBs in-situ. A successful demonstration of the technologies and application techniques in the proposed Test Project will allow for these to be used at other PCB-contaminated sites both within the Commonwealth of Massachusetts and elsewhere in the United States.

### **Study Design – Chapter 91 Plan, Wetland Study Plan**

The proposed project does not involve the construction of any temporary or permanent structures, does not create any impervious areas, and is not anticipated to negatively alter the geochemistry or ecology. No new infrastructure, nor use or change of existing infrastructure are proposed.

The proposed Test Project will be conducted in three types of plots: 1) an Experimental Plot, which will receive the bio-amended SediMite; 2) a Positive Control plot, which will receive un-amended SediMite, and; 3) a Negative Control Plot, which will not receive any sediment amendments. A map showing the locations of the plots is shown in Figure 1.



The majority of the Experimental and Positive Control plots will be located in the intertidal zone of the Veranda Inlet of the Acushnet River, situated between the salt marsh border and mean low lower water line. The total area of each of these plots will be 254 square meters.

Sub-plots of the Experimental and Positive Control plots will be established within the EZ4 salt marsh. Both sub-plots will measure 6.8 meters by 6.8 meters (46.24 m<sup>2</sup>, 497.7 ft<sup>2</sup>).

SediMite will be applied to the plots at a rate of 1.5 lbs/ft<sup>2</sup>, which equals 4,101 lbs in the intertidal areas of the plots and 746.5 lbs in the salt marsh areas of the plots. The total amount of SediMite to be applied is 4,853.2 lbs, which is approximately 4 cubic yards of SediMite. Initially, this amount of SediMite will constitute a layer of approximately 0.5 inches thickness. Following hydration and settling over the course of a few tidal inundations, the layer will settle to approximately a 0.25-inch thickness. The sediment amendments will be incorporated into the biologically active zone of sediment, typically represented as the upper six inches of the sediment column, by natural bioturbations processes such as burrowing or plant root growth.

An unamended control plot will serve as a negative control.

Discrete sediment samples will be collected from five locations within each of the three plots (experimental, positive control, negative control) on two occasions: prior to application and one-year after application. Passive samplers will also be deployed in the sample locations for analysis of porewater-associated PCBs. Vegetation stem counts will be performed during the sampling events to evaluate effects of the applications to marsh vegetation. Access to the marsh for all sampling activities will be by foot.

The corners of the plots will be marked using PVC piping, which will be removed following the completion of the study. Temporary sediment temperature data loggers will be installed in the marsh for the duration of the study and removed following completion of the study.

The applications will be performed from work barges on the Acushnet River adjacent to the test plots. The SediMite inoculation will occur on the barges, followed by application to the marsh using pneumatic devices. No vehicular or heavy equipment will be utilized in the marsh or intertidal areas. The application may utilize floating mats to accommodate limited foot traffic into the marsh during application. The application period is anticipated to take one work day.

The SediMite will be left in-place after the proposed study, as it will have been incorporated into the marsh sediments. No discernable changes to the marsh platform elevation or vegetation are expected.

### **Analysis of Potential Environmental Effects and Impacts**

SediMite applications in similar marshes have not resulted in reductions in benthic community or effects to marsh vegetation when evaluated after periods of 1 to 6 years (Ruiz et al 2014, Patmont et al 2015, Menzie et al 2016). Addition of the microbial amendment on SediMite had no significant impact on the indigenous microbial communities based on metagenomic DNA

sequencing (Payne et al 2019). Based on these studies no indirect impacts from the proposed study to the flora, fauna, or overlying water are anticipated.

The potential impacts of the proposed Test Project that were evaluated as part of this permit were: 1) potential effects to benthic invertebrates in the application plots; 2) potential effects to vegetation in the application plots; 3) potential effects to the native sediment microbiota and; 4) interference with on-going remediation at the NBHSS.

#### Potential Effects to Benthic Invertebrates

Impacts to benthic invertebrates have been observed in laboratory toxicity and bioaccumulation assays when AC is mixed with sediment at AC doses of 5% (by sediment dry weight) or higher (Beckingham et al 2013; Patmont et al 2015). These effects seem to be relegated to laboratory environments, as effects to the benthic community have not been observed in field pilot studies using the proposed material SediMite or other AC sediment amendments (Patmont et al 2015).

In field pilot studies using SediMite, benthic community samples were collected prior to application and approximately one year after application and found no significant differences in the benthic community abundance or diversity (Menzie et al 2016). Similar lack of effects to benthic invertebrate community has been observed in other field pilot studies with various forms and doses of AC, which exhibit rapid recolonization of AC-amended plots and no changes in benthic community structure or number of individuals (Beckingham et al 2013, Patmont et al 2015).

Taken together, effects of AC on benthic invertebrates appears to be relegated to laboratory assays using epibenthic fauna and not transmissible to field pilot studies, such as the proposed study. However, as AC doses below 5% by sediment dry weight are still effective in achieving the desired reductions in PCB bioavailability (Patmont et al 2015), a dose of less than 5% AC by sediment dry weight will be targeted for the proposed study to mitigate any potential effects to the benthic community.

#### Potential Effects to Marsh Vegetation

In laboratory studies on the effects of AC to aquatic vegetation, aquatic plants in site sediments amended with AC doses greater than 5% by sediment dry weight grew at a moderately reduced rate (approximately 25% less than controls). The reduced growth rate was attributed to nutrient dilution of the sediment (Beckingham et al. 2013).

Field pilot studies using SediMite have found no effects to vegetation after applications of SediMite. A study that included three AC amendment methods, including SediMite, on Canal Creek, Aberdeen Proving Ground in Maryland found no significant phytotoxicity, changes in species abundance, richness or diversity, vegetative cover, or shoot weight or length in a tidally-influenced freshwater wetland (Ruiz et al 2013, Menzie et al 2014). Additionally, plant nutrient uptake in the AC-amended plots was not significantly lower than control plots (Ruiz et al 2013). A field pilot study on Bailey's Creek, Fort Eustis, VA that was performed in a similar habitat to the proposed study area (brackish, intertidal, *Spartina*-dominated marsh) shown no quantitative

differences (vegetation presence, appearance, bank shape) in the SediMite application area approximately a year after application.

Similar to the potential effects of AC amendments on benthic organisms, the effects observed in a laboratory setting do not translate to conditions observed in field pilot studies and are likely to be a result of nutritional constraints in small experimental vessels. However, in order further mitigate the potential for effects to marsh vegetation, a dose of less than 5% AC by sediment dry weight will be applied to the proposed study plots. The monitoring events for the proposed study include stem counts in the application plots before and one year after the proposed application. While no effects to the vegetation are anticipated, an observance of significant short-term reductions in vegetation will be remediated by planting the affected areas with native vegetation equivalent to the stem counts observed in the control plots.

#### Potential Effects to the Native Sediment Microbiota

The PCB-degraders to be used in the proposed Test Project, DF1 and LB400, are ubiquitous in the environment and expected in the native sediment microbiota of the NBHSS EZ4. However, their natural population levels in sediment are insufficient to cause significant PCB degradation. The addition of enriched populations of DF1 and LB400 do not cause any adverse effects to the native microbiota based on prior field studies (Payne et al, 2019). The anticipated effects of the proposed Test Project's amendment will be a period of enhanced PCB degradation followed by a return to background populations of the sediment microbiota as the PCB levels decrease.

#### Interference with On-Going Remediation Activities at the NBHSS

Remediation of the saltmarsh in EZ4 was completed in 2022. Remediation activities included the removal, backfill, and re-planting of marsh sediment with total PCB concentrations of over 50 mg/kg. There are no further remediation activities planned for EZ4 as part of the NBHSS remediation strategy; therefore, the proposed study will not interfere with on-going NBHSS remediation activities.

## **Attachment 2. Alternatives Analysis**

Potential alternatives to the proposed study are limited by the nature of the grant from the NIEHS SRP: SRP-funded studies must be performed on Superfund Sites. The scope of the proposed Test Project, as it was submitted by RemBac and UMBC and accepted by NIEHS SRP, specified that the study is to be performed in areas of the NBHSS. Therefore, alternatives considered for the proposed location are limited to areas within the NBHSS that fit the following criteria:

- 1) the proposed study would not interfere with on-going remediation work associated with the NBHSS;
- 2) an area of un-remediated marsh exists that would accommodate the footprint of the test plots;
- 3) foot access to the test plots would not traverse removal/revegetation areas of the marsh, and;
- 4) approval from the landowner for conducting the study was likely.

RemBac and UMBC were provided a tour of the site by the USEPA RPM in November 2021 to view and discuss the potential areas for the proposed study. The proposed area in EZ4 was selected primarily because remediation has been completed and the proposed study would not interfere with on-going remediation efforts. The proposed study area meets the other criteria as well, most importantly in that the proposed study area is located on parcels owned by the Town of Fairhaven and Buzzards Bay Coalition, both of whom who have provided written support for the grant.

Other areas of the NBHSS exist that could support the proposed study, but these areas are either undergoing remediation or owned by parties that did not respond to our inquiries for access. We therefore do not consider other areas of the NBHSS as appropriate alternatives for the proposed Test Project.

### **Attachment 3. Stormwater Report**

As per 310 CMR 10.05 (11)(C)(1) and (2), a Stormwater Report prepared by a Certified Professional Engineer is not required for proposed Test Projects. For the purposes of complements, we present the following statement regarding potential effects of the proposed Test Project related to stormwater.

The proposed Test Project does not include the activities for which the MA DEP Stormwater Policy is set. The proposed Test Project does not involve excavation, construction of any structures, the creation of any conveyances, impoundments, impervious surfaces, or in any other way affect stormwater at the project location.

We note that the majority of the project area (85% by sediment surface area to be amended) is located in the intertidal zone of the NBHSS EZ4, while the remaining portion is located in an area subject to coastal storm flowage. No effects to groundwater recharge are possible in such conditions.

## Attachment 4. Site Plans

As per 310 CMR 10.05 (11)(C)(1), a NOI for a Test Project may provide location of the project on a plan designating all project components by coordinates referenced to the Massachusetts State Plane Coordinate System in lieu of plans prepared by a Registered Professional Engineer or Registered Land Surveyor. The plans submitted as Attachment 4 are:

- Attachment 4a: Existing Conditions Plan
- Attachment 4b: Environmental Constraints in Project Area Plan
- Attachment 4c: Proposed Conditions Plan
- Attachment 4d: Proposed Test Plot Coordinates

# Attachment 4a: Existing Conditions Plan



## Legend

Base Layer Source: MassGIS  
Bureau of Geographic Information, Commonwealth of Massachusetts EOTSS (MassMapper)



1:2,257

30 m

100 ft

MassMapper

Leaflet | MassGIS

# Attachment 4b: Environmental Constraints in Project Area Plan

## Legend

### Layers from MassMapper

Tidelands Jurisdiction Chapter 91 Marsh Boundary - landward

Tidelands Jurisdiction Chapter 91 Marsh Boundary - seaward

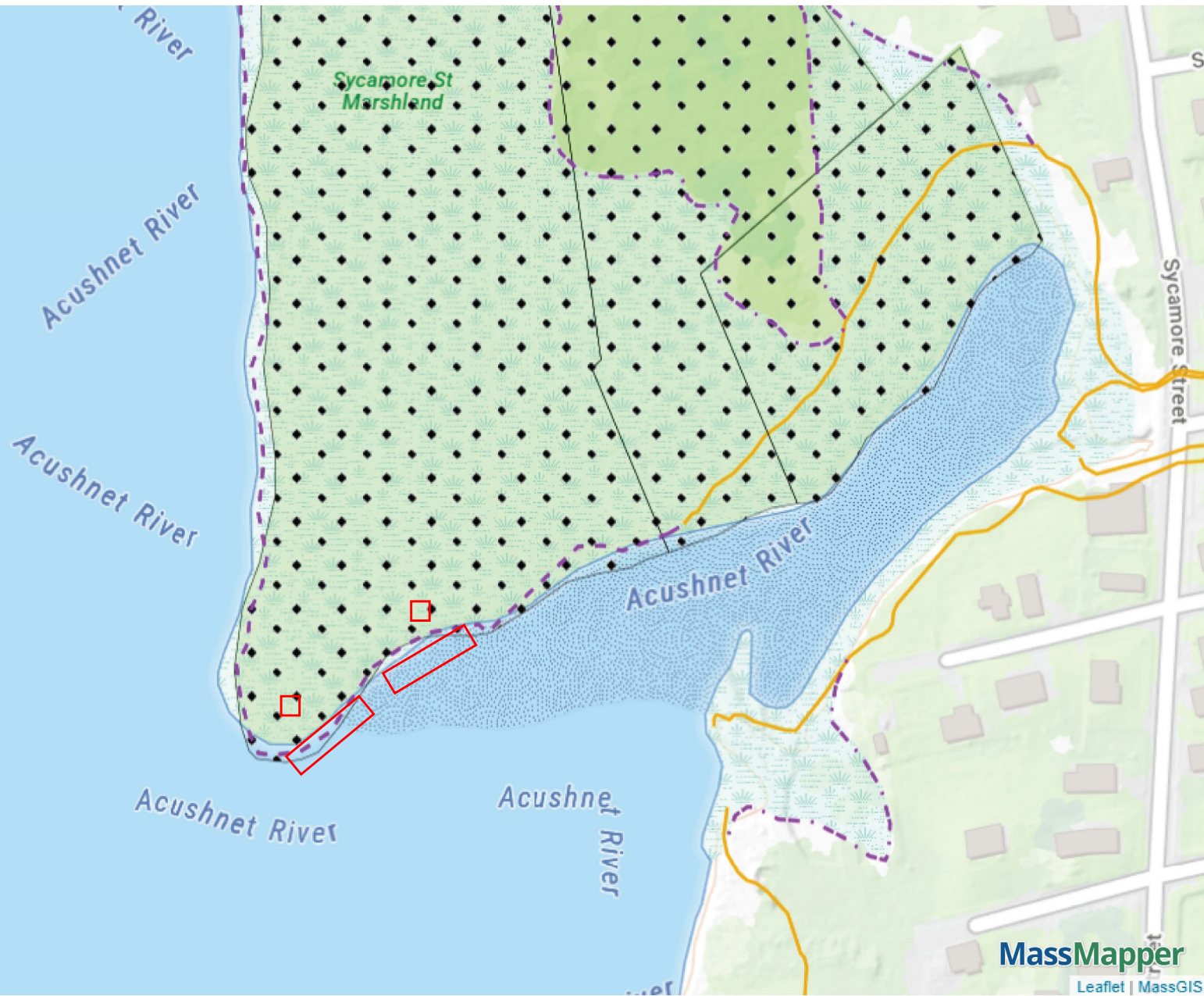
Openspace Article 97

Tidelands Jurisdiction Chapter 91 Jurisdiction

Data Source: MassGIS Bureau of Geographic Information, Commonwealth of Massachusetts EOTSS (MassMapper)

### Additional Layers

 Test Project Plots





# Attachment 4c: Proposed Conditions Plan



## Attachment 4d: Proposed Test Plot Coordinates

Experimental Plots - Inoculated SediMite				
In-Marsh				
Plot Corner	NW	NE	SW	SE
Latitude	N 41.660525°	N 41.660525°	N 41.660465°	N 41.660465°
Longitude	W -70.914988°	W -70.914908°	W -70.914988°	W -70.914908°
Intertidal				
Plot Corner	N	E	W	S
Latitude	N 41.660527°	N 41.660498°	N 41.660304°	N 41.660258°
Longitude	W -70.914614°	W -70.914556°	W -70.914935°	W -70.914863°
Positive Control Plots - SediMite				
In-Marsh				
Plot Corner	NW	NE	SW	SE
Latitude	N 41.660780°	N 41.660780°	N 41.660719°	N 41.660719°
Longitude	W -70.914504°	W -70.914424°	W -70.914504°	W -70.914424°
Intertidal				
Plot Corner	N	E	W	S
Latitude	N 41.660707°	N 41.660649°	N 41.660580°	N 41.660526°
Longitude	W -70.914111°	W -70.914070°	W -70.914511°	W -70.914468°