List of files documenting *Magnuson Stevens Fishery Conservation and Management Act* consultation between the Environmental Protection Agency and National Oceanic and Atmospheric Administration National Marine Fisheries Service for essential fish habitats (EFH) for LOC-NESS Phase 1 and Phase 2

A. EFH Assessment Worksheet for LOC-NESS Phase 1 and Phase 2 submitted by the EPA to NOAA Fisheries (May 30, 2024)
B. EFH Supporting Documents for LOC-NESS Phase 1 and Phase 2 submitted by the EPA to NOAA Fisheries (June 10, 2024)
C. NOAA Fisheries' EFH Conservation Recommendations Letter to the EPA for LOC-NESS Phase 1 and Phase 2 (July 2, 2024)
D. The EPA's Final Response Letter to NOAA Fisheries' EFH Conservation Recommendations for LOC-NESS Phase 1 and Phase 2 (August 6, 2024)
E. Correspondence regarding LOC-NESS Phase 1 project updates and conclusion of the EFH Consultation for LOC-NESS Phase 1 and Phase 2 (July 22, 2024 - August 7, 2024)

A. EFH Assessment Worksheet for LOC-NESS Phase 1 and Phase 2 submitted by the EPA to NOAA Fisheries (May 30, 2024)

NOAA Fisheries Greater Atlantic Regional Fisheries Office Essential Fish Habitat (EFH) Assessment & Fish and Wildlife Coordination Act (FWCA) Consultation Worksheet

August 2021 rev.

Authorities

The Magnuson Stevens Fishery Conservation and Management Act (MSA) requires federal agencies to consult with NOAA Fisheries on any action or proposed action authorized, funded, or undertaken by such agency that may adversely affect essential fish habitat (EFH) identified under the MSA. This process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in the consultation process.

The Fish and Wildlife Coordination Act (FWCA) requires that all federal agencies consult with NOAA Fisheries when proposed actions might result in modifications to a natural stream or body of water. The FWCA also requires that federal agencies consider the effects that these projects would have on fish and wildlife and must also provide for improvement of these resources. Under the FWCA, we work to protect, conserve and enhance species and habitats for a wide range of aquatic resources such as shellfish, diadromous species, and other commercially and recreationally important species that are not federally managed and do not have designated EFH.

It is important to note that these consultations take place between NOAA Fisheries and federal action agencies. **As a result, EFH assessments, including this worksheet, must be provided to us by the federal agency, not by permit applicants or consultants.**

Use of the Worksheet

This worksheet can serve as an EFH assessment for **Abbreviated EFH Consultations**, and as a means to provide information on potential effects to other NOAA trust resources considered under the FWCA. An abbreviated consultation allows us to determine quickly whether, and to what degree, a federal action may adversely affect EFH. Abbreviated consultation procedures can be used when federal actions do not have the potential to cause substantial adverse effects on EFH and when adverse effects could be alleviated through minor modifications.

The intent of the EFH worksheet is to provide a guide for determining the information needed to fully assess the effects of a proposed action on EFH. In addition, the worksheet may be used as a tool to assist you in developing a more comprehensive EFH assessment for larger projects that may have more substantial adverse effects to EFH. However, for large, complex projects that have the potential for significant adverse effects, an **Expanded EFH Consultation** may be warranted and the use of this worksheet alone is not appropriate as your EFH assessment.

An **adverse effect** is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

Consultation under the MSA is not required if there is no adverse effect on EFH or if no EFH has been designated in the project area. However, because the definition of "adverse effect" is very broad, most in-water work will result in some level of adverse effect requiring consultation with us, even if the impact is temporary or the overall result of the project is habitat restoration or enhancement. It is important to remember that an adverse effect determination is a trigger to consult with us. It does not mean that a project cannot proceed as proposed, or that project modifications are necessary. An adverse effect determination under the EFH provisions of the MSA simply means that the effects of the proposed action on EFH must be evaluated to determine if there are ways to avoid, minimize, or offset adverse effects. Additional details on EFH consultations, tools, and resources, including frequently asked questions can be found on our website.

Instructions

This worksheet should be used as your EFH assessment for **Abbreviated EFH Consultations** or as a guide to develop your EFH assessment. It is not appropriate to use this worksheet as your EFH assessment for large, complex projects, or those requiring an Expanded EFH Consultation.

When completed fully and with sufficient information to clearly describe the activities proposed, habitats affected, and project impacts, as well as the measures taken to avoid, minimize or offset any unavoidable adverse effects, this worksheet provides us with required components of an EFH assessment including:

1. A description of the proposed action.
2. An analysis of the potential adverse effects on EFH and the federally managed species.
3. The federal agency's conclusions regarding the effects of the action on EFH.
4. Proposed mitigation, if applicable.

When completing this worksheet and submitting information to us, it is important to ensure that sufficient information is provided to clearly describe the proposed project and the activities proposed. At a minimum, this should include the public notice (if applicable) or project application and project plans showing:

- location map of the project site with area of impact.
- existing and proposed conditions.
- all in-water work and the location of all proposed structures and/or fill.
- all waters of the U.S. on the project site with mean low water (MLW), mean high water (MHW), high tide line (HTL), and water depths clearly marked.
- Habitat Areas of Particular Concern (HAPCs).
- sensitive habitats mapped, including special aquatic sites (submerged aquatic vegetation, saltmarsh, mudflats, riffles and pools, coral reefs, and sanctuaries and refuges), hard bottom or natural rocky habitat areas, and shellfish beds.
- site photographs, if available.

Your analysis of effects **should focus on impacts that reduce the quality and/or quantity of the habitat or result in conversion to a different habitat type** for all life stages of species with designated EFH within the action area. Simply stating that fish will move away or that the project

will only affect a small percentage of the overall population is not a sufficient analysis of the effects of an action on EFH. Also, since the intent of the EFH consultation is to evaluate the direct, indirect, individual and cumulative effects of a particular federal action on EFH and to identify options to avoid, minimize or offset the adverse effects of that action, is it not appropriate to conclude that an impact is minimal just because the area affected is a small percentage of the total area of EFH designated. The focus of the consultation is to reduce impacts resulting from the activities evaluated in the assessment. Similarly, a large area of distribution or range of the fish species is also not appropriate rationale for concluding the impacts of a particular project are minimal.

Use the information on the our EFH consultation website and NOAA's EFH Mapper to complete this worksheet. The mapper is a useful tool for viewing the spatial distribution of designated EFH and HAPCs. Because summer flounder HAPC (defined as: " all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH") does not have region-wide mapping, local sources and on-site surveys may be needed to identify submerged aquatic vegetation beds within the project area. The full designations for each species may be viewed as PDF links provided for each species within the Mapper, or via our website links to the New England Fishery Management Councils Omnibus Habitat Amendment 2 (Omnibus EFH Amendment), the Mid-Atlantic Fishery Management Councils FMPs (MAMFC - Fish Habitat), or the Highly Migratory Species website. Additional information on species specific life histories can be found in the EFH source documents accessible through the Habitat and Ecosystem Services Division website. This information can be useful in evaluating the effects of a proposed action. Habitat and Ecosystem Services Division (HESD) staff have also developed a technical memorandum *Impacts to Marine Fisheries Habitat from Non-fishing Activities in the Northeastern United States,* NOAA Technical Memorandum NMFS-NE-209 to assist in evaluating the effects of non-fishing activities on EFH. If you have questions, please contact the HESD staff member in your area to assist you.

Federal agencies or their non-federal designated lead agency should email the completed worksheet and necessary attachments to the HESD New England (ME, NH, MA, CT, RI) or Mid- Atlantic (NY, NJ, PA, DE, MD, VA) Branch Chief and the regional biologist listed on the Contact Regional Office Staff section on our EFH consultation website and listed below.

We will provide our EFH conservation recommendations under the MSA, and recommendations under the FWCA, as appropriate, within 30 days of receipt of a **complete** EFH assessment for an abbreviated consultation. Please ensure that the EFH worksheet is completed in full and includes detail to minimize delays in completing the consultation. If we are unable to assess potential impacts based on the information provided, we may request additional information necessary to assess the effects of the proposed action on our trust resources before we can begin a consultation. If the worksheet is not completely filled out, it may be returned to you for completion. **The EFH consultation and our response clock does not begin until we have sufficient information upon which to consult**.

If this worksheet is not used, you should include all the information required to complete this worksheet in your EFH assessment. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. You may need to prepare a more detailed EFH assessment for more substantial or complex projects to fully characterize the effects of the project and the avoidance and minimization of impacts to EFH. The format of the EFH worksheet may not be sufficient to incorporate the extent of detail required for large-scale projects, and a separate EFH assessment may be required.

Regardless of the format, you should include an analysis as outlined in this worksheet for an expanded EFH assessment, along with any additional necessary information including:

- the results of on-site inspections to evaluate habitat and site-specific effects.
- the views of recognized experts on habitat or the species that may be affected.
- a review of pertinent literature and related information.
- an analysis of alternatives that could avoid or minimize adverse effects on EFH.

For these larger scale projects, interagency coordination meetings should be scheduled to discuss the contents of the EFH consultation and the site-specific information that may be needed in order to initiate the consultation.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or threatened and endangered species and the appropriate consultation procedures.

HESD Contacts*

New England - ME, NH, MA, RI, CT

Chris Boelke, Branch Chief	christopher.boelke@noaa.gov
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Mid-Atlantic - NY, NJ, PA, MD, VA

Karen Greene, Branch Chief	karen.greene@noaa.gov
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Keith Hanson - NJ (Ocean Co. and south), DE and PA, Mid-Altantic wind	keith.hanson@noaa.gov
Maggie Sager - NJ (Ocean Co. and south), DE and PA	lauren.m.sager@noaa.gov
Jonathan Watson - MD, DC	jonathan.watson@noaa.gov
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Ecosystem Management (Wind/Aquaculture)

Peter Burns, Branch Chief	peter.burns@noaa.gov
Alison Verkade (NE Wind)	alison.verkade@noaa.gov
Susan Tuxbury (wind coordinator)	susan.tuxbury@noaa.gov

***Please check for the most current staffing list on our contact us page prior to submitting your assessment.**

EFH Assessment Worksheet rev. August 2021

Please read and follow all of the directions provided when filling out this form.

1. General Project Information

Date Submitted: 05/30/2024

Project/Application Number: EPA-HQ-MPRSA-2024-001 and EPA-HQ-MPRSA-2024-002

Project Name: LOC-NESS Project - Phase 1(P1) and Phase 2(P2)

Project Sponsor/Applicant: Dr. Adam Subhas on behalf of Woods Hole Oceanographic Institution

Federal Action Agency (or state agency if the federal agency has provided written notice delegating the authority[1]): Environmental Protection Agency

Fast-41: Yes ☐ No ☑

Action Agency Contact Name: Sena McCrory

Contact Phone: 202-564-6237 Contact Email: mccrory.sena@epa.gov

Address, City/Town, State:

1301 Constitution Ave NW
Washington, DC 20460

2. Project Description

[2]Latitude: P1: 41°8'8.31" N | P2: 42°32'33.35"N Longitude: P1: 70°44'4.58" W | P2: 69°31'15.11"W

Body of Water (e.g., HUC 6 name): P1: South of Martha's Vineyard | P2: Wilkinson Basin

Project Purpose:

The project proponent has applied for two MPRSA research permits for the transportation and controlled release of 50% sodium hydroxide (alkaline solution) along with Rhodamine Water Tracer dye into surface waters at two locations offshore of Massachusetts. The proposed research study is intended to investigate a ship-based ocean alkalinity enhancement approach and the effectiveness and feasibility of the monitoring techniques employed to assess environmental impacts.

Project Description:

Please see the attached Supporting Document: Essential Fish Habitat Asessment, LOC-NESS Phase 1 and Phase 2 and the EPA Fact Sheet for more information. The applicant and a team of researchers has proposed a two-phased study to collect information on the feasibility and potential beneficial and adverse impacts of a ship-based ocean alkalinity enhancement technique. Phase 1 of the proposed research study would take place during the summer of 2024 south of Martha's Vineyard, approximately 9.5 miles south of the nearest shoreline in Nomans Land Island, Massachusetts. During Phase 1, up to 6,600 gallons of sodium hydroxide solution would be gradually released over 2-3 hours to create a patch of alkalinity on the ocean surface and then monitored for up to 5 days by an on-site scientific research team. Phase 2 of the study would take place during the summer of 2025 in the Wilkinson Basin, approximately 38 miles from the nearest shoreline in Cape Cod, Massachusetts. During Phase 2, up to 66,000 gallons of sodium hydroxide solution would be gradually released over 3-6 hours and monitored for up to 14 days. Monitoring activities during both phases would include measurements of water quality (including real-time pH) and biological endpoints (phytoplankton and zooplankton).

Anticipated Duration of In-Water Work including planned Start/End Dates and any seasonal restrictions proposed to be included in the schedule:

P1: Aug 2024 - release would occur for up to 3 hours, with up to 5 days of monitoring
P2: July or Aug 2025 - release would occur for up to 6 hours, with up to 14 days of monitoring

[1] A federal agency may designate a non-Federal representative to conduct an EFH consultation by giving written notice of such designation to NMFS. If a non-federal representative is used, the Federal action agency remains ultimately responsible for compliance with sections 305(b)(2) and 305(b)(4)(B) of the Magnuson-Stevens Act. [2] Provide the decimal, or the degrees, minutes, seconds values for latitude and longitude using the World Geodetic System 1984 (WGS84) and negative degree values where applicable.

3. Site Description

EFH includes the biological, chemical, and physical components of the habitat. This includes the substrate and associated biological resources (e.g., benthic organisms, submerged aquatic vegetation, shellfish beds, salt marsh wetlands), the water column, and prey species.

Is the project in designated EFH[3]? ☑ Yes ☐ No

Is the project in designated HAPC? ☑ Yes ☐ No

Does the project contain any Special Aquatic Sites[4]? ☐ Yes ☑ No

Is this coordination under FWCA only? ☐ Yes ☑ No

Total area of impact to EFH (indicate sq ft or acres): p1= 211,349,381ft2 / p2= 1,656,974,842 ft2

Total area of impact to HAPC (indicate sq ft or acres): p1= 211,349,381ft2 / p2= 1,656,974,842 ft2

Current range of water depths at MLW	Salinity range (PPT):	Water temperature range (°F):
p1 ≈ 38 m, p2 ≈ 278	p1 ≈ 31.4 | p2 ≈ 31.7	p1 ≈ 66.92 | p2 ≈ 63.68

[3]Use the tables in Sections 5 and 6 to list species within designated EFH or the type of designated HAPC present. See the worksheet instructions to find out where EFH and HAPC designations can be found. [4] Special aquatic sites (SAS) are geographic areas, large or small, possessing special ecological characteristics of productivity, habitat, wildlife protection, or other important easily disrupted ecological values. These areas are generally recognized as significantly influencing or positively contributing to the general overall environmental health or vitality of the entire ecosystem of a region. They include sanctuaries and refuges, wetlands, mudflats, vegetated shallows, coral reefs, and riffle and pool complexes (40 CFR Subpart E). If the project area contains SAS (i.e. sanctuaries and refuges, wetlands, mudflats, vegetated shallows/SAV, coral reefs, and/or riffle and pool complexes, describe the SAS, species or habitat present, and area of impact.

4. Habitat Types

In the table below, select the location and type(s) for each habitat your project overlaps. For each habitat type selected, indicate the total area of expected impacts, then what portion of the total is expected to be temporary (less than 12 months) and what portion is expected to be permanent (habitat conversion), and if the portion of temporary impacts will be actively restored to pre- construction conditions by the project proponent or not. A project may overlap with multiple habitat types.

Habitat Location	Habitat Type	Total impacts ($lf/ft^2/ft^3$)	Temporary impacts ($lf/ft^2/ft^3$)	Permanent impacts ($lf/ft^2/ft^3$)	Restored to pre-existing conditions?*
Marine	Water column	2.1x10^8 ft2	2.1x10^8 ft2		Yes
Marine	Water column	1.7x10^9 ft2	1.7x10^9 ft2		Yes
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one
Select one	Select One				Select one

*Restored to pre-existing conditions means that as part of the project, the temporary impacts will be actively restored,such as restoring the project elevations to pre-existing conditions and replanting. It does not include natural restoration or compensatory mitigation.

Submerged Aquatic Vegetation (SAV) Present?:

Yes: ☐ No: ☑

If the project area contains SAV, or has historically contained SAV, list SAV species and provide survey results including plans showing its location, years present and densities if available. Refer to Section 12 below to determine if local SAV mapping resources are available for your project area.

"Summer flounder: SAV" was identified in the EFH mapper in the Phase 1 study area; however, the MassDEP seagrass coverage maps show that there is no SAV present in area as the waters are too deep to support eelgrass populations.

Sediment Characteristics:

The level of detail required is dependent on your project – e.g., a grain size analysis may be necessary for dredging. In addition, if the project area contains rocky/hard bottom habitat [6](pebble, cobble, boulder, bedrock outcrop/ledge) identified as Rocky (coral/rock), Substrate (cobble/gravel), or Substrate (rock) above, describe the composition of the habitat using the following table.

Substrate Type* (grain size) No benthic interaction expected	Present at Site? (Y/N)	Approximate Percentage of Total Substrate on Site
Silt/Mud (<0.063mm)	Select one	
Sand (0.063-2mm)	Select one	
Rocky: Pebble/Gravel /Cobble(2-256mm)**	Select one	
Rocky: Boulder (256-4096mm)**	Select one	
Rocky: Coral	Select one	
Bedrock**	Select one	

[6]The type(s) of rocky habitat will help you determine if the area is cod HAPC.

* Grain sizes are based on Wentworth grain size classification scale for granules, pebbles, cobbles, and boulders.

** Sediment samples with a content of 10% or more of pebble-gravel-cobble and/or boulder in the top layer (6-12 inches) should be delineated and material with epifauna/macroalgae should be differentiated from bare pebble-gravel-cobble and boulder.

If no grain size analysis has been conducted, please provide a general description of the composition of the sediment. If available please attach images of the substrate.

The proposed activities would occur within the top 10 m of the surface ocean mixed layer and are not anticipated to impact the seafloor. Sediment traps will be deployed in Phase 2 to measure the amount of material leaving the seawater mixed layer (export flux) and entering the water column below. No grain size analysis has been conducted nor is planned. Please see attached Supporting Document and the EPA Fact Sheet for more information.

Diadromous Fish (migratory or spawning habitat- identify species under Section 10 below):

Yes: ☑ No: ☐

5. EFH and HAPC Designations

Within the Greater Atlantic Region, EFH has been designated by the New England, Mid-Atlantic, and South Atlantic Fisheries Management Councils and NOAA Fisheries. Use the EFH mapper to determine if EFH may be present in the project area and enter all species and life stages that have designated EFH. Optionally, you may review the EFH text descriptions linked to each species in the EFH mapper and use them to determine if the described habitat is present at your project site. If the habitat characteristics described in the text descriptions do not exist at your site, you may be able to exclude some species or life stages from additional consideration. For example, the water depths at your site are shallower that those described in the text description for a particular species or life stage. We recommend this for larger projects to help you determine what your impacts are.

Species Present	**EFH is designated/mapped for:** See Attachment for species list and details.				**What is the source of the EFH information included?**
	EFH: eggs	**EFH: larvae**	**EFH: juvenile**	**EFH: adults/ spawning adults**	
Select One	☐	☐	☐	☐	Select One
Select One	☐	☐	☐	☐	Select One
Select One	☐	☐	☐	☐	Select One
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Select One	☐	☐	☐	☐	Select One
Select One	☐	☐	☐	☐	Select One
Select One	☐	☐	☐	☐	Select One

6. Habitat Areas of Particular Concern (HAPCs)

HAPCs are subsets of EFH that are important for long-term productivity of federally managed species. HAPCs merit special consideration based their ecological function (current or historic), sensitivity to human-induced degradation, stresses from development, and/or rarity of the habitat.While many HAPC designations have geographic boundaries, there are also habitat specific HAPC designations for certain species, see note below. Use the EFH mapper to identify HAPCs within your project area. Select all that apply.

☑	Summer flounder: SAV[7]	☐	Alvin & Atlantis Canyons
☐	Sandbar shark	☐	Baltimore Canyon
☐	Sand Tiger Shark (Delaware Bay)	☐	Bear Seamount
☐	Sand Tiger Shark (Plymouth-Duxbury-Kingston Bay)	☐	Heezen Canyon
☐	Inshore 20m Juvenile Cod[8]	☐	Hudson Canyon
☐	Great South Channel Juvenile Cod	☐	Hydrographer Canyon
☐	Northern Edge Juvenile Cod	☐	Jeffreys & Stellwagen
☐	Lydonia Canyon	☐	Lydonia, Gilbert & Oceanographer Canyons
☐	Norfolk Canyon (Mid-Atlantic)	☐	Norfolk Canyon (New England)
☐	Oceanographer Canyon	☐	Retriever Seamount
☐	Veatch Canyon (Mid-Atlantic)	☐	Toms, Middle Toms & Hendrickson Canyons
☐	Veatch Canyon (New England)	☐	Washington Canyon
☐	Cashes Ledge	☐	Wilmington Canyon
☐	Atlantic Salmon		Southern New England (Cod)

[7] Summer flounder HAPC is defined as all native species of macroalgae, seagrasses, and freshwater and tidal macrophytes in any size bed, as well as loose aggregations, within adult and juvenile summer flounder EFH. In locations where native species have been eliminated from an area, then exotic species are included. Use local information to determine the locations of HAPC.

[8] The purpose of this HAPC is to recognize the importance of inshore areas to juvenile Atlantic cod. The coastal areas of the Gulf of Maine and Southern New England contain structurally complex rocky-bottom habitat that supports a wide variety of emergent epifauna and benthic invertebrates. Although this habitat type is not rare in the coastal Gulf of Maine, it provides two key ecological functions for juvenile cod: protection from predation, and readily available prey. See EFH mapper for links to text descriptions for HAPCs.

7. Activity Details

Select all that apply	Project Type/Category Research
☐	Agriculture
☐	Aquaculture - List species here:
☐	Bank/shoreline stabilization (e.g., living shoreline, groin, breakwater, bulkhead)
☐	Beach renourishment
☐	Dredging/excavation
☐	Energy development/use e.g., hydropower, oil and gas, pipeline, transmission line, tidal or wave power, wind
☐	Fill
☐	Forestry
☐	Infrastructure/transportation (e.g., culvert construction, bridge repair, highway, port, railroad)
☐	Intake/outfall
☐	Military (e.g., acoustic testing, training exercises)
☐	Mining (e.g., sand, gravel)
☐	Overboard dredged material placement
☐	Piers, ramps, floats, and other structures
☐	Restoration or fish/wildlife enhancement (e.g., fish passage, wetlands, mitigation bank/ILF creation)
☐	Survey (e.g., geotechnical, geophysical, habitat, fisheries)
☐	Water quality (e.g., storm water drainage, NPDES, TMDL, wastewater, sediment remediation)
☑	Other: MPRSA research permits for the transportation and disposition of material into ocean waters as part of the two-phased LOC-NESS research project.

8. Effects Evaluation

Select all that apply	Potential Stressors Caused by the Activity
☐	Underwater noise
☑	Water quality/turbidity/ contaminant release
☑	Vessel traffic/barge grounding
☐	Impingement/entrainment
☐	Prevent fish passage/spawning
☐	Benthic community disturbance
☑	Impacts to prey species

Select all that apply and if temporary[9] or permanent		Habitat alterations caused by the activity
Temp	Perm	Project does not involve any construction activities
☐	☐	Water depth change
☐	☐	Tidal flow change
☐	☐	Fill
☐	☐	Habitat type conversion
☑	☐	Other: Surface Water Alteration
☐	☐	Other:

[9] Temporary in this instance means during construction. [10] Entrainment is the voluntary or involuntary movement of aquatic organisms from a water body into a surface diversion or through, under, or around screens and results in the loss of the organisms from the population. Impingement is the involuntary contact and entrapment of aquatic organisms on the surface of intake screens caused when the approach velocity exceeds the swimming capability of the organism.

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Details - project impacts and mitigation

Briefly describe how the project would impact each of the habitat types selected above and the amount (i.e., acreage or sf) of each habitat impacted. Include temporary and permanent impact descriptions and direct and indirect impacts. For example, dredging has a direct impact on bottom sediments and associated benthic communities. The turbidity generated can result in a temporary impact to water quality which may have an indirect effect on some species and habitats such as winter flounder eggs, SAV or rocky habitats. The level of detail that you provide should be commensurate with the magnitude of impacts associated with the proposed project. Attach supplemental information if necessary.

Please see the Supporting Document and the EPA Fact Sheet for more information and an in-depth discussion of project impacts and mitigation. The total square feet provided above are the anticipated maximum patch areas for Phases 1 and 2, respectively. The proposed research activities would result in localized changes in the carbonate chemistry of the surface ocean waters in and surrounding the release location for up to a few days (~72hrs) during the summer of 2024 (Phase 1) and for up to a couple of weeks during the summer of 2025 (Phase 2). Within 2 minutes of the initial release of the alkaline solution, pH is expected to return to levels within the EPA's National Recommended Water Quality Criteria for saltwater aquatic life (pH <9). The temporary changes in carbonate chemistry may result in localized adverse impacts to the plankton community, but these impacts are not expected to be severe or long-lasting within the environment. Based on the applicant's calculations seawater pH to return to baseline within 24 hours and would not be detectable after 48 to 72 hours after the release for both phases. In both phases, a transport vessel would be in the area for about 24 hrs and a research vessel for the full monitoring period.

What specific measures will be used to avoid and minimize impacts, including project design, turbidity controls, acoustic controls, and time of year restrictions? If impacts cannot be avoided or minimized, why not?

The permit applications include the applicant's plan to monitor water quality impacts, biological impacts, and other environmental impacts (accessible via the provided Docket links). Seawater pH will be monitored continuously from an on-site research vessel and contingency actions are outlined in the tentative permit conditions. The study is designed to minimize pH ranges outside of EPA's WQC. The EPA's full assessment is provided in the Fact Sheet and tentative permit conditions are provided which include specific limits on rates and amounts of materials and contingency actions.

Is compensatory mitigation proposed? Yes ☐ No ☑

If compensatory mitigation is not proposed, why not? If yes, describe plans for compensatory mitigation (e.g. permittee responsible, mitigation bank, in-lieu fee) and how this will offset impacts to EFH and other aquatic resources. Include a proposed compensatory mitigation and monitoring plan as applicable.

Compensatory mitigation is not applicable in this case.

9. Effects of Climate Change

Effects of climate change should be included in the EFH assessment if the effects of climate change may amplify or exacerbate the adverse effects of the proposed action on EFH. Use the Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) 8.5/high greenhouse gas emission scenario (IPCC 2014), at a minimum, to evaluate the future effects of climate change on the proposed projections. For sea level rise effects, use the intermediate-high and extreme scenario projections as defined in Sweet et al. (2017). For more information on climate change effects to species and habitats relative to NMFS trust resources, see Guidance for Integrating Climate Change Information in Greater Atlantic Region Habitat Conservation Division Consultation Processes.

1. Could species or habitats be adversely affected by the proposed action due to projected changes in the climate?If yes, please describe how:

No. Unlikely to have a measurable affect due to the limited time frame of the proposed activities (5 days and 14 days)

2. Is the expected lifespan of the action greater than 10 years? If yes, please describe project lifespan:

No.

3. Is climate change currently affecting vulnerable species or habitats, and would the effects of a proposed action be amplified by climate change? If yes, please describe how:

Ocean acidification resulting from climate change is affecting many marine habitats and organisms. The proposed activities may result in a temporary increase in pH and alkalinity within the plume

4. Do the results of the assessment indicate the effects of the action on habitats and species will be amplified by climate change? If yes, please describe how:

No

5. Can adaptive management strategies (AMS) be integrated into the action to avoid or minimize adverse effects of the proposed action as a result of climate? If yes, please describe how:

No

10. Federal Agency Determination

Federal Action Agency's EFH determination (select one)	
☐	There is no adverse effect[7] on EFH or EFH is not designated at the project site. EFH Consultation is not required. This is a FWCA only request.
☑	The adverse effect[7] on EFH is not substantial. This means that the adverse effects are no more than minimal, temporary, or can be alleviated with minor project modifications or conservation recommendations. This is a request for an abbreviated EFH consultation.
☐	The adverse effect[7] on EFH is substantial. This is a request for an expanded EFH consultation. We will provide more detailed information, including an alternatives analysis and NEPA documents, if applicable.

[7] An adverse effect is any impact that reduces the quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

11. Fish and Wildlife Coordination Act

Under the FWCA, federal agencies are required to consult with us if actions that the authorize, fund, or undertake will result in modifications to a natural stream or body of water. Federal agencies are required to consider the effects these modifications may have on fish and wildlife resources, as well as provide for the improvement of those resources. Under this authority, we consider the effects of actions on NOAA-trust resources, such as anadromous fish, shellfish, crustaceans, or their habitats, that are not managed under a federal fisheries management plan. Some examples of other NOAA-trust resources are listed below. Some of these species, including diadromous fishes, serve as prey for a number of federally-managed species and are therefore considered a component of EFH pursuant to the MSA. We will be considering the effects of your project on these species and their habitats as part of the EFH/FWCA consultation process and may make recommendations to avoid, minimize or offset and adverse effects concurrently with our EFH conservation recommendations.

Please contact our Greater Atlantic Regional Fisheries Office, Protected Resources Division regarding potential impacts to marine mammals or species listed under the Endangered Species Act and the appropriate consultation procedures.

Fish and Wildlife Coordination Act Resources	The proposed activities would not involve water resource development, would not result in impounded waterways, and would not restrict movement of diadromous species.
Species known to occur at site (list others that may apply)	**Describe habitat impact type (i.e., physical, chemical, or biological disruption of spawning and/or egg development habitat, juvenile nursery and/or adult feeding or migration habitat). Please note, impacts to federally listed species of fish, sea turtles, and marine mammals must be coordinated with the GARFO Protected Resources Division.**
alewife	
American eel	
American shad	
Atlantic menhaden	
blue crab	
blue mussel	
blueback herring	
Eastern oyster	
horseshoe crab	
quahog	
soft-shell clams	
striped bass	
other species:	
other species:	
other species:	

12. Useful Links

National Wetland Inventory Maps
EPA's National Estuary Program (NEP)
Northeast Regional Ocean Council (NROC) Data Portal
Mid-Atlantic Regional Council on the Ocean (MARCO) Data Portal

Resources by State

Maine
Maine Office of GIS Data Catalog
Town shellfish information including shellfish conservation area maps
State of Maine Shellfish Sanitation and Management
Eelgrass maps
Casco Bay Estuary Partnership
Maine GIS Stream Habitat Viewer

New Hampshire
NH Statewide GIS Clearinghouse, NH GRANIT
NH Coastal Viewer
State of NH Shellfish Program

Massachusetts
MA DMF Shellfish Sanitation and Management Program
MassGIS Data (Including Eelgrass Maps)
MA DMF Recommended TOY Restrictions Document Massachusetts
Bays National Estuary Program
Buzzards Bay National Estuary Program
Massachusetts Division of Marine Fisheries
Massachusetts Office of Coastal Zone Management

Rhode Island
RI Shellfish and Aquaculture
RI Shellfish Management Plan
RI Eelgrass Maps
Narragansett Bay Estuary Program
Rhode Island Division of Marine Fisheries
Rhode Island Coastal Resources Management Council

Connecticut

CT Bureau of Aquaculture

Natural Shellfish Beds in CT

Eelgrass Maps

Long Island Sound Study

CT GIS Resources

CT DEEP Office of Long Island Sound Programs and Fisheries

CT River Watershed Council

New York

Eelgrass Report

Peconic Estuary Program

NY/NJ Harbor Estuary Program

New York GIS Clearinghouse

New Jersey

Submerged Aquatic Vegetation Mapping

Barnegat Bay Partnership

NJ GeoWeb

NJ DEP Shellfish Maps

Pennsylvania

Delaware River Management Plan

PA DEP Coastal Resources Management Program

PA DEP GIS Mapping Tools

Delaware

Partnership for the Delaware Estuary

Center for Delaware Inland Bays

Delaware FirstMap

Maryland

Submerged Aquatic Vegetation Mapping

MERLIN (Maryland's Environmental Resources and Land Information Network)

Maryland Coastal Atlas

Maryland Coastal Bays Program

Virginia

VMRC Habitat Management Division

Submerged Aquatic Vegetation mapping

B. EFH Supporting Documents for LOC-NESS Phase 1 and Phase 2 submitted by the EPA to NOAA Fisheries (June 10, 2024)

Supporting Document: Essential Fish Habitat Assessment, LOC-NESS Phase 1 and Phase 2

The EPA's Assessment of Potential Effects to Essential Fish Habitats Designated under the *Magnuson-Steven Fishery Conservat on and Management Act*

June 10, 2024

MPRSA Permit # (Tentative)	**EPA-HQ-MPRSA-2024-001 (Phase 1)**	**EPA-HQ-MPRSA-2024-002 (Phase 2)**
Regulations.gov Docket ID No.	EPA-HQ-OW-2023-0591	EPA-HQ-OW-2024-0189
Permit Type	MPRSA Research Permit	MPRSA Research Permit
Issuing Office	Environmental Protection Agency Office of Water 1200 Pennsylvania Ave, N.W. Washington, DC 20460	Environmental Protection Agency Office of Water 1200 Pennsylvania Ave, N.W. Washington, DC 20460
Applicant	Dr. Adam Subhas on behalf of Woods Hole Oceanographic Institution 266 Woods Hole Rd., MS #8 Woods Hole, MA 02543	Dr. Adam Subhas on behalf of Woods Hole Oceanographic Institution 266 Woods Hole Rd., MS #8 Woods Hole, MA 02543
Proposed Initial Release Coordinates	Starting at 41°8'8.31"N, 70°44'4.58"W (NAD83) (approximately 7.4 miles south of Nomans Land Island, Massachusetts)	Starting at 42°32'33.35"N, 69°31'15.11"W (NAD83) (approximately 38 miles northeast of Cape Cod, Massachusetts)
Proposed Project Area Location	Centered at 41°4'27.43"N, 70°46'27.78"W (NAD83) (approximately 9.5 miles south of Nomans Land Island, Massachusetts)	Centered at 42°32'33.35"N, 69°31'15.11"W (NAD83) (approximately 38 miles northeast of Cape Cod, Massachusetts)

The public dockets on Regulations.gov include the following documents:

1. Permit Applications for Phase 1 and Phase 2 of the LOC-NESS Project
2. Tentative Permits for Phase 1 and Phase 2 of the LOC-NESS Project
3. The EPA Fact Sheet LOC-NESS Phase 1 and Phase 2 (May 30, 2024), which includes:
    a. The EPA's summary of the proposed Phase 1 and Phase 2 activities for the LOC-NESS Project, and
    b. The EPA's assessment of the scientific merit and potential impacts of Phase 1 and Phase 2 activities to support the EPA's tentative determination to issue two research permits for the proposed activities.

Introduction

The U.S. Environmental Protection Agency has tentatively determined to issue two research permits pursuant to the *Marine Protection, Research and Sanctuaries Act* for the transportation and disposition of 50% sodium hydroxide solution at two locations offshore of Massachusetts as part of Woods Hole Oceanographic Institution's Locking Ocean Carbon in the Northeast Shelf and Slope (LOC-NESS) Project. The proposed two-phased ocean alkalinity enhancement research activities for the LOC-NESS project are designed to (1) evaluate the effectiveness of the applicant's approach to monitoring changes in alkalinity and any subsequent carbon dioxide uptake by the ocean resulting from the sodium hydroxide additions and (2) collect scientific information to better understand any potential adverse impacts to human health, the environment or other uses of the ocean resulting from the alkalinity enhancement activity. The EPA has prepared an EFH assessment pursuant to 50 C.F.R. 600.920 (e) and has determined that the proposed activities would not impact the quantity of Essential Fish Habitats identified under the *Magnuson Stevens Fishery Conservation and Management Act* that may overlap with the project study area (project area) but may temporarily affect the quality of some EFH via temporary changes in water quality within a portion of the project area that would last for minutes to hours before returning to baseline conditions due to rapid mixing and dispersion of the sodium hydroxide solution within the surface waters. A brief analysis to support these conclusions is provided below.

Project Description

Phase 1 of the LOC-NESS project is designed to evaluate the monitoring methods and environmental impacts from a small-scale alkalinity addition. Phase 1 would occur over approximately 5 days between August 2-12, 2024, south of Martha's Vineyard and approximately 9.5 miles south of the nearest shoreline of Nomans Land Island, Massachusetts (Figure 1A). During Phase 1, up to 6,600 gallons of a 50% sodium hydroxide solution would be transported by tug-and-barge (transport vessel) from the Port of New Bedford, Massachusetts, to the release location south of Martha's Vineyard. The sodium hydroxide solution would be released at a controlled rate (approximately 4.6 L/s) from the transport vessel into surface ocean waters (via hose/pipe one to two meters below the surface) for about 90 minutes to establish a patch of increased alkalinity in the surface waters. During the release, the transport vessel would be traveling at approximately two knots in an outward spiral pattern beginning at 41°8'8.31"N, 70°44'4.58"W. Rhodamine Water Tracer dye would be released along with the sodium hydroxide solution to allow the applicant and their research team to track the movement and dispersion of the alkalinity patch as it mixes with surrounding ocean waters.

Phase 2 is designed to assess the scalability of the alkalinity addition and monitoring methods of a ship-based ocean alkalinity enhancement activity using similar methods as Phase 1. Phase 2 would occur over a 14-day period in July or August 2025 within the Wilkinson Basin and approximately 38 miles from the nearest shoreline in Cape Cod, Massachusetts (Figure 1B). During Phase 2, up to 66,000 gallons of 50% sodium hydroxide solution would be transported by tug-and-barge (transport vessel) from the Port of New Bedford, Massachusetts, to the release location, with an alternative Port of departure out of Port of Portsmouth, New Hampshire. The sodium hydroxide solution would be released at a controlled rate (approximately 11.6 L/s) from the transport vessel into surface ocean waters (via a hose/pipe 1-2 meters below the surface), for about 6 hours to establish a patch of increased alkalinity in surface waters. During the release, the transport vessel would be traveling at

approximately four knots in an outward spiral pattern beginning at 42°32’33.35” N, 69°31’15.11” W. Rhodamine Water Tracer dye would be released along with the sodium hydroxide solution to allow the applicant and their research team to track the movement and dispersion of the alkalinity patch as it mixes with surrounding ocean waters.

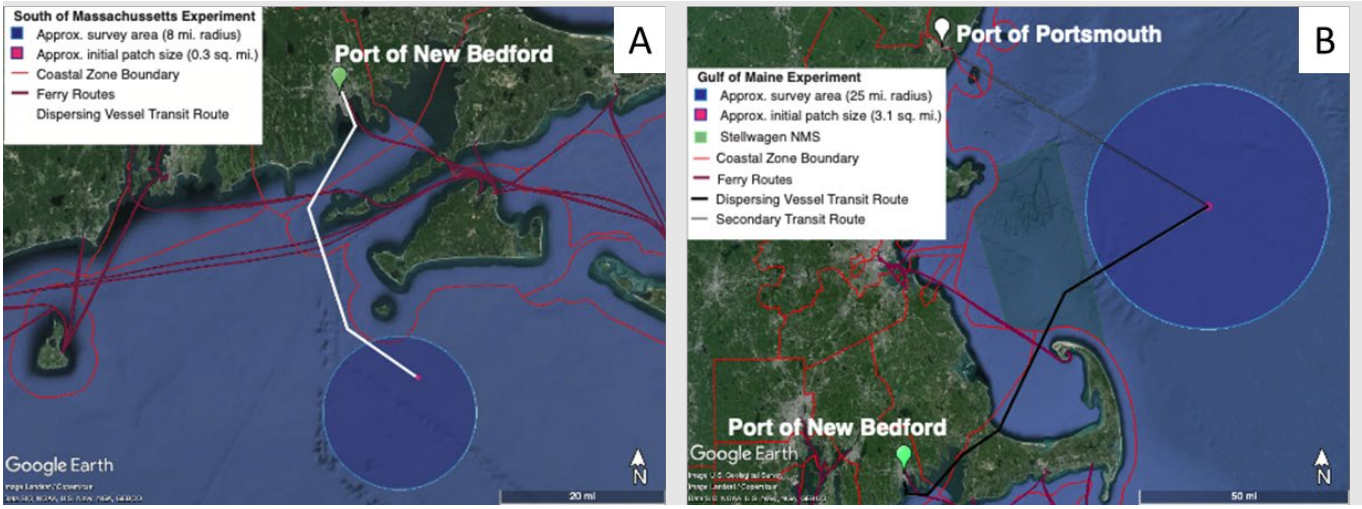

Figure 1: Locations of the Project Areas for Phase 1 (A) and Phase 2 (B). *Pink points represent the initial patch locations within the larger survey area (blue circles). (A) The white line represents the transit route for the transport vessel from the Port of New Bedford to the initial release coordinates for Phase 1. (B) The black line represents the transit route for the transport vessel from the Port of New Bedford to the initial release coordinates for Phase 2 and the grey line represents an alternative route for the transit if the transport vessel were to leave from the Port of Portsmouth.*

Water Quality

For both Phase 1 and Phase 2 of the research study, temporary changes to carbonate and ocean chemistry, such as an increase in alkalinity and pH, are expected at the immediate release location of the sodium hydroxide solution into the ocean surface waters and, to a lesser extent, within the alkalinity patch in the mixed layer for a limited period (hours to days). The applicant provided dilution estimates based on the applicant’s initial tracer dye experiment results (Phase 1 Application Section 2; Phase 2 Application Section 2) that suggest that pH is not expected to exceed 9 for more than two minutes after the release of the solution (Figure 2). Based on their calculations, the applicant expects seawater pH would return to near baseline values within 24 hours and would not be detectable after 48 to 72 hours after the release in both phases (Phase 1 Application Section 2; Phase 2 Application Section 2). Based on information provided by the applicant and supported with peer-reviewed literature, the sodium hydroxide addition should result in alkalinity concentrations within 10% of naturally occurring background conditions and no more than approximately 0.2 pH units above baseline conditions after the initial mixing period (four hours after release). For both Phase 1 and Phase 2, changes in pH in the alkalinity patch are expected to be within the range of the EPA’s recommended Water Quality Criteria for Aquatic Life (i.e., pH 6.5 to 9) within about two minutes after the release of the sodium hydroxide from the transport vessel (Figure 2).

The increase in bicarbonate ions would lead to elevated total alkalinity within the Phase 1 and Phase 2 project areas that may persist after the conclusion of the study; this net increase would likely be undetectable from baseline concentrations by the end of the monitoring periods of each phase of the study. The proposed activities are not expected to result in measurable increase in turbidity or significant movement of any precipitated minerals below the mixed layer.

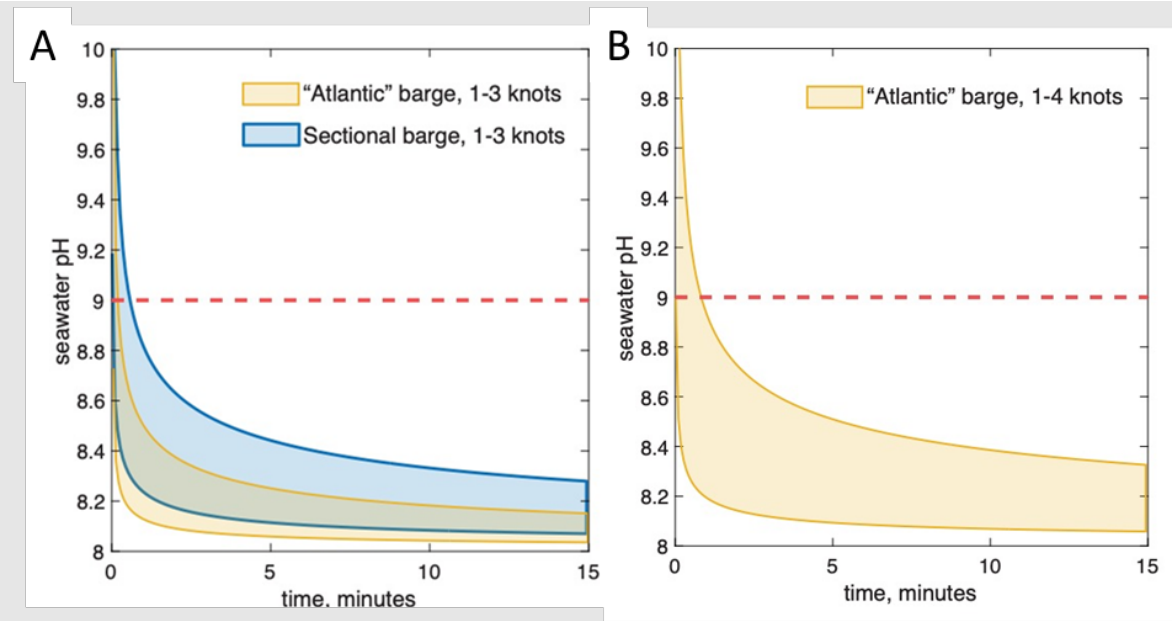

Figure 2. (A) Dilution curve representing the Phase 1 dilution of 50% sodium hydroxide solution directly into the vessel wake using the formula from Chou (1996) and parameters for the two proposed barge configurations (Sectional barge, 33' wide; Atlantic barge, 54' wide), traveling at a speed between 1 and 3 knots. *Calculations used the target release rate of 4.6 L/s, to ensure maximum dilution by the ship's wake in the first 10 minutes of dispersal. See Phase 1 Application Section 2 for more information. (B) Dilution curve representing the Phase 2 dilution of 50% sodium hydroxide solution directly into the vessel wake using the formula from Chou (1996) and parameters for the 41 North Offshore barge configurations (140ft long by 53ft wide), traveling at a speed between 1 and 4 knots. Calculations used the target release rate of 11.6 L/s, to ensure maximum dilution by the ship's wake in the first 10 minutes of dispersal. See Phase 2 Application Section 2 for more information.*

Up to 250 gallons of Rhodamine WT dye solution would be released along with the sodium hydroxide solution to "label" the patch of high alkalinity. Rhodamine WT dye is commonly used in water tracing studies and is not expected to cause any toxicity effects at the concentrations proposed in the study (Skjolding et al. 2021). The tracer dye would appear as a red or pink color within the surface ocean for hours to days but is unlikely to impact feeding capabilities of organisms in the area. The Rhodamine WT dye solution would not result in a change in water turbidity or total suspended solids.

Assessment of Effects to Essential Fish Habitat

Thirty-five managed species have Essential Fish Habitats that intersect with the vicinity of the proposed Phase 1 project area (Phase 1 Application Appendix 21) and 18 managed species have designated Essential Fish Habitats within the vicinity of the proposed Phase 2 project area (Phase 2 Application

Appendix 22); no interaction with benthic or epibenthic species or life stages is expected due to the nature of the proposed activities. The EPA has determined that the temporary water quality changes that would result from the proposed activities would not significantly reduce the quantity of the habitat or result in conversion to a different habitat type for all life stages of species with designated EFH within the respective project areas for Phase 1 and Phase 2. The proposed activities would result in a temporary, localized impact to habitat quality through the elevation of pH and alkalinity during the release of the sodium hydroxide solution.

Due to the proposed release method and the rapid dilution expected within the surface waters, the highest pH values (above pH 9) would likely be present for no more than two minutes near the immediate discharge point of the sodium hydroxide solution (Figure 2). Therefore, potential exposure of organisms to elevated pH or high alkalinity conditions would be highly localized to the seawater within the alkalinity release path and would persist for approximately 2 minutes. EFH species or life stages that happen to be present within the mixed layer along the release path of the sodium hydroxide solution could be exposed to seawater with a pH above 9 and elevated alkalinity. While it is known that low pH can be harmful to the development of larvae, fish eggs and juvenile fish when exposed for long periods of time (Clements and Chopin 2017), elevated pH when kept below 9 has been shown to have either no impact or positive impacts on fish development and aquaculture (Boyd et al. 2016, dos Santos et al. 2020). Sustained seawater pH above 9.0 can be stressful to fish and prolonged exposure to pH above 9.5 can be life-threatening (Mariu et al. 2023, Menon et al. 2023). Accidental release events of sodium hydroxide have resulted in minor impacts to fish populations (See Table 2 of the EPA Fact Sheet LOC-NESS Phase 1 and Phase 2), but these events involved the uncontrolled release of thousands of gallons of sodium hydroxide solution. The EPA is not aware of any publication regarding the impacts of short-term increases of pH or alkalinity (less than 1 hour), as is proposed in this research study, on marine animals at any life stage. While fish gills are a potential exposure route for impacts from elevated seawater pH, it is expected that the mobility of the adult and juvenile stages of these organisms would minimize time spent interacting with the elevated pH waters. For more details on the EPA's assessment of potential impacts, please refer to Section VI of the EPA Fact Sheet.

Assessment of Effects to Habitat Areas of Particular Concern

Two Habitat Areas of Particular Concern (HAPC) were identified for the Phase 1 project area by the EFH Mapper: (1) Summer Flounder: Submerged Aquatic Vegetation (SAV), and (2) Atlantic Cod: Southern New England (Figure 3A). The Massachusetts Department of Environmental Protection's seagrass coverage maps do not show SAV present in the proposed project area, as the waters are too deep to support SAV populations (MassGIS 2023). The EPA has therefore determined that the likelihood of the proposed activities harming Summer Flounder: SAV HAPC is discountable, as there appears to be no suitable habitat for this species in the vicinity of the project area. The Phase 1 project area overlaps with the Southern New England HAPC which was established to protect the spawning habitat of Atlantic Cod. Atlantic Cod spawn near the ocean floor from winter to early spring, and thus spawning Cod should not be present in the project area during the time of the proposed Phase 1 activities in August (NMFS 2024). Further, due to the nature of the proposed activities which are constrained to the upper surface waters, seafloor habitats where Cod spawning may occur are very unlikely to be affected.

The EPA has therefore determined that impacts from proposed activities on the spawning habitat of Atlantic Cod are discountable.

There were no HAPCs identified for Phase 2 (Figure 3B). Further, no Essential Fish Habitat Areas Protected from Fishing were identified in either project area.

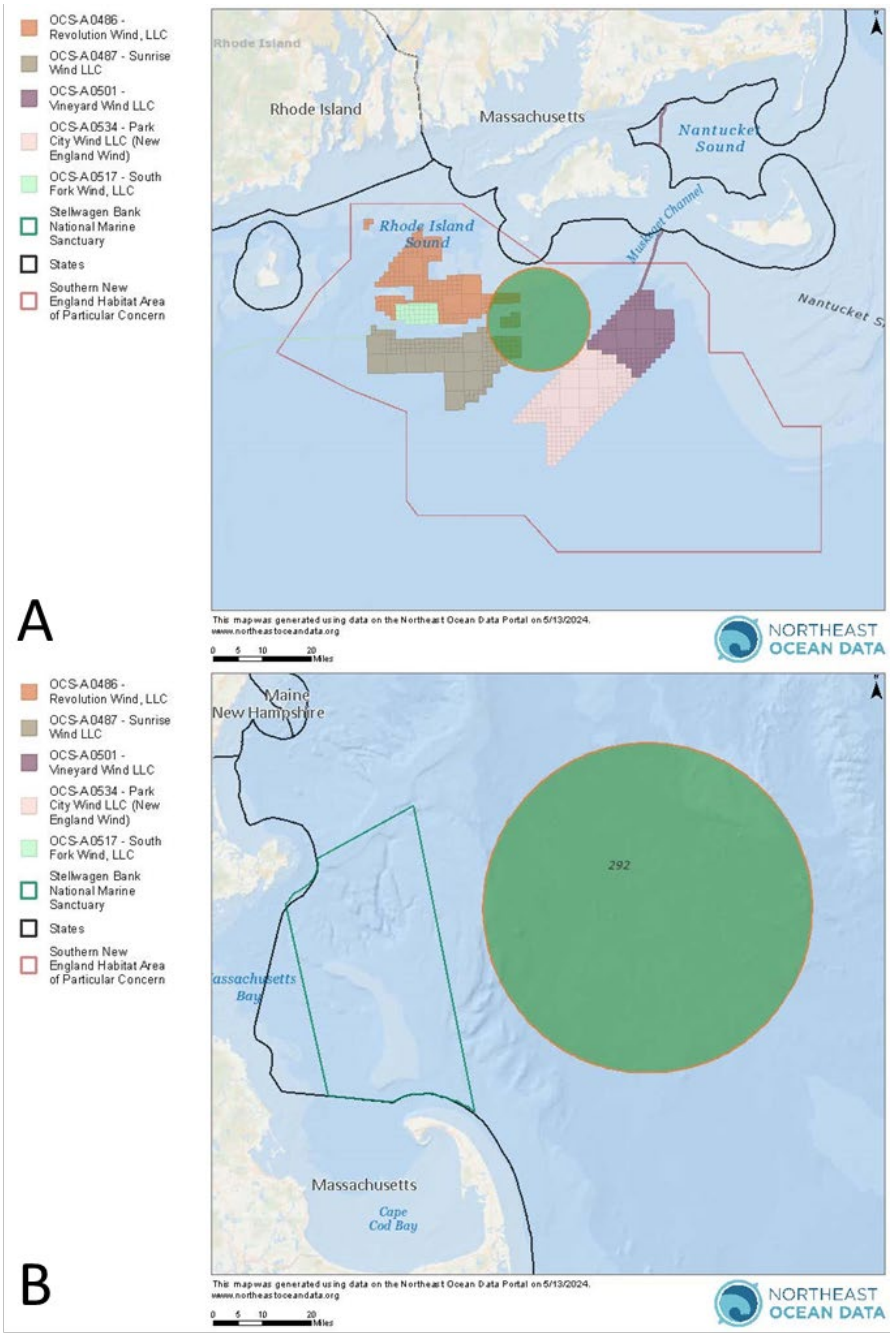

Figure 3. Habitat Areas of Particular Concern and other uses of the ocean for the (A) Phase 1 project area, and (B) Phase 2 project area. *Green circles in both panels show the extent of the Phase 1 and Phase 2 project areas, which would include the alkalinity patch areas and potential area that would be monitored during the proposed activities.*

Contingency Plans, Conservation Measures, and Environmental Monitoring

The applicant and their research team (as described in the Phase 1 and Phase 2 applications), the person or firm transporting the material (41 Offshore North, LLC) and the firm producing and supervising the release of the material (Fluechem LTD) would all be jointly and separately responsible for compliance with permit conditions within their control. As described in the Phase 1 and Phase 2 applications, the research team includes a number of individuals, not all of whom are affiliated with the Woods Hole Oceanographic Institution. The responsible entities would be required to take various contingency actions to minimize the potential risk of organisms being exposed to significantly elevated pH during the proposed release of the sodium hydroxide solution in Phase 1 and Phase 2. The tentative permits for Phase 1 and Phase 2 include conditions requiring the applicant or their designee to adjust the dispersal rate of the sodium hydroxide solution to achieve the target pH dilution factor and limit the time that seawater pH within the alkalinity patch would be above 9, based on real-time seawater pH monitoring within the alkalinity release path. The applicant and their research team would be required to pause or postpone the release activities if critical fish events (such as schools of fish or fish eggs masses) or protected species (such as marine mammals or sea turtles) are spotted in the vicinity during release. Please refer to the tentative permits and the EPA Fact Sheet Section V in the public docket for additional details about contingency and mitigation actions.

The EPA has evaluated the applicant's proposed monitoring plan to ensure that relevant chemical, physical and biological endpoints would be measured to adequately monitor for potential environmental impacts resulting from the proposed release of the 50 percent sodium hydroxide solution into ocean surface waters. The research team would monitor the alkalinity patch using a range of techniques (described in the permit applications and summarized in the EPA Fact Sheet in Section IV). Monitoring equipment that may be deployed from the research vessel would include: ship-board sensors; a Conductivity, Temperature, Depth (CTD) rosette sampler; Niskin bottles; towed underwater vehicles; plankton tow nets; free-drifting sensor buoys (drifters); particulate flux traps (sediment traps); aerial drones for tracking the alkalinity plume; and autonomous underwater gliders. Biological samples will be analyzed for abundance (flow cytometry, counts), composition (flow cytometry, counts, eDNA), and functionality (deck-board incubations). Particulate flux traps float in the water column and would collect sinking particles with collection tubes suspended at multiple depths in the water column (approximately 10-15 meters, 50 meters, and 150 meters), allowing the collection of any actively sinking particles. During Phase 2, Five Spray2 autonomous underwater gliders would be deployed to measure the background conditions in the Action Area beginning up to two weeks prior to the release of the sodium hydroxide solution and tracer dye and would monitor the alkalinity patch after the release, remaining deployed for up to 40 days after the release. During Phase 1 and Phase 2, the applicant and their research team plan to characterize planktonic species abundances and composition, including for ichthyoplankton and any other fish life stages present in collected samples using bongo net tows following standardized protocols by the Ecosystem Monitoring (EcoMon) and the Long-Term Ecological Research Network (LTER) within and outside the alkalinity patch. The EcoMon is the National Oceanic and Atmospheric Administration's standardized protocol estimating spawning stock biomass and overall fish biodiversity (NMFS 2021). Although these methods would not distinguish between

dead and alive specimen, the methods would allow for an analysis of the presence or absence of any fish species or their life stages.

References:

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Chou, H.-T. (1996). On the dilution of liquid waste in ships' wakes. Journal of Marine Science and Technology, 1(3), 149–154. doi: 10.1007/bf02391175

Clements, J. C., & Chopin, T. (2017). Ocean acidification and marine aquaculture in North America: Potential impacts and mitigation strategies. Reviews in Aquaculture, 9(4), 326–341. https://doi.org/10.1111/raq.12140

dos Santos, J. A., Soares, C. M., & Bialetzki, A. (2020). Effects of pH on the incubation and early development of fish species with different reproductive strategies. Aquatic Toxicology, 219, 105382. https://doi.org/10.1016/j.aquatox.2019.105382

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MassGIS (Bureau of Geographic Information). (2023). MassGIS Data: MassDEP Eelgrass Mapping Project. https://www.mass.gov/info-details/massgis-data-massdep-eelgrass-mapping-project

Menon, Soumya V., Avnish Kumar, Sushil Kumar Middha, Biswaranjan Paital, Shivangi Mathur, Rajee Johnson, Asha Kademan, et al. (2023). "Water Physicochemical Factors and Oxidative Stress Physiology in Fish, a Review." Frontiers in Environmental Science 11. https://doi.org/10.3389/fenvs.2023.1240813.

National Marine Fisheries Service (2021). Monitoring the Northeast Shelf Ecosystem. Monitoring the Northeast Shelf Ecosystem | NOAA Fisheries

National Marine Fisheries Service (2024). Species Directory: Atlantic Cod https://www.fisheries.noaa.gov/species/atlantic-cod/overview

Skjolding, L. M. *et al.* (2021). Assessing the aquatic toxicity and environmental safety of tracercompounds Rhodamine B and Rhodamine WT. *Water Res.* **197**, 117109.

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 41° 8' 8" N, Longitude = 71° 15' 55" W
Decimal Degrees: Latitude = 41.136, Longitude = -70.735

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

***** W A R N I N G *****

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Albacore Tuna	Adult, Juvenile	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Atlantic Butterfish	Juvenile, Larvae	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Atlantic Cod	Adult, Juvenile, Larvae	New England	Amendment 14 to the Northeast Multispecies FMP

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Atlantic Herring	Adult, Juvenile, Larvae	New England	Amendment 3 to the Atlantic Herring FMP
		Atlantic Mackerel	Eggs, Juvenile	Mid-Atlantic	Atlantic Mackerel, Squid,& Butterfish Amendment 11
		Atlantic Sea Scallop	ALL	New England	Amendment 14 to the Atlantic Sea Scallop FMP
		Atlantic Wolffish	ALL	New England	Amendment 14 to the Northeast Multispecies FMP
		Basking Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Black Sea Bass	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Blue Shark	Juvenile/Adult, Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Bluefin Tuna	Adult, Juvenile	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Bluefish	Adult	Mid-Atlantic	Bluefish
		Common Thresher Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Dusky Shark	Juvenile/Adult, Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Little Skate	Adult, Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Monkfish	Adult, Eggs/Larvae, Juvenile	New England	Amendment 4 to the Monkfish FMP
		Ocean Pout	Adult, Eggs, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
		Red Hake	Eggs/Larvae/Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Sand Tiger Shark	Neonate/Juvenile	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Sandbar Shark	Adult, Juvenile	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Scup	Adult, Juvenile	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		Shortfin Mako Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Silver Hake	Eggs/Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
		Skipjack Tuna	Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Smoothhound Shark Complex (Atlantic Stock)	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Spiny Dogfish	Adult Female	Mid-Atlantic	Amendment 3 to the Spiny Dogfish FMP
		Summer Flounder	Adult	Mid-Atlantic	Summer Flounder, Scup, Black Sea Bass
		White Hake	Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
		White Shark	Juvenile/Adult, Neonate	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Windowpane Flounder	Adult, Juvenile, Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
		Winter Flounder	Juvenile, Larvae/Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Winter Skate	Adult, Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		Witch Flounder	Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
		Yellowfin Tuna	Adult, Juvenile	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Yellowtail Flounder	Adult, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

Link	Data Caveats	HAPC Name	Management Council
		Southern New England	New England Fishery Management Council
		Summer Flounder SAV	Mid-Atlantic Fishery Management Council

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.
****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**

All EFH species have been mapped for the Greater Atlantic region,
Atlantic Highly Migratory Species EFH,
Bigeye Sand Tiger Shark,
Bigeye Sixgill Shark,
Caribbean Sharpnose Shark,
Galapagos Shark,
Narrowtooth Shark,
Sevengill Shark,
Sixgill Shark,
Smooth Hammerhead Shark,
Smalltail Shark

EFH Mapper Report

EFH Data Notice

Essential Fish Habitat (EFH) is defined by textual descriptions contained in the fishery management plans developed by the regional fishery management councils. In most cases mapping data can not fully represent the complexity of the habitats that make up EFH. This report should be used for general interest queries only and should not be interpreted as a definitive evaluation of EFH at this location. A location-specific evaluation of EFH for any official purposes must be performed by a regional expert. Please refer to the following links for the appropriate regional resources.

Greater Atlantic Regional Office
Atlantic Highly Migratory Species Management Division

Query Results

Degrees, Minutes, Seconds: Latitude = 42º 32' 35" N, Longitude = 70º 28' 47" W
Decimal Degrees: Latitude = 42.543, Longitude = -69.520

The query location intersects with spatial data representing EFH and/or HAPCs for the following species/management units.

***** W A R N I N G *****

Please note under "Life Stage(s) Found at Location" the category "ALL" indicates that all life stages of that species share the same map and are designated at the queried location.

EFH

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Acadian Redfish	Adult, Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
		American Plaice	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Atlantic Herring	Juvenile	New England	Amendment 3 to the Atlantic Herring FMP
		Atlantic Wolffish	ALL	New England	Amendment 14 to the Northeast Multispecies FMP
		Basking Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Bluefin Tuna	Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Common Thresher Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Monkfish	Adult, Eggs/Larvae, Juvenile	New England	Amendment 4 to the Monkfish FMP
		Pollock	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Porbeagle Shark	ALL	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Red Hake	Adult	New England	Amendment 14 to the Northeast Multispecies FMP
		Silver Hake	Adult, Eggs/Larvae, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP
		Smooth Skate	Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP

Link	Data Caveats	Species/Management Unit	Lifestage(s) Found at Location	Management Council	FMP
		Spiny Dogfish	Adult Male, Sub-Adult Female, Sub-Adult Male	Mid-Atlantic	Amendment 3 to the Spiny Dogfish FMP
		Thorny Skate	Adult, Juvenile	New England	Amendment 2 to the Northeast Skate Complex FMP
		White Hake	Adult, Eggs, Juvenile, Larvae	New England	Amendment 14 to the Northeast Multispecies FMP
		White Shark	Juvenile/Adult	Secretarial	Amendment 10 to the 2006 Consolidated HMS FMP: EFH
		Witch Flounder	Adult, Juvenile	New England	Amendment 14 to the Northeast Multispecies FMP

Pacific Salmon EFH

No Pacific Salmon Essential Fish Habitat (EFH) were identified at the report location.

Atlantic Salmon

No Atlantic Salmon were identified at the report location.

HAPCs

No Habitat Areas of Particular Concern (HAPC) were identified at the report location.

EFH Areas Protected from Fishing

No EFH Areas Protected from Fishing (EFHA) were identified at the report location.

Spatial data does not currently exist for all the managed species in this area. The following is a list of species or management units for which there is no spatial data.
****For links to all EFH text descriptions see the complete data inventory: open data inventory -->**

All EFH species have been mapped for the Greater Atlantic region,
Atlantic Highly Migratory Species EFH,
Bigeye Sand Tiger Shark,
Bigeye Sixgill Shark,
Caribbean Sharpnose Shark,
Galapagos Shark,
Narrowtooth Shark,
Sevengill Shark,
Sixgill Shark,
Smooth Hammerhead Shark,
Smalltail Shark

C. NOAA Fisheries' EFH Conservation Recommendations Letter to the EPA for LOC-NESS Phase 1 and Phase 2 (July 2, 2024)

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
GREATER ATLANTIC REGIONAL FISHERIES OFFICE
55 Great Republic Drive
Gloucester, MA 01930

July 2, 2024

Betsy Valente
Chief, Freshwater and Marine Regulatory Branch
Office of Wetlands, Oceans, and Watersheds
Office of Water, U.S. Environmental Protection Agency
Washington, DC 20004

Dear Ms. Valente,

We have reviewed the Essential Fish Habitat (EFH) assessment and additional supporting documents provided to us by the U.S. Environmental Protection Agency (EPA) on May 30, 2024, regarding a proposed Marine Protection, Research and Sanctuaries Act (MPRSA) permit for the Woods Hole Oceanographic Institution's Locking Ocean Carbon in the Northeast Shelf and Slope (LOC-NESS) Project. The proposed two-phased ocean alkalinity enhancement research project involves the transportation and disposition of 50% sodium hydroxide solution at two locations offshore of Massachusetts. The research activities for the LOC-NESS project are designed to (1) evaluate the effectiveness of the applicant's approach to monitoring changes in alkalinity and any subsequent carbon dioxide uptake by the ocean resulting from the sodium hydroxide additions and, (2) collect scientific information to better understand any potential adverse impacts to human health, the environment or other uses of the ocean resulting from the alkalinity enhancement activity. Phase 1 of the proposed experiment would occur over approximately 5 days between August 2-12, 2024, south of Martha's Vineyard and approximately 9.5 miles south of the nearest shoreline of Nomans Land Island, Massachusetts. Phase 2 of the proposed experiment would occur over a 14-day period in July or August 2025 within the Wilkinson Basin and approximately 38 miles from the nearest shoreline in Cape Cod, Massachusetts.

Consultation Responsibilities

In the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Congress recognized that one of the greatest long-term threats to the viability of commercial and recreational fisheries is the continuing loss of marine, estuarine, and other aquatic habitats. Congress also determined that habitat considerations should receive increased attention for the conservation and management of fishery resources of the United States. As a result, one of the purposes of the MSA is to promote the conservation of EFH in the review of projects conducted under federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. The MSA requires federal agencies to consult with the Secretary of Commerce, through NOAA Fisheries, with respect to "any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by such agency that may adversely affect any essential fish habitat identified under this Act," 16 U.S.C. § 1855(b)(2).

Project Description
Phase 1 of the proposed project would release up to 6,600 gallons of a 50% sodium hydroxide (NaOH) solution, and would be transported by tug-and-barge (transport vessel) from the Port of New Bedford, Massachusetts, to the release location south of Martha's Vineyard. The NaOH solution would be released at a controlled rate (approximately 4.6 liters per second) from the transport vessel into surface ocean waters (via hose/pipe one to two meters below the surface) for about 90 minutes to establish a patch of increased alkalinity in the surface waters. During the release, the transport vessel would be traveling at approximately two knots in an outward spiral pattern. Rhodamine Water Tracer dye would be released along with the NaOH solution to allow the applicant and their research team to track the movement and dispersion of the alkalinity patch as it mixes with surrounding ocean waters.

Phase 2 is designed to assess the scalability of the alkalinity addition and monitoring methods of a ship-based ocean alkalinity enhancement activity using similar methods as Phase 1. Phase 2 would occur over a 14-day period in July or August 2025 within the Wilkinson Basin and approximately 38 miles from the nearest shoreline in Cape Cod, Massachusetts. During Phase 2, up to 66,000 gallons of 50% NaOH solution would be transported by tug-and-barge (transport vessel) from the Port of New Bedford, Massachusetts, to the release location, with an alternative Port of departure out of Port of Portsmouth, New Hampshire. The NaOH solution would be released at a controlled rate (approximately 11.6 liters per second) from the transport vessel into surface ocean waters (via a hose/pipe 1-2 meters below the surface), for about 6 hours to establish a patch of increased alkalinity in surface waters. During the release, the transport vessel would be traveling approximately four knots in an outward spiral pattern. Rhodamine Water Tracer dye would be released along with the NaOH solution to allow the applicant and their research team to track the movement and dispersion of the alkalinity patch as it mixes with surrounding ocean waters.

Project Affects to EFH and Federally-managed Species
According to the EFH assessment, EPA has determined that the proposed activities for the LOC-NESS Phase 1 and Phase 2 would not adversely affect the quantity of EFH, but may cause short-term impacts to the quality of some EFH via temporary changes in water quality within surface waters in a portion of the project areas. Specifically, based on the applicant's calculations, the seawater pH would return to near baseline values within 24 hours and would not be detectable after 48 to 72 hours after the release in both phases. Furthermore, due to the proposed release method and the rapid dilution of NaOH, the highest pH values (above 9.0) would likely be present for no more than two minutes near the immediate discharge point. The potential exposure of organisms to elevated pH or high alkalinity conditions would be localized within the release path and would persist for approximately two minutes. Life stages of species that may be present within the water column along the release path of the NaOH solution could be exposed to seawater with a pH above 9.0 and elevated alkalinity. The supporting documents provided by EPA as part of the EFH consultation included some discussions about the effects of high alkalinity water on aquatic organisms. For example, the supporting documents state "sustained seawater with pH above 9.0 can be stressful to fish and prolonged exposure to pH above 9.5 can be life-threatening". In addition, the "EPA is not aware of any publication regarding the impacts of short-term increases of pH or alkalinity (less than 1 hour), as is proposed in this research study, on marine animals at any life stage". Furthermore, the supporting documents state "While

fish gills are a potential exposure route for impacts from elevated seawater pH, it is expected that the mobility of the adult and juvenile stages of these organisms would minimize time spent interacting with the elevated pH waters". Although adult and juvenile life stages of fish may have the capacity to swim out of the high alkaline plume during the experiment, based on the information provided in the EFH assessment, there is no empirical evidence supporting this. Furthermore, planktonic life stages of fish (i.e., eggs and larvae) are not capable of mobility that would allow minimizing time spent in the high alkaline plume.

We have determined that the proposed action would adversely affect EFH (i.e., the top 10 meters of the ocean water column), and could adversely affect federally-managed species and other NOAA trust resources that may occur in the action area during the LOC-NESS experiment. This adverse effect would likely be limited, spatially and temporally, to the discharge plume within 24 hours after discharge. The most acute affects would likely be limited to an area near the discharge point for two minutes. Although the spatial and temporal scale is relatively small, the proposed experiment has the potential to injure or kill all life stages of federally-managed species (especially planktonic egg and larval stages) that may occur in the action area during the first few minutes after the NaOH deployment. Furthermore, the EFH regulations define an adverse effect as any impact that reduces quality and/or quantity of EFH, and may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH (Part 600, Subpart J, §600.810). As such, any loss or injury to prey species and their habitats for federally-managed species could be considered an adverse effect to EFH.

Proposed Monitoring

According to EPA's supporting documents, the monitoring plan for the proposed experiment indicate that the research vessels for the Phase 1 and Phase 2 activities would be outfitted with pH and fluorescence sensors capable of monitoring seawater chemistry and the tracer dye in real time. The applicant and their research team would continuously monitor the total alkalinity, partial pressure of carbon dioxide, dissolved oxygen, temperature and salinity of seawater using ship- and platform-based sensors. The applicant and their research team would take discrete samples of seawater every 4-6 hours using a Conductivity, Temperature, Depth rosette sampler and Niskin bottles to monitor a suite of other physico-chemical properties and would be combined with other physical measurements such as air temperature, surface water currents and wind speeds. Drifting buoys equipped with GPS trackers and strobes would be released into the alkalinity patch from the research vessel and used for tracking the patch continuously, alongside shipboard sensors on the research vessel. During the Phase 2 monitoring, additional monitoring techniques would be deployed, including autonomous underwater gliders and water-column sediment traps. Aerial drone imagery and satellite data would also be collected during both the Phase 1 and Phase 2 monitoring activities if weather and cloud conditions permit. Monitoring would continue for several days, day and night, within and outside of the alkalinity patch until the alkalinity and tracer dye are no longer detectable from baseline concentrations by the research team's instrumentation.

Proposed biological monitoring includes phytoplankton and zooplankton community measurements to assess impacts on major microbial groups (e.g., picophytoplankton,

coccolithophores, diatoms, heterotrophic bacteria) and other critical organism groups such as zooplankton and copepods. Phytoplankton community composition would be measured using flow cytometry and other imaging tools. Plankton tows would be conducted to sample macroplankton, such as copepods and other zooplankton. Furthermore, the applicant and their research team would conduct ship-board incubations of alkalinity-enhanced seawater to directly assess carbon fixation rates over the course of the release and subsequent dilution of the sodium hydroxide solution.

During early coordination with you, we expressed some concerns regarding uncertainties of the effects to planktonic life stages of federally-managed species, primarily eggs and larvae, from the proposed enhanced alkalinity experiment. Although the mobility of adult and juvenile stages may have the capacity to minimize time spent exposed to elevated pH waters, the effects of short-term increases of pH above 9.0 on marine animals, particularly for egg and larval life stages in the upper water column, is not well understood. In response to our preliminary comments, you noted that the applicant and their research team plan to characterize planktonic species abundances and composition, including ichthyoplankton and any other fish life stages present in collected samples using bongo net tows following standardized protocols by the Ecosystem Monitoring (EcoMon) and the Long-Term Ecological Research Network (LTER) within and outside the alkalinity patch. However, as noted in the supporting documents, these methods would not distinguish between dead and injured, and alive specimens, and would only allow for an analysis of the presence or absence of any fish species or their life stages within and immediately outside the alkalinity patch.

Based on these concerns, we believe additional in-situ and/or onboard monitoring to evaluate the potential effects of the proposed experiment on planktonic egg and larval life stages, if feasible, should be implemented for Phase 1 and 2 of the LOC-NESS project. For example, one potential modification to methods for ichthyoplankton net tows could include video recordings in the nets to possibly distinguish live from dead plankton specimens.

If in-situ or onboard monitoring is not feasible, we believe further controlled laboratory and/or mesocosm studies should be pursued to better understand the potential adverse effects of high alkalinity deployments on early life stage fish and invertebrates. Furthermore, should Phase 1 monitoring of effects to biological communities identify any indications of adverse effects to EFH or federally-managed species, we believe it is prudent to assess the methods and protocols to determine if additional measures to avoid and minimize adverse effects can be implemented for Phase 2.

While the proposed experiment may be spatially and temporally restricted, the expectations are that these experiments may be scaled up to commercial-scale carbon dioxide removal applications. Therefore, we believe these data gaps should be addressed now rather than later when the spatial and temporal scales of future experiments and commercial-scale ocean alkalinity enhancement operations could have more substantial negative effects.

EFH Conservation Recommendations

In order to avoid, minimize, and offset significant impacts to EFH as a result of the proposed project, pursuant to Section 305(b)(4)(A) of the MSA, we recommend that you adopt the

following EFH conservation recommendations (CRs):

1. In-situ and/or onboard monitoring to evaluate the potential effects of the proposed ocean alkalinity enhancement on planktonic egg and larval life stages, if feasible, should be implemented for the LOC-NESS project. If in-situ or onboard monitoring is not feasible, controlled laboratory and/or mesocosm studies should be developed and implemented to better understand the potential adverse effects of high alkalinity deployments to early life stage fish and invertebrates.

2. Should Phase 1 monitoring for effects to biological communities identify any indications of adverse effects to EFH or federally-managed species, an assessment of methods and protocols should be reevaluated to determine if additional measures to avoid and minimize adverse effects can be implemented for Phase 2.

Please note that Section 305(b)(4)(B) of the MSA requires you to provide us with a detailed written response to these EFH CRs, including a description of measures you have adopted that avoid, mitigate, or offset the impact of the project on EFH. In the case of a response that is inconsistent with our recommendations, Section 305(b)(4)(B) of the MSA also indicates that you must explain your reasons for not following the recommendations. Included in such reasoning would be the scientific justification for any disagreements with us over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects pursuant to 50 CFR 600.920(k).

Please also note that a distinct and further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(1) if new information becomes available or the project is revised in such a manner that affects the basis for the above EFH conservation recommendations.

Conclusion

We appreciate the opportunity to provide these EFH conservation recommendations. The conservation recommendations we provide in this letter are based on the information provided in the EFH assessment and supporting documents, and will ensure that the adverse effects to EFH, federally-managed species, and other NOAA trust resources from this project are minimized. If you have any questions regarding our conservation recommendations or information in this letter, please contact Michael Johnson at 978-281-9130 or at mike.r.johnson@noaa.gov.

Sincerely,

Louis A Chiarella
Assistant Regional Administrator
for Habitat and Ecosystem Services

cc:
GARFO (Pentony)
PRD (Koch, Anderson)
NEFSC (Jewett)
NWFSC (McElhany)

D. The EPA's Final Response Letter to NOAA Fisheries' EFH Conservation Recommendations for LOC-NESS Phase 1 and Phase 2 (August 6, 2024)

OFFICE OF WETLANDS, OCEANS AND WATERSHEDS
WASHINGTON, D.C. 20460

August 6, 2024

Louis A. Chiarella
NOAA National Marine Fisheries Service
Greater Atlantic Regional Fisheries Office
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts, 01930

Dear Mr. Louis A. Chiarella:

This letter is a response to the Essential Fish Habitat conservation recommendations that the National Oceanic and Atmospheric Administration National Marine Fisheries Service provided to the U.S. Environmental Protection Agency via letter dated July 2, 2024, regarding two tentative *Marine Protection, Research and Sanctuaries Act* research permits for Woods Hole Oceanographic Institution's Locking Ocean Carbon in the Northeast Shelf and Slope (LOC-NESS) Project Phase 1 and Phase 2. The EPA provides this written response to each EFH conservation recommendation after coordination with the applicant and their research team and after discussion with NOAA Fisheries regarding its recommendations. The EPA will add clarifying language to the permit conditions regarding monitoring of planktonic eggs and larval life stages but considers that additional monitoring or laboratory studies suggested by NOAA Fisheries in Conservation Recommendation 1 is not feasible to include in the LOC-NESS Phase 1 and Phase 2 research activities. The EPA is prepared to implement Conservation Recommendation 2 upon completion of Phase 1 research activities using existing provisions of the MPRSA.

Pursuant to Section 305(b)(4)(A) of the *Magnuson-Stevens Fishery Conservation and Management Act*, the National Marine Fisheries Service recommended that the EPA adopt the following two conservation recommendations to avoid, minimize and offset significant impacts to EFH as a result of the proposed LOC-NESS Phase 1 and Phase 2 projects:

NOAA Fisheries Conservation Recommendation 1:

> In-situ and/or onboard monitoring to evaluate the potential effects of the proposed ocean alkalinity enhancement on planktonic egg and larval life stages, if feasible, should be implemented for the LOC-NESS project. If in-situ or onboard monitoring is not feasible, controlled laboratory and/or

mesocosm studies should be developed and implemented to better understand the potential adverse effects of high alkalinity deployments to early life stage fish and invertebrates.
The Recommendation acknowledges that, while the proposed experiment may be spatially and temporally restricted, NOAA Fisheries expects that these experiments may be scaled up to commercial-scale carbon dioxide removal applications. Therefore, NOAA Fisheries believes these data gaps should be addressed now rather than later when the spatial and temporal scales of future experiments and commercial-scale ocean alkalinity enhancement operations could have more substantial negative effects.

NOAA Fisheries Conservation Recommendation 2:

Should Phase 1 monitoring for effects to biological communities identify any indications of adverse effects to EFH or federally-managed species, an assessment of methods and protocols should be reevaluated to determine if additional measures to avoid and minimize adverse effects can be implemented for Phase 2.

EPA Response to Conservation Recommendation 1

The EPA agrees with NOAA Fisheries' assessment that additional research would support a better understanding of the potential adverse impacts of ocean alkalinity enhancement activities, and that this research could be used to inform the assessment of impacts of any future proposed activities which could be larger scale or longer term. However, the proposed LOC-NESS Phase 1 and Phase 2 studies are not large-scale commercial activities and are designed specifically to address research needs and gather scientific information to better understand the potential impacts of ocean alkalinity enhancement activities.

As NOAA Fisheries notes, the LOC-NESS Phase 1 and Phase 2 activities includes biological monitoring characterizing the planktonic communities. The monitoring plan provided by the applicant and their research team includes net tow sampling following the NOAA Fisheries standard protocols used in EcoMon surveys and by the Northeast U.S. Shelf Long-Term Ecological Research Network including sampling within and outside of the alkalinity patch prior to the release of the sodium hydroxide solution, immediately following the release, and during the monitoring period of the proposed research for Phase 1 (approximately 5-day monitoring period) and Phase 2 (approximately 21-day monitoring period). The research team would also capture imagery using a FlowCam or Imaging FlowCytobot to identify zooplankton and planktonic eggs and smaller larvae during the monitoring periods of each study. The EPA understands that these methods should allow the researchers to observe differences in egg and larvae abundance and community composition between areas located within and outside of the alkalinity patch as well as observations of changes in abundance or community composition over time after the release of the sodium hydroxide solution. Changes in absolute abundance, relative abundance, and presence or absence of species or life stages would provide information on the effects of the sodium hydroxide solution on these communities. The EPA will add additional language to the conditions in the proposed permits (section III-D-1-b of the proposed permits for Phase 1 and Phase 2)

to clarify that the permittee would be required to monitor planktonic egg and larval life stages as part of their biological monitoring.

NOAA Fisheries recommends that the EPA require additional *in-situ* or onboard monitoring beyond the applicant's research proposals, specifically to further evaluate potential injury or mortality of egg or larval stages resulting from the addition of sodium hydroxide solution into ocean surface waters during the LOC-NESS Phase 1 and Phase 2 research activities. Incorporating this Recommendation as permit requirement at this time is not scientifically feasible for the reasons discussed below.

NOAA Fisheries suggests, for example, that video recordings conducted during net tows could be used for *in-situ* evaluation of the viability or mortality of egg or larval fish. The EPA cannot identify reported literature that demonstrates the effectiveness of using video recordings during net tows that would justify inclusion of such a permit provision to assess injury or mortality of egg or larval fish.

Standard methods for collection and assessment of planktonic egg and larval life stages rely on sample collection via net tows followed by larval observation via microscopy (Kelso et al., 2012). However, studies assessing larval mortality using these protocols have identified that net-induced sampling methods are a significant cause of mortality (Cada and Hergenrader 1978; O'Conner and Schaffer 1997). For example, a study by Usvyatsov et al. (2013) attempted to differentiate between environmental- and sampling-related mortality in shortnose sturgeon larvae by examining larval decomposition stages after net tow sample collection. The study found that 20 to 56 percent of larval mortality was attributed to the sampling method and 4 to 25 percent of larval mortality was attributed to environmental-related sources (Usvyatsov et al., 2013). Given the short window of time between exposure and sample collection during the proposed Phase 1 and Phase 2 studies, the EPA does not expect these methods relying on larval decomposition stages would be a viable method to use in the proposed studies. Therefore, onboard microscopy of net tow samples is also unlikely to effectively distinguish between any egg or larval mortality resulting from the release of the sodium hydroxide solution, the net tow sampling methods, or other environmental conditions.

The EPA further evaluated the available scientific literature in its assessment of potential impacts to egg and larval fish in its EFH Assessment for LOC-NESS Phase 1 and Phase 2. The EPA determined that the Phase 1 and Phase 2 LOC-NESS project activities would not adversely affect the *quantity* of EFH but acknowledged that the activities may cause short-term impacts to the *quality* of some EFH attributable to temporary changes in water quality within surface waters in a small portion of the project areas. The EPA recognizes that pH below 9 has been shown to have either no impact or positive impacts on fish development and aquaculture (Boyd et al. 2016, dos Santos et al. 2020) and sustained seawater pH above 9.0 can be stressful to fish and prolonged exposure to pH above 9.5 can be life-threatening (Mariu et al. 2023, Menon et al. 2023). Additionally, a study by Parra and Yúfera (2002) found that larvae of two species of Mediterranean fish had lethal pH values affecting 50 percent of the population (LC50) at seawater pH values that ranged from 8.94 to 9.57 and 8.66 to 9.26 when exposed to elevated seawater pH for 24 hours. The EPA is not aware of any publication assessing the impacts of short-term

increases of pH or alkalinity (less than 24 hours), as is proposed in this research study, on marine fish at any life stage.

The EPA recognizes that laboratory or mesocosm studies could provide further information on potential impacts of short-term (seconds to minutes) exposure to high alkalinity and high pH environments on early life stage fish and invertebrates. The EPA is aware that lab research on these specific topics is currently underway (e.g., Camatti et al., 2024; Goldenberg et al., 2024 preprint) and looks forward to evaluating the results of these studies. Based upon the EPA's evaluation of potential impacts using the available scientific literature and the knowledge that these laboratory studies are underway, adding a permit condition that would require the applicant and their research team to conduct further laboratory toxicity testing for egg or larval fish species is unnecessary. Under the provisions of the MPRSA, the EPA may consider whether the results of the Phase 1 activities or available scientific literature would warrant alteration or revocation of the Phase 2 permit.

EPA Response to Conservation Recommendation 2

This Recommendation would be met under the existing provisions of the MPRSA, which are translated and incorporated into the conditions of the proposed permits and the processes that would take place prior to the beginning of the Phase 2 activities. The proposed Phase 2 permit conditions specify a delayed effective date for summer 2025 such that Phase 2 would occur after Phase 1, as was proposed in the permit application. Due to the phased sequence for the research activities, information or data collected during the Phase 1 activities would likely be relevant to the Phase 2 activities. Under the MPRSA, the EPA may alter or revoke partially or entirely the terms of permits issued if the factors or other criteria in the permit requirements cannot be met. In this matter, the proposed permits provide the opportunity for the EPA to consider whether the results or data collected during the Phase 1 research activities warrant modification or revocation of the Phase 2 research permit prior to its effective date. The Phase 1 permit conditions would require the permittee to provide results of Phase 1 to the EPA and specifically identify any proposed changes for the Phase 2 activities. The EPA also would independently assess the need for and types of any changes for the Phase 2 research permit after receiving results from the Phase 1 research activities. In the case of any substantive modification of the proposed terms of a permit for Phase 2, the EPA would reinitiate consultations or other coordination actions as required by federal regulations.

In summary, the EPA will add clarifying language to the permit conditions regarding monitoring of planktonic egg and larval life stages but considers that additional *in situ*, onboard, or laboratory research suggested by NOAA Fisheries in Conservation Recommendation 1 is not feasible to include in the Phase 1 and Phase 2 research activities. The EPA is prepared to implement Conservation Recommendation 2 upon completion of Phase 1 research activities under the existing provisions of the MPRSA. The EPA agrees with NOAA Fisheries' assessment that additional research would support a better understanding of the potential adverse impacts of ocean alkalinity enhancement activities; the EPA will continue to consider available scientific information relevant to this topic.

If you have any questions, please feel contact me at 202-564-9895 or valente.betsy@epa.gov.

Sincerely,

CYNTHIA VALENTE

Digitally signed by CYNTHIA VALENTE
Date: 2024.08.06 16:38:59 -04'00'

Betsy Valente
Chief, Freshwater and Marine Regulatory Branch

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E. Correspondence regarding LOC-NESS Phase 1 project updates and conclusion of the EFH Consultation for LOC-NESS Phase 1 and Phase 2 (July 22, 2024 - August 7, 2024)

From: Valente, Betsy
To: Mike R Johnson - NOAA Federal
Cc: Lanpher, Kaycie (she/her/hers); McCrory, Sena
Subject: Status updates for LOC-NESS Phase 1 and Phase 2
Date: Monday, July 22, 2024 1:10:36 PM
Attachments: Proposed modifications to LOC-NESS Phase 1_11Jul2024.pdf

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Hi Mike,

We are currently coordinating with the LOC-NESS research team to discuss the conservation recommendations provided to EPA for the LOC-NESS Phase 1 and Phase 2 activities and anticipate a response soon. In the meantime, I did want to provide you with an update regarding some proposed changes for the Phase 1 activities. The EPA does not believe that the proposed changes to Phase 1 substantively alter our prior assessment of impacts to essential fish habitats.

The LOC-NESS research team has proposed a couple modifications to the LOC-NESS Phase 1 activities which we have reviewed. A summary of the proposed changes from the applicant and our review of these changes is provided below. I have also attached a copy of the proposed changes provided by the LOC-NESS research team to this email.

The proposed changes to the LOC-NESS Phase 1 activities are summarized below:

- The research team has proposed to shift the project dates from a 5-day period within August 2-11, 2024, to a 5-day period within September 19-30, 2024.
    - Oceanographic conditions relevant to the research activities (specifically, stratified waters and shallow mixed layer) are expected to be very similar during August (~10 m mixed layer depth) and September (~12 m mixed layer depth).
    - Hurricane risk is higher in September than August; the proposed permit conditions, however, would prevent the research activities from occurring in unsafe sea or weather conditions, at the discretion of the master of the transport vessel. Hurricane risk would remain effectively managed under the permit.
- The research team has proposed to switch the transport and primary research vessels and use a second research vessel for additional monitoring during the release of the sodium hydroxide solution (originally proposed vessels were unavailable during the new dates).
    - Switching the transport vessel would not substantively change the dilution rates or expected seawater pH conditions for the Phase I (Martha's Vineyard) research.
    - The addition of a second research vessel would further expand monitoring capabilities.

The 4-to-6-week shift in the timing of the proposed activities does not change the EPA's assessment of potential impacts to the plankton communities in the Action Area. According to the information provided by the applicant and as supported by scientific literature (see NOAA NMFS resource here), the later September dates correspond with the start of the natural decline of primary production at the late summer/fall blooming events, where the phytoplankton community shifts from being dominated by larger eukaryotes, such as diatoms, to smaller picophytoplankton and dinoflagellates. Zooplankton abundance is also expected to be naturally in decline following the phytoplankton decline for these later dates. Pressure on ichthyoplankton, such as epipelagic spawning fish larvae and eggs, may decrease in September because there are generally fewer larvae species in the Northeast Slope and Shelf region in the early fall than in the summer.

The EPA has reviewed the proposed changes and information provided by the applicant to confirm that the proposed shift in project start dates for Phase 1 does not substantively alter the EPA's essential fish habitat assessment.

Based upon this information, please let me know if further action is needed by NMFS to consider the updated project information.

Thank you,
Betsy

Betsy Valente
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From:	Mike R Johnson - NOAA Federal
To:	Valente, Betsy
Cc:	christopher.Boelke@Noaa.gov; Pentony, Michael; Anderson, Jennifer; Emma Koch - NOAA Affiliate; Libby Jewett - NOAA Federal; Paul McElhany - NOAA Federal; Lou.chiarella@NOAA.gov; McCrory, Sena; Lanpher, Kaycie (she/her/hers); christine.vaccaro@noaa.gov
Subject:	Re: EPA Response to NOAA Fisheries' EFH conservation recommendations for the LOC-NESS Phase 1 and Phase 2
Date:	Wednesday, August 7, 2024 10:42:04 AM

Betsy,
Thank you for your response to our EFH conservation recommendations for the LOC-NESS project.
Regarding your request for our concurrence that the change in the proposed dates for the experiment will not affect our EFH conservation recommendations or our effects determination on EFH. Specifically, the WHOI is proposing to shift the time frame for the LOC-NESS Phase 1 research activities, which would occur south of Martha's Vineyard, from a 5-day period within the date range of August 2-11, 2024, to a 5-day period within the date range of September 19-30, 2024. NOAA Fisheries has determined this proposed change in the project's schedule would not affect our EFH conservation recommendations or the effects to EFH and federally managed species.
Your response concludes the EFH consultation for the proposed project. As noted in our letter and EPA's response, a distinct and further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(1) if new information becomes available or the project is revised in such a manner that affects the basis for our EFH conservation recommendations.
Thank you,
Mike

On Tue, Aug 6, 2024 at 6:19 PM Valente, Betsy <Valente.Betsy@epa.gov> wrote:

> Hi Mike,
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> Thank you for your time today. Please find attached the EPA's final response to NOAA Fisheries' EFH conservation recommendations provided to the EPA on July 2, 2024.
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> I would kindly request a confirmation of receipt of the status updates on the LOC-NESS Phase 1 project timing that were provided to NOAA Fisheries on July 22, 2024, and that no further action is needed by NOAA Fisheries to consider the shift in the project dates.
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> Best Regards,
>
> Betsy
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> Betsy Valente
>
> Chief, Freshwater and Marine Regulatory Branch
>
> Office of Wetlands, Oceans, and Watersheds

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