Herring River Restoration Project
Wellfleet, MA
Regulatory Oversight Group (ROG)
Monday, December 12, 2022, 1-3 pm

Join Zoom Meeting
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Meeting ID: 854 6923 0366
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--Agenda--

1. Welcome and introductions

2. Review Regulatory Oversight Group charge and discuss review protocols

3. Phase 1 Restoration Project Update
   - Permitting
   - Fundraising
   - Construction and pre-construction activity timeline
   - ROG questions, discussion, guidance

4. Adaptive Management Plan
   - Initial tide gate management policy
   - Vegetation management
   - Berm pilot project
   - ROG questions, discussion, guidance

Meeting Attachments

A. MEPA Certificate (ROG charge highlighted)
B. PowerPoint slides (draft): Project Update
C. PowerPoint slides (draft): Summary of Restoration Activities Planned for 2022-2025
D. Current list of ROG members
E. Links to all Phase 1 project permits received

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July 15, 2016

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

PROJECT NAME	: Herring River Restoration Project
PROJECT MUNICIPALITY	: Wellfleet and Truro
PROJECT WATERSHED	: Cape Cod
EEA NUMBER	: 14272
PROJECT PROPONENT	: Towns of Wellfleet and Truro
DATE NOTICED IN MONITOR	: June 8, 2016

As Secretary of Energy and Environmental Affairs, I hereby determine that the Final Environmental Impact Report (FEIR)[1] submitted on this project **adequately and properly** complies with the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00). The project is undergoing a coordinated review process under the National Environmental Policy Act (NEPA) and the Cape Cod Commission Act as a Development of Regional Impact (DRI).

This project represents the single largest salt marsh restoration project in New England to date. It will restore native tidal wetland habitat to upwards of 950 acres of the Herring River floodplain in and adjacent to the Cape Cod National Seashore (the Seashore) by re-establishing tidal flow. Tidal flow will be increased incrementally, over time, using an adaptive management approach that will balance ecological goals with flood control measures to allow the highest tide range practicable while protecting

[1] In accordance with the project's Special Review Procedure, the FEIR is a joint document filed to meet the requirements of both MEPA and the National Environmental Policy Act (NEPA). For the purposes of this Certificate, the joint final Environmental Impact Statement (EIS) and EIR will be referred to as the FEIR.

vulnerable properties, including roads and homes. Tidal flow will be facilitated through changes to the existing dike and tidal control structure at Chequessett Neck Road, construction or alteration of other tidal control structures within the project area (e.g., Mill Creek, Upper Pole Dike Creek), vegetation management, and habitat management. Implementation of the project will be informed by extensive modeling, monitoring and analysis so that unexpected and/or undesirable responses can be detected and appropriate response actions taken. The project will result in significant improvements in water quality, rare species habitat, fisheries, and recreational opportunities throughout the Herring River floodplain while improving its resiliency and ability to adapt to the effects of climate change.

The FEIR provides a clear description of the project, project goals, and potential environmental impacts associated with this ambitious undertaking. It identifies measures to avoid environmental impacts, where possible, and where impacts are unavoidable, to minimize and mitigate impacts. The heart of the MEPA review process is the development and analysis of alternatives that can meet project goals while minimizing environmental impacts. Review of this project has included an iterative development of project alternatives and variations of alternatives developed in consultation with resource agencies, property owners and local officials. The FEIR adequately addressed the Scope including development of a framework for project implementation consisting of a management structure, draft Adaptive Management Plan (AMP), and a permitting strategy. As required, the FEIR included additional information regarding salt marsh transition and invasive species management; impacts associated with the Chequessett Yacht and Country Club (CYCC) mitigation; and construction period impacts.

I acknowledge and appreciate the investment of time and resources contributed by The Towns of Wellfleet and Truro, the Herring River Restoration Committee (HRRC), and the Technical Working Group (TWG), as well as the leadership provided by the Division of Ecological Restoration (DER) and the National Park Service (NPS).

Comments from State Agencies and the Cape Cod Commission (CCC) identify support for the project and its ecological benefits. I also acknowledge comments from residents who express concern with project impacts and are seeking assurance that their interests will be adequately considered and protected. These concerns are understandable given the scope and scale of the project. For the purpose of MEPA review, the FEIR has adequately addressed potential environmental impacts including impacts to private property, identified mitigation for immediate impacts, and identified potential mitigation for future phases. Several project components require additional review and consideration, most notably, the process between the Towns, the Seashore and low-lying property owners that may incur varying degrees of impact. Permitting processes must include more detailed information regarding potential impacts and mitigation commensurate with the proposed actions.

Project Area

The project area examined in the FEIR consists of the approximately 1,100-acre Herring River estuary[2] in the Towns of Wellfleet and Truro. It is located in the Wellfleet Harbor Area of Critical Environmental Concern (ACEC). The Herring River (along with its floodplain, tributary streams, and associated estuarine habitats within Wellfleet Harbor) was the largest tidal river and estuary complex on the Outer Cape prior to its historic alteration. Approximately 80 percent of the River's floodplain is

[2] Approximately defined by the landward limit of the floodplain of the river and its tributaries.

located within Seashore boundaries, with the river itself extending from Wellfleet Harbor northeast for nearly four miles to Herring Pond in North Wellfleet. Bound Brook, a major tributary, extends northwest to Ryder Beach in South Truro. The Herring River basin is separated from Wellfleet Harbor by the Chequessett Neck Road Dike. The dike has three six-foot wide box culverts, each with an attached flow control structure. One culvert has an adjustable sluice gate that is currently set open at 24 inches and allows limited bi-directional tidal flow. The remaining two culverts have tidal flap gates designed to permit flow only during outgoing (ebb) tides. The project area includes the Herring River's Upper, Lower and Middle basins as well as a series of additional sub-basins which are physically, chemically, and biologically distinct from the Herring River itself. These stream sub-basins include: Duck Harbor, Mill Creek, Lower and Upper Bound Brook, and Lower and Upper Pole Dike Creek. Below is a brief description of each distinct sub-component of the project area:

Lower Herring River – 166 acres located immediately upstream of the Chequessett Neck Road Dike and extends northerly to the High Toss Road crossing;
Middle Herring River – 74 acres extending from the High Toss Road crossing north to Bound Brook Island Road;
Upper Herring River – 156 acres extending northeast from Bound Brook Island Road and east of Route 6 to Herring Pond;
Mill Creek – 80 acres in area extending easterly from its confluence with the Herring River (located about 1,600 feet east of the Chequessett Neck Road Dike) between the CYCC and Old Chequessett Neck Road;
Lower Pole Dike Creek – 114 acres extending northeast from High Toss Road to Pole Dike Road;
Upper Pole Dike Creek – 174 areas of freshwater marsh extending east of Pole Dike Road and including wetland and floodplain north of Wellfleet Center and east of Route 6;
Duck Harbor – 131 acres extending from the Herring River main stem to the Duck Harbor barrier beach;
Lower Bound Brook –86 acres extending north and west of the Herring River north of Old County Road; and
Upper Bound Brook – 148 acres located northwest of Lower Bound Brook and extending into the Ryder Hollow area of Truro.

According to the FEIR, in 1909 the Town of Wellfleet diked the mouth of the Herring River in an effort to drain the breeding area for salt marsh mosquitoes (the Chequessett Neck Road Dike). Subsequently, the Town dug drainage ditches in the marsh upstream of the dike structure. By the mid-1930s, the Herring River main stem, now flowing with freshwater, was channelized and straightened, cutting off many creek meanders between High Toss Road and Route 6, substantially reducing the length of the river. Subsequent to the diking of the Herring River, development occurred within the historic reaches of the estuary, in some cases at low elevations within the floodplain. Notable construction within the floodplain includes a portion of the CYCC 9-hole golf course and private residences within the Mill Creek and Upper Pole Dike Creek sub-basins. Over the decades the Chequessett Neck Road Dike has deteriorated, been repaired, and efforts have been made to modify control structures to increase tidal flow to the Herring River. Despite these efforts, estuary conditions continued to degrade after the tide gates were repaired. Concerns about tidal flooding of private properties and increased mosquito production prevented the Town of Wellfleet from opening the existing tide gate further than 24 inches, where it has remained since 1984.

Adverse ecological impacts resulting from this tidal restriction and salt marsh drainage include: tidal restrictions; loss of salt marsh vegetation and increases in non-native, invasive species; loss of estuarine habitat and degradation of water quality; alteration of natural sediment processes; salt marsh subsidence; nuisance mosquito production; and impediments to river herring migration.

A comprehensive set of project objectives to address these impacts were created by the NPS and HRRC. They include three overarching goals: maximize the extent of ecological restoration; improve the overall function of estuarine habitat; and minimize adverse impacts to surrounding land uses. The objectives guide the project's design. Alternatives and associated impacts were evaluated based on consistency with and ability to advance project goals.

Procedural Review and Background

The Towns committed as part of a Special Review Procedure (SRP) to file one set of environmental review documents that fulfill the requirements of NEPA, MEPA and the CCC. A Certificate Establishing a Special Review Procedure (SRP) was issued on June 20, 2008 to provide for coordination of MEPA review with other environmental and developmental review and permitting processes. The FEIR was published in the June 8, 2016 issue of the Environmental Monitor, with a comment period that concluded on July 8, 2016. A joint CCC/MEPA hearing was held on June 30, 2016 in conformance with joint review requirements between the CCC and MEPA.

The project has a lengthy history of coordination between local, State and federal officials and agencies necessary given the complex nature and scope of the project. Subsequent to an August 2005 Memorandum of Understanding (MOU I) between the Town of Wellfleet and the NPS, the Herring River Technical Committee (HRTC) was established to review scientific and technical data and consider community concerns regarding the feasibility of restoring the wetland system. In January 2006 the HRTC produced a "Full Report of the Herring River Technical Committee" which recommended the tidal restoration of the Herring River estuary. The HRTC worked to develop a Conceptual Restoration Plan (CRP) for the Herring River estuary which described possible ways to restore the Herring River. A second MOU (MOU II) was created on November 13, 2007 between the Seashore and the Towns of Wellfleet and Truro accepting the CRP, agreeing to move forward with a detailed restoration plan, and establishing a new committee, the HRRC. In addition, the TWG comprised of members of various State, federal and local environmental and permitting agencies, as well as members of the HRRC, was established to identify and address environmental management and permitting issues associated with the project. The TWG met throughout the preparation of the FEIR and assisted in the development of study methodologies and protocols to ensure that these data meet the requirements anticipated as part of the permitting and approval processes.

A third MOU (MOU III) between the Seashore and the Towns of Wellfleet and Truro has been drafted to facilitate project implementation. It proposes an intergovernmental team to provide policy oversight, assume decision-making authority, and, through a contractual arrangement, direct the activities of an independent organization that will undertake project permitting, construction and implementation, including the adaptive management process. The MOU III will establish a Herring River Executive Council (HREC) comprised of: two members of the Town of Wellfleet Board of

Selectmen and the Town Administrator; two members of the Town of Truro Board of Selectmen and the Town Administrator; and the Superintendent of the Seashore or his/her designee.

Through contracts for services and/or Cooperative Agreements, MOU III will enable the Towns and/or the Seashore, to engage the services of an independent organization to undertake some or all of the responsibilities assigned to the HREC including: provide and manage staff; compete for, receive and administer project funding; prepare and submit permit applications and applicable environmental compliance obligations; prepare and advertise bid solicitation packages, manage and oversee competitive bidding processes, select and manage contractors, oversee construction activities, pay invoices, and comply with funder and contractor stipulations; facilitate agreements with affected property owners; conduct public outreach and education activities; operate and maintain infrastructure in cooperation with the Towns and Seashore; and implement the AMP.

The HRRC will serve as an advisor to the HREC and include representation from the towns of Wellfleet and Truro, the Seashore, the Division of Ecological Restoration (DER), the U.S. Fish and Wildlife Service (USFWS), the Natural Resources Conservation Service (NRCS), and the National Oceanic and Atmospheric Administration (NOAA). Additional project support and acquisition of grant funding will also continue to be provided by the Friends of Herring River (FHR), an independent non-profit organization that promotes education, research and public awareness of the Herring River estuary. The HRRC will also analyze, compile, and summarize monitoring data, modeling output, field observations, and other information for the HREC.

Jurisdiction and Permitting

This project is subject to MEPA review and required the preparation of a mandatory EIR because it requires State Agency Actions and exceeds several EIR thresholds, including: alteration of one or more acres of salt marsh or bordering vegetated wetlands (301 CMR 11.03(3)(a)(a)) and alteration of ten or more acres of any other wetlands (301 CMR 11.03(3)(a)(b)). In addition, it may result in alteration requiring a variance in accordance with the Wetlands Protection Act (301 CMR 11.03(3)(a)(2)).

The project will require approval of a Combined Permit by the Massachusetts Department of Environmental Protection (MassDEP), as allowed by 314 CMR 9.09(4) to cover both Section 401 Water Quality Certification (WQC) and Chapter 91 Waterways licensing. The Proponent intends to prepare and implement a Habitat Management and Monitoring Plan in compliance with the Massachusetts Endangered Species Act (MESA) (M.G.L. c.131A and 321 CMR 10.00) and applicable habitat management exemption provisions at 321 CMR 10.14(15). Federal Consistency Review will be required in accordance with the Coastal Zone Management Act of 1972.

The project will be subject to DRI Review by the CCC. The Proponent will seek a hardship exemption as a Project of Community Benefit. The project will require an Individual Permit from the United States Army Corps of Engineers (USACE) in accordance with Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Review and approval in compliance with the National Historic Preservation Act (NHPA) and the Massachusetts Historical Commission (MHC) pursuant to Section 106 requirements and M.G.L. c.9, ss. 26-27C will also be required. The NPS and MHC have executed a Programmatic Agreement (PA) to address Section 106 compliance. The project will require

coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit administered by the United States Environmental Protection Agency (EPA).

The project is proposed as an Ecological Restoration Limited Project in accordance with the Massachusetts Wetlands Protection Act (WPA) (310 CMR 10.24(8)(a)). The Proponent will require Orders of Conditions from the Wellfleet and Truro Conservation Commissions in accordance with the WPA regulations or in the case of an appeal, a Superseding Order of Conditions from MassDEP.

The FEIR outlined a coordinated and comprehensive permitting strategy and framework to facilitate efficient review, accommodate the long-term and dynamic implementation process, and to provide adequate environmental protection and public input.

The project will receive Financial Assistance, in part, from State Agencies. Therefore, MEPA jurisdiction for this project is broad and extends to all aspects of the project that are likely, directly or indirectly, to cause Damage to the Environment as defined in the MEPA regulations.

Review of the FEIR

The MEPA review process has included extensive analysis of alternatives and sub-alternatives supported by hydrodynamic modeling, detailed resource assessment, identification of changes in floodplains and tidal regimes and impacts on private property. The FEIR incorporated the results of additional data collection and analyses and roadway, culvert and bridge design assessment to further refine the discussion of potential project-related impacts and benefits. The project has not changed significantly since the issuance of the Certificate on the FEIR with the exception of including the installation of tide control at Pole Dike Creek in the Preferred Alternative.

Proposed Regulatory Strategy

The proposed regulatory strategy presented in the FEIR will be applied to review and approvals required in accordance with the WPA, c .91 Waterways Regulations, and Section 401/404 of the State and Federal Clean Water Acts. Subsequent to MEPA and NEPA approvals, but prior to initiation of restoration activities, the Proponents will apply for a comprehensive set of permits and approvals from all federal, State, regional and local regulatory authorities. Project elements will be grouped into two classes based upon project implementation phases.

Class 1 components include those actions that are required to implement the initial phase of the project, including but not limited to:

- Reconstruction of the Chequessett Neck Road Dike;
- Construction of the dike at Mill Creek;
- Installation of a new tide gate at Pole Dike Creek Road and
- Hydraulic improvements and public access modifications at High Toss Road;

In areas that lie below targeted water elevations in the project's initial implementation phase, Class 1 elements will also include:

- Mitigation measures designed to prevent flooding impacts to private structures;
- Elevation of low-lying portions of public roads;
- Channel and marsh surface modifications; and
- Vegetation management.

Detailed plans, data and narratives will be provided in the permit applications for Class 1 activities (an "umbrella" permit). All permits will include the condition that tide gates and water levels be managed to prevent impacts in the Mill Creek and Upper Pole Dike Creek sub-basins, and other potentially affected locations, until Class 1 impact mitigation has been implemented. Any permit application that includes work on private property will require the signature of landowners.

Class 2 will cover project elements proposed in subsequent phases, including, but not limited to:

- Additional private property impact mitigation measures;
- Additional channel and marsh surface modifications;
- Modifications to minor roads and replacement of small culverts in upstream areas; and
- Vegetation management activities beyond the Lower Herring River.

The scope and potential impact of Class 2 mitigation measures cannot be accurately estimated prior to implementation of Class 1 elements and will be determined by agreements with landowners, monitoring results, and adaptive management decisions based upon the incremental increases in tidal exchange within the estuary. Class 2 projects will be identified and generally described in initial permit applications, with further detail provided if and/or when they are proposed for implementation. Any work proposed on private property will require the signature of landowners on any permit application or request for permit amendment.

To support this regulatory strategy I hereby establish a successor group to the TWG, the Regulatory Oversight Group (ROG). It will include, at a minimum, representative(s) from the following agencies:

- Federal: NPS, USFWS, NOAA, NRCS, EPA, USACE;
- State: MEPA, DER, DMF, NHESP, MassDEP, CZM, State Historic Preservation Officer (SHPO);
- Regional: CCC;
- Local: Town of Wellfleet, Town of Truro: and
- Tribal: Mashpee Wampanoag Tribe

The ROG will assist in the preparation and review of the final AMP. It will review the incremental tidal restoration process and advise Proponents, as necessary, on approval requirements for any major proposed design changes to Phase 1 elements. It will review and advise on requirements for more detailed design plans, methodologies, and specific restoration management actions associated with Class 2 elements. Individual Agency representatives will determine respective jurisdictional authority for Class 1 changes and/or Class 2 refinements to evaluate whether these project components may proceed under the original comprehensive permit authorization or if an amendment or new permit is

required. If formal review is required, the Proponents will submit an application for approval in compliance with the applicable regulations and procedures.

A representative of the MEPA Office will participate to provide guidance regarding the extent to which significant project changes or unforeseen secondary actions may warrant the filing of a Notice of Project Change (NPC). MEPA review, while supported by detailed assessment and analysis, has been based on conceptual planning that will be further developed and detailed through subsequent review and permitting and implemented through the AMP. The Preferred Alternative reflects the maximum level of anticipated environmental impacts. This Certificate acknowledges that certain project elements and associated environmental impacts may vary from what has been presented in the DEIR and FEIR. Determinations regarding the need for a NPC would be based on the type and scope of these project modifications and their potential to significantly increase or alter the nature of environmental impacts within the project area.

The ROG and the HRRC should meet at least annually to review monitoring results and consider changes and/or refinements to the project design and management activities based upon data collection, analysis and predicted outcomes. These meetings should be open to the public and noticed at least 14-days in advance through the Environmental Monitor and the official websites for the Towns of Wellfleet and Truro and the Seashore. Materials to be reviewed at these meetings should be made available to the public at least 14 days prior to the meeting via the aforementioned websites as well as hard copies at the Town libraries and the Seashore headquarters and/or Visitor's Center. The ROG and HRRC should establish a protocol to facilitate the submission of written public comments for consideration by group members. Group deliberations and decisions regarding proposed changes should be documented in official meeting minutes and published in the Environmental Monitor and the official websites for the Towns of Wellfleet and Truro and the Seashore.

When MOU III is formally executed, a new stakeholder group will be established by the HREC to represent community interests and concerns during project implementation. This group will work with the HRRC, HREC and ROG. It should represent the broad interests of the community including, but not limited to, potentially affected landowners and business owners, recreational users of the Herring River flood plain, shellfishermen, and conservation and environmental advocates. Additional opportunities for public input and comment will be provided during permitting processes including the CCC Development of Regional Impact (DRI) review process. The CCC comment requests additional project information be provided for the DRI review, including the potential impact on the Town of Wellfleet landfill, project budgeting and funding, private property impacts and proposed flood proofing measures.

Adaptive Management Plan

Adaptive management is an approach for simultaneously managing and learning about the dynamics of resources under management to aid in the decision-making process when uncertainties exist. The FEIR included a draft AMP that will be finalized prior to permitting. It is designed to minimize risk to property and the environment given the complexity of the project and uncertainties regarding the response of the Herring River system over time. Despite extensive modeling efforts and data gathering, it is uncertain how specific ecological processes will respond over the short-term and long-term. Upon completion, the Final AMP should be published in the Environmental Monitor for informational purposes.

The FEIR included a discussion of the adaptive management planning process including the set-up phase and iterative phase. The set-up phase includes identification of the project, objectives and other key components (definition of the problem and objectives, identification of measurable parameters, identification of alternatives and potential outcomes, and monitoring). The iterative process includes decision making, implementation, monitoring and analysis of predicted/observed outcomes.

Objectives and performance measures were developed through a series of forums with regulatory agencies, technical advisors, local stakeholders, and comments on the Draft EIS/EIR. The five fundamental project objectives are: restore hydrography; restore ecological function/integrity; minimize adverse impacts; maximize ecosystem services; and minimize cost. The FEIR identified sub-objectives and described associated performance measures, predictions, and monitoring methods for each. For example, to maximize marsh elevation, the AMP will use data from electronic water level data loggers in areas of predicted ponding to evaluate the extent of ponded water at low-tide.

The HRRC reviewed models capable of simulating a broad range of ecosystem functions and services and predicting responses to multiple project objectives that result from tidal restoration and other activities. The draft AMP modeling framework is comprised of individual sedimentation, vegetation change, and water quality models integrated and linked to the Environmental Fluid Dynamics Code (EFDC) hydrodynamic model (Hamrik and Wu 1997).

The primary driver of the project will be management of tide gate adjustments, which could occur up to several times per year, at Chequessett Neck Road Dike, Mill Creek Dike and Pole Dike Creek Road. The adjustments will take into consideration the need to avoid adverse impacts to structures and roads, water quality, and vegetation as a result of changes in tidal flow, as well as the time needed to collect data on potential impacts to rare species and system changes. Decisions will be complicated by the overlapping, integrated nature of anticipated management actions, including secondary activities such as vegetation and sediment management. The iterative phase of the AMP will commence when the HRRC proposes an initial tide gate management plan to the HREC.

Monitoring data will be analyzed to determine whether or not pre-determined threshold values have been met and management decisions will be made accordingly. In making recommendations to the HREC the HRRC will consider the current state of the system (e.g., cumulative changes since project commencement, effects of natural or anthropogenic events unrelated to tidal restoration), predicted outcomes of recommended management actions, and the operational and administrative structure for supporting recommended management actions.

The Final AMP must include quantifiable metrics for all objectives; identify a discrete set of management alternatives available to meet restoration objectives; define a monitoring protocol that identifies what parameters will be monitored, how they will be measured, and frequency of monitoring; and identify thresholds for decision-making or action.

Alternatives Analysis

Alternative A is the No Action Alternative which maintains the 18-foot-wide Chequessett Neck Road Dike with two flap gates and one adjustable tide gate. It does not include tidal restoration. The

action alternatives represent "bookends" of the minimum and maximum tidal exchange restoration necessary to meet project objectives. Alternative B provides the lowest high tide water surface elevations needed to achieve the project objectives, and Alternative D achieves the highest practicable high tide water surface elevations possible, given the constraints of current land uses in the floodplain. Alternatives B, C, and D include a new box beam bridge/dike structure with a total opening width of 165 feet spanned by a series of adjustable and removable tide gates at the location of the Chequessett Neck Road Dike. Each alternative describes the possible endpoints of incremental tidal restoration. Guided by the AMP, the final degree of tidal exchange may fall somewhere between Alternative B and D.

Alternative B – New Tidal Control Structure at Chequessett Neck – No Dike at Mill Creek: The Mill Creek sub-basin will be left open to the Herring River, thereby subjecting the sub-basin to a limited tidal regime controlled at the Chequessett Neck Road Dike. Tide gates will be opened incrementally to a maximum of three feet with an objective of obtaining a mean high spring tide of 4.8 feet and a maximum coastal storm driven tide of 6.0 feet in the Lower Herring River. These tidal elevations represent the maximum restoration possible without the need to install a secondary tidal control structure at Mill Creek to protect private properties. Tides in upstream basins will be lower because of natural tide attenuation. Proposed flood proofing actions will be designed to accommodate 100-year storm driven tidal flooding up to 5.9 feet within the Mill Creek sub-basin and 5.3 feet in the Upper Pole Dike Creek sub-basin. The maximum mean high water spring tide elevation in Mill Creek will be limited to 4.7 feet. Final maximum high tide elevations will not exceed the aforementioned elevations within Mill Creek. Several areas of the CYCC golf course will be affected by the tidal inundation levels proposed under this alternative and will require mitigation. Options to address these impacts are discussed later in this Certificate.

Alternative C – New Tidal Control Structure at Chequessett Neck – Dike at Mill Creek that Excludes Tidal Flow: Tide gates at the Chequessett Neck Road Dike will be fully opened (incrementally) to allow mean high water spring tides up to 5.6 feet and coastal storm driven tides up to 7.5 feet in the Lower Herring River. This alternative provides the highest practicable high tide water surface elevations possible given the constraints of current land uses in the floodplain. Mitigation actions proposed throughout the remainder of the estuary will be designed to accommodate flooding up to the anticipated maximum tidal elevations. Tides in upstream basins will be lower because of natural tide attenuation. This alternative includes construction of a tidal exclusion dike at the mouth of Mill Creek to avoid flooding impacts and associated mitigation to low-lying properties within the sub-basin. This will eliminate tidal influence to the sub-basin and be designed to the minimum recommended crest height of two feet above the projected 100-year storm surge elevation (i.e., 9.5 feet). A one-way, flapper-style tide gate, possibly along with a mechanical pump, will be installed in the dike to allow freshwater to drain from the Mill Creek sub-basin toward the Herring River. Mechanical pumping may be necessary at times to facilitate freshwater drainage. Construction of this dike will require approximately 2,900 cubic yards (cy) of fill and will permanently impact 12,500 sf of wetland. Temporary impacts to 2.4 acres of vegetated wetlands are associated with construction dewatering.

Alternative D – New Tidal Control Structure at Chequessett Neck Dike – Dike at Mill Creek that Partially Restores Tidal Flow: Tide gates at the Chequessett Neck Road Dike will be fully opened (incrementally) to allow mean high water spring tides up to 5.6 feet and coastal storm driven tides up to 7.5 feet in the Lower Herring River. Tides in upstream basins will be lower because of natural

tide attenuation. With the exception of Mill Creek, mitigation actions proposed throughout the remainder of the estuary will be designed to accommodate flooding up to the anticipated maximum tidal elevations. This alternative includes a dike at the mouth of Mill Creek with an adjustable, two-way tide gate partially restore tidal flow to the sub-basin. Mean spring high tides will be limited to 4.7 feet and coastal storm driven events to a maximum of 5.9 feet in Mill Creek. The impacts of the dike's construction will be similar to Alternative C, while flood proofing described in Alternative B will be required for Mill Creek (e.g., CYCC mitigation and low-lying private properties).

Chequessett Yacht and Country Club Sub-Options

As noted previously, Alternatives B and D include options for mitigating potential flood impacts to the CYCC golf course. Option 1 includes relocating portions of the facility to upland locations owned by the CYCC which would include clearing, grading, and planting of new golf holes and a practice area. Option 2 includes elevating affected portions of the facility through fill, regrading, and replanting. Portions of five low-lying golf holes would be reconstructed to a minimum elevation of 6.7 feet, which is two feet above the mean spring tide in Mill Creek. Additional details regarding impacts and mitigation are discussed later in this Certificate.

Comparison of Alternatives

The comparative habitat restoration potential for each alternative is summarized below:

Alternative	Total Acres of Habitat Restored
Alternative A	0
Alternative B w/ Option 1	898.7
Alternative B w/ Option 2	881.1
Alternative C	912.7
Alternative D w/ Option 1	964.3
Alternative D w/ Option 2	956.0

The FEIR included a comparative discussion of how the alternatives meet (or do not meet) stated project objectives. Alternative D with Option 2 was selected as the Preferred Alternative because it will provide the best value with the highest benefit to cost ratio. It is anticipated that some impacts in the Preferred Alternative such as improvements to water quality and sub-tidal habitat, will begin relatively soon after tidal exchange is restored. Other changes, in particular those involving vegetation/wetland habitat change and marsh surface accretion, will continue for decades, until the system reaches a state of self-sustainable equilibrium.

Chequessett Neck Road Dike

The Herring River Hydrodynamic Modeling Report prepared in 2012 evaluated a range of potential opening widths at Chequessett Neck Road and determined that a 165-foot opening was the largest width required to optimize restoration. Based upon this determination, the Proponent evaluated several types of bridge structures consistent with the MassDOT Bridge Design Manual and selected three options for additional analysis: a four-sided pre-cast concrete box culvert; a three-sided pre-case concrete box culvert; and adjacent pre-stressed concrete box beams (Preferred Bridge Alternative).

Each alternative met project functional requirements, but the Preferred Bridge Alternative was selected as it was comparatively superior based upon the relative importance of various criteria including effects on natural resources, low-tide drainage, sediment transport and scour, long-term maintenance, construction costs, and safety and security. The Preferred Bridge Alternative roadway cross-section will consists of 11-foot travel lanes, an 8-foot wide parking lane and adjacent 5-foot wide sidewalk on the western side of the bridge, and a 5-foot wide sidewalk on the eastern side of the bridge. Concrete platforms that meet Americans with Disabilities Act (ADA) accessibility requirements will be provided on both sides of the structure. Construction is expected to temporarily impact approximately 103,200 sf (2.4 acres) of area currently comprised of the dike itself, as well as adjacent inter- and sub-tidal wetland areas. Dike reconstruction and associated dewatering, sub-grade preparation, slope protection and related work will be confined to this footprint. Wetland impacts will likely change upon completion of the final design. Final wetland impacts will be tabulated as part of the local, State and federal permitting processes and appropriately mitigated, as necessary. Based upon the design presented in the FEIR, potential wetland resource area impacts include:

Wetland Resource Type	Temporary Impact Area (sf)	Permanent Impact Area (sf)
Land Under Ocean/Fish Run	7,354	13,452
Tidal Flats	1,280	6,662
Salt Marsh	4,038	9,764
Land Containing Shellfish	11,009	31,484
Bordering Vegetated Wetlands	808	3,906
Coastal Bank	539	12,299
Land Subject to Coastal Storm Flowage	100,742	88,888
Riverfront Area	50,127	53,990

The bridge structure will be comprised of three spans with 5-foot wide piers and will support removable pre-cast concrete panels spanning each of the bays. Panels will be sized to accommodate the configuration of gate frames providing 6-foot wide by 10-foot high openings through the panels. A permanent steel sheeting cutoff wall will be constructed along the length of the concrete bases below the panel, extending continuously below the bridge piers and abutments, and continuing beyond the abutments to meet existing timber cutoff sheeting at the limits of excavation. This sheeting will extend to at least 24 feet below the mudline to achieve sufficient seepage cutoff below the panels under the maximum hydraulic loading. Vertical clearances will range from 9.0 feet from the proposed channel bed (elevation -4.0) to the low chord of the arch openings (elevation 5.0 feet) to 10.0 feet from the proposed channel bed (-4.0 feet) to the high chord at the center of the arch openings (elevation 6.0 feet). Stormwater runoff will be conveyed to deep sump hooded catch basins and planter/filter boxes adjacent to both bridge abutments. To minimize wetland impacts, the width of the existing embankment's base will not be increased except where required by a 2:1 slope (maximum proposed slope grade). As currently proposed, the structure's vertical clearance is approximately 4.5 feet above the mean high water elevation and provides more than 4.0 feet of clearance below the roof of the main bridge deck. The Proponent will continue to evaluate boater and rescue safety elements of the bridge as final design advances including the placement of signage and buoys to warn boaters of the potential hazard.

Canoe and Kayak Access

The Proponent identified an opportunity to expand recreational access by facilitating safe and convenient passage of small boats (generally canoes and kayaks) between the downstream side of the Chequessett Neck Road Dike and upstream areas. Currently, a small parking lot and launch area is located on the downstream side and provides access to Wellfleet Harbor. No formalized access is provided on the upstream side; although some boaters climb the steep rip rap embankments to launch their boats.

The HRRC is considering several options for a designated hand-carry portage. The FEIR identified potential locations for an upstream and downstream boat launch located on the northern, Griffin Island, side of the bridge. Construction of new launch areas will require some wetland disturbance to create new landings, ramps, and stairways along the embankments on both sides of the dike. The existing, informal parking area (2 spaces) on the upstream side at the end of Duck Harbor Road may be expanded to accommodate no more than 8-10 cars. This is within a proposed staging area that would be disturbed by construction. The lot will remain unpaved and informal. An approximately 400-foot trail will be cleared from the parking area to the upstream boat launch which could result in the disturbance of up to 4,000 sf of wetlands. The FEIR estimated approximately 10,000 sf of wetlands disturbance for each canoe/kayak launch; however, no formal design work has been undertaken for the launches/parking area. I strongly encourage the Proponent to avoid, minimize, and mitigate impacts to wetland resource areas, rare species habitat and cultural resources to the maximum extent practicable as project design advances. The specific wetland impacts, and any necessary mitigation, will be considered during the Notice of Intent process with the Wellfleet Conservation Commission and the c.91 licensing process (if applicable) with MassDEP.

Mill Creek Dike Alternatives

Alternatives C and D include construction of a dike at Mill Creek to control tidal flow within the Mill Creek sub-basin. Design requirements include: a 75-year design life with proper maintenance; minimize temporary and long-term environmental impacts; allow for the reconfiguration of the structure to provide a maximum hydraulic opening 5-feet in height by 25-feet in width with an invert elevation of -1.5 NAVD; accommodate potential sea level rise without damage from overtopping; minimize future maintenance costs; and provide adequate freeboard with a top crest elevation of 9.5 NAVD88.

Design requirements for the multiple water control structures (i.e., gates) include provision of: a 75-year design life with proper maintenance; a safe and secure mechanism for adjusting and controlling flow into and out of the Mill Creek; gates requiring minimal maintenance costs; and gates that can be easily operated and require minimal labor.

The FEIR considered four different structural alternatives: an earthen dike, a hybrid wall/earthen dike, a double wall dike, and a single wall dike. The earthen dike and single wall dike were selected for further analysis. The single wall alternative consisted of several sub-alternatives for the wall type (i.e., T-wall, gravity wall, steel sheet pile wall, I-wall). The analysis included an assessment of the dike's ability to manage site geometry and access, seepage, settlement, culvert installation, future modification capability, and construction sequencing.

Gate structure configurations considered included: slide gates with separate flap gates, combination slide-flap gates, and inverted weir stop logs. The FEIR also considered different types of gate operator alternatives such as manual operators (e.g., hand-operated crank or wheel-type) or power operators (e.g., electrically or hydraulically actuated from a power source, in this case a portable electric power generator as no 3-Phase power is available at this location).

The FEIR compared each alternative using similar selection criteria to those used in the selection of the Chequessett Neck Road Dike. The Mill Creek Dike Preferred Alternative consists of a sheet pile wall because it will reduce the construction footprint/wetland impact, lower construction costs, shorten construction duration to limit impacts to CYCC operations, and reduce maintenance requirements. It will include an approximately 630-foot long and 48-foot wide (at the base) earthen berm with a 12-foot wide roadway along its crest. A sheet pile wall will be driven through the berm and extend approximately 20 feet below grade to eliminate seepage. Flow control structures will be mounted directly to the wall, on the River side face. Five openings, approximately 5 feet wide by 6 feet tall, separated by 18-inch concrete columns, will be required. The wall will be constructed in accordance with the USACE *Engineering Manual: Retaining and Flood Walls (EM 1110-2-2502)*. Stone armor will be placed near the flow control structures to provide scour protection. The steel sheet pile wall will be constructed with a "sacrificial thickness" to allow the wall to be subject to corrosive action over its lifetime without resulting in structural failure.

The Mill Creek Dike Preferred Alternative will result in the permanent loss of approximately 29,500 sf of wetlands due to the placement of fill, including approximately 3,600 sf of salt marsh associated with a vehicle access route from the adjacent upland. Access for inspection, maintenance and tide controls will be provided with a gate operator's cantilevered steel walkway system.

Common Project Elements

Project elements common to all action alternatives include: incremental tidal restoration; monitoring; public access and recreation opportunities; vegetation management; low-lying road crossings and culverts; restoration of tidal channel and marsh surface elevation; removal of tidal restriction at High Toss Road; and, tide control structure at Upper Pole Dike Creek. Incremental tidal restoration is planned to allow monitoring of the system so that unexpected and/or undesirable outcomes can be detected and appropriate response actions taken. Field monitoring will be closely tied to the AMP and designed to measure progress towards project objectives and assumptions built into the conceptual models. In addition to traditional ecological monitoring, these data will be used to support management decision making and assessment. Specific monitoring data subsets are discussed later in this Certificate. Development of public access points or visitor facilities is likely to occur at the discretion of adjacent landowners or stakeholders (e.g., the Towns, Wellfleet Conservation Trust, Friends of Herring River). The Chequessett Neck Road Bridge will be designed to include safe fishing access and canoe and kayak launches are being considered in final design. Other opportunities that will be considered include walking trails and access to recreational shellfishing areas.

Changes due to tidal range, frequency and duration of tidal flooding, soil saturation, and salinity will require vegetation management. It will facilitate re-establishment of tidal marsh, improve fish passage, and reduce mosquito breeding habitat. These activities will occur in stages over a period of several years and are planned to occur before tidal flow is restored to each sub-basin. This will consist

primarily of removal of shrubs and trees before salt water reaches them and invasive vegetation control. These actions will be similar in type and implemented in an identical manner for each alternative; however, the spatial extent and timing of actions may vary.

Low-lying roads within the Herring River flood plain range from infrequently traveled fire roads to moderately busy paved roads. Portions of these roads will be vulnerable to high tide flooding or coastal storm surge from the storm of record (Blizzard of '78) subsequent to the proposed restoration.[3] To prevent this, these roadway segments may be elevated or relocated. Alternatively, consideration will be given to the extent that minimal risks can be accepted. Water surface elevations within any sub-basin will not be increased until mitigation for low-lying roads is in place. The FEIR included the engineering design report prepared by the Louis Berger Group, Inc., entitled *Herring River Restoration Project Engineering Design to Elevate Low-Lying Roadways and Replace Associated Culverts*, *Truro and Wellfleet*, *Massachusetts* (June 2015). It described property conditions, including wetland delineation, geotechnical, and site survey data, presented preliminary design plans for culverts and roadways, and proposed traffic management options. It evaluated alternative design features (e.g., side slope ratios, fill, layout, etc.) to limit environmental impacts. The FEIR summarized maximum impacts to these roads for each alternative. These estimates are subject to change upon completion of survey and design work.

Paved Roads

Road Name	Maximum Length Affected (ft)	Impacts of Alternative D	Potential Flood Proof Solution(s)/Comments
Bound Brook Island road/Old Country Road	3,700	Flooded at MHW and above	Elevate. Possibly relocated some sections; also replace two culverts
Pole Dike Creek Road	3,105 (two segments)	Flooded at MHW and above	Elevate, possibly relocate some sections; also replace culvert
Duck Harbor Road/Griffin Island Road	1,284 (two segments)	All flooded by coastal storm driven tidal event	Elevate or accept minimal risk
Old Chequessett Neck Road (Snake Creek Rd)	703	Adjacent Area flooded by coastal storm surge	Elevate or accept minimal risk
Old County Road (Paradise Hollow), Wellfleet	289	Flooded at MHWS and above	Elevate and replace culvert
Old County Road (Lombard Hollow), Truro	197	Flooded at AHW and above	Elevate and replace culvert
Old County Road (Prince Valley), Truro	119	Flooded by coastal storm driven tidal event only	Elevate and replace culvert
Maximum length of affected paved roads	9,397	9,397	

[3] According to the report, the roadway will be overtopped during the 100-year storm as mapped by FEMA as this exceeds the elevations observed during the Blizzard of 1978 (storm of record). The Blizzard of 1978 resulted in an observed 9.7-foot tide (USACE Atlas of Tidal Flood Profiles for the New England Coast, 1988).

Fire Roads

Road Name	Maximum Length Affected (ft)	Impacts of Alternative D	Potential Flood Proof Solution(s)/Comments
Duck Harbor Road, Fire Road West of Herring River	4,574	>75% flooded at MHWS and above	Elevate sections Relocate to adjacent upland Accept minimal risk
High toss Road, from Pole Dike Rd to Snake Creek Rd.	3,299	>75% flooded at MHWS and above	Elevate sections Relocate to adjacent upland Accept minimal risk
High Toss Road, causeway across flood plain	1,017	Flooded at MHW and above	Elevate Remove Culvert to be removed or enlarged
Snake Creek Road (Rainbow Lane)	992	>75% flooded at MHWS and above	Elevate sections Relocate to adjacent upland Accept minimal risk
Mill Creek Lane	395	100 ft flooded at AHW; All flooded at coastal storm driven tidal event	Elevate sections Accept minimal risk
Ryder Beach Road, Truro	176	Affected by coastal storm driven tidal event only	Elevate Accept minimal risk
Ryder Beach Road, Truro	118	Affected by coastal storm driven tidal event only	Elevate Accept minimal risk
DPW Yard Driveway	101	Affected by coastal storm driven tidal event only	Elevate Accept minimal risk
Ryder Beach Road, Truro	55	MHW and above	Replace culvert Elevate
Maximum length of affected sand and fire roads	10,727	10,727	

The project will include actions to elevate certain roadway segments to a minimum grade of 5.5 feet, one to three feet above the existing grade, to prevent overtopping from storm driven tides in the Herring River. Based upon the preliminary design, this elevation may require a minimum fill of 57,400 cy which may increase (or decrease) based upon final roadway design and will be reviewed as part of the local, State and federal permitting processes, as applicable. The elevations identified in the FEIR assumed six inches of freeboard to provide a factor of safety against unknown or climate change driven

increases in flood elevations; the Proponent will continue to evaluate the acceptable amount of "freeboard" in determining minimum roadway elevations.

According to the report, the proposed roadways will retain their horizontal alignments with minor adjustments to vertical alignment as necessary to accommodate increased elevation and culvert crossings. Proposed elevated roadway segments for Old County Road, Bound Brook Island Road and Pole Dike Creek Road consist of two 11-foot travelways and two three-foot unpaved shoulders with a 3:1 side slope treatment. Associated widening of the road base could impact to up to 90,000 sf of wetland resource areas. Permanent and temporary impacts to BVW, BLSF, ILSF, Bank, LUW, and Riverfront Area are anticipated but will depend on final design and surveys. These impacts should be tabulated in the local and State wetlands permitting applications upon completion of project design.

Grading will be minimized to limit fill outside the right-of-way and minimize wetland impacts. However, in some locations it may be necessary to extend fill onto private and municipal properties. The FEIR estimated this total impact at approximately 24,000 sf, but is subject to change based upon final project design and resolution of access agreements. This may include adjustments to isolated public or private driveways to eliminate negative sloping and ponding. The roadway elevation projects must meet the MassDEP stormwater management standards (SMS) to the maximum extent practicable in accordance with the standards for redevelopment projects.

Six culverts will be replaced as part of the low-lying roads projects. These include: Pole Dike Road, a 36-inch steel pipe (Station 6+90); Bound Brook Island Road at Herring River, a 54-inch reinforced concrete pipe (RCP) (Station 57+13); Bound Brook Island Road at Bound Brook, a 24-inch RCP (Station 63+65); Old County Road at Paradise Hollow, a 12-inch RCP (Station 83+59); Old County Road at Lombard Hollow (S), a pipe of unknown diameter and type (approximately Station 121+34.66); and Old County Road at Lombard Hollow (N), a pipe of a pipe of unknown diameter and type (approximately Station 134+56.82).[4]

Based on the results of the 2012 *Herring River Hydrodynamic Modeling Final Comprehensive Report* and MassDOT guidelines, the FEIR presented preliminary design information for each replacement culvert. The Pole Dike Road and Bound Brook Island Road culverts will be replaced with appropriately-sized box culverts. The culverts on Old County Road will be replaced with larger RCP culverts. The Massachusetts Stream Crossing Standards were not used to define the required crossing span because the crossings will be converted from freshwater to tidal systems post-restoration. The span of the culverts will be based solely upon the hydraulic capacity required to convey the storm of record.

The Herring River presently passes under High Toss Road (the second road that crosses the river) approximately one mile upstream from Chequessett Neck Road. It is an infrequently traveled, unpaved earthen berm capable of accommodating pedestrian and emergency vehicle access to Griffin Island. The Herring River passes under the road at the western end though a five-foot diameter concrete culvert. Under all restoration scenarios High Toss Road will be overtopped daily by seawater and ebb tide drainage will be impeded by the causeway.

[4] The culverts at Old County Road and Lombard Hollow were either not able to be located or fully submerged. The existing culverts are likely 10-inch to 12-inch in size.

The tidal restriction at High Toss Road will be removed completely under all action alternatives. It will be replaced with either a box culvert or an open channel with sufficient hydraulic capacity. An open channel may include a bridge spanning the river if pedestrian and/or vehicle access was continued. Preliminary analysis suggests that a tidal channel approximately 30 feet wide will be needed to adequately convey tidal flows, although further hydrodynamic modeling and analysis is necessary to advance either design.

High Toss Road will be flooded at high tides greater than approximately three feet in all action alternatives. Alternatives to ensure adequate drainage and avoid or minimize potential impacts are under consideration and range from elevating the roadway above predicted high tides to removing it in its entirety and constructing a boardwalk to facilitate non-vehicular public access. According to the FEIR, the NPS and Town of Wellfleet have determined that elevating and reinforcing the embankment to withstand daily tidal flow in a manner that maintains vehicle access is impractical due to environmental impacts (approximately 13,000 sf of wetland impact), cost (construction and long-term maintenance) and infrequent vehicle use. Decommissioning and removal of the roadway may result in additional wetland restoration. Maintaining public access in this location is a concern; it may include pedestrian, bicycle, equestrian, and canoe/kayak access. I encourage the NPS and the Towns to continue to work with stakeholders during final project design and prior to submitting environmental permit applications to address this unresolved concern.

To achieve maximum tidal restoration, actions will be necessary to reverse previous direct and indirect alteration of the system's topography, bathymetry, and drainage capacity. Diking and drainage have caused subsidence of the former salt marsh by up to three feet in some location, while other areas have been channelized or blocked by soil berms. Guided by the AMP, the following supplemental habitat management actions will be implemented to counteract the limitations created by these historic alterations and reduce potential barriers that may limit or delay progress:

- Dredging of accumulated sediment to establish a natural bottom of the Herring River channel at the appropriate depth and maximize ebb tide drainage;
- Creation of small channels and ditches to improve tidal circulation;
- Restoring natural channel sinuosity;
- Removing lateral ditch dredge spoil berms and other anthropogenic material on the marsh surface to facilitate drainage of ponded water;
- Applying a thin layer of dredged material to build up subsided marsh surfaces; and
- Beneficial re-use of dredged material to enhance the sediment supply and promote marsh accretion within the flood plain, as informed through the AMP.

The Upper Pole Dike Creek sub-basin contains approximately 130 private parcels located wholly or partially within the historic floodplain. Hydrodynamic modeling indicates that portions of these low-lying properties will potentially be affected by restored tides. A tide control structure will be constructed to provide an additional layer of control and to maintain a specific tide regime for this sub-basin. Assessments to determine if partial restoration of tidal flow is possible in this sub-basin are ongoing. Although the project goal includes full restoration of this sub-basin, it will not occur unless and until provisions are in place to prevent any structural impacts to private property. Regulatory approvals and funding will also be required to implement mitigation measures if deemed necessary.

Low-lying Properties

The project will result in impacts to low-lying properties situated within the historic floodplain due to increased tidal influence and potential changes to State and local wetland resource areas regulatory jurisdictions. According to the FEIR there are 378 parcels of potentially affected private land, owned by 325 individuals and trusts. The majority of these properties are located within the Mill Creek or Upper Pole Dike Creek sub-basins.

CYCC

The HRRC and FHR hired a team of golf course designers to prepare plans to reconstruct the fairways, tees, greens, and other modifications to prevent impacts from the restoration of tidal flow in Mill Creek on CYCC property. According to the FEIR, representatives from the CYCC and HRRC agreed upon a detailed design plan for the golf course to allow for the assessment of project impacts and to inform ongoing negotiations regarding the potential funding and execution of Option 1 or 2.

Under Alternatives B and D portions of the CYCC property (golf hole numbers 1, 6, 7, 8, 9 and the practice area) will be impacted by tidal waters that require modification to avoid flooding. Option 1, relevant to either Alternatives B or D, will relocate the practice area and portions or all of holes 1, 6, 7 and 8 to upland areas west of the current golf course and will elevate portions of fairway 9 in place. A portion of former fairway 1 will also be elevated to accommodate a new area. In this option, most abandoned parts of the golf course will become subject to tidal exchange and transition back to wetland resource areas. This option will require filling approximately 89,000 sf on hole number 9, which according to the FEIR, cannot be relocated due to its proximity to the CYCC golf clubhouse. This option will result in approximately 30 acres of long-term upland disturbance. According to the FEIR the relocation of low-lying golf holes will require an extensive archaeological investigation given the likely cultural and archaeological resources in these upland areas.

Option 2 will retain the current layout of the course, elevate low-lying golf holes, and relocate the practice area to an upland site that will also serve as the borrow area for the fill necessary to elevate the low fairways. In this option, the current practice area and an area between fairways 7 and 8 will be restored to tidal wetland. This option will result in the loss of approximately 360,000 sf (8.3 acres) of wetlands due to placement of approximately 150,000 cy of fill. Under existing conditions all of the wetland areas to be filled are currently maintained by the CYCC as part of the golf course, with the exception of approximately 4,800 sf, which is naturally vegetated. Fill will be elevated above the high tide line and regraded as golf holes, leaving the layout of the golf course generally unchanged. Fill would be generated from an approximately 5-acre borrow area on adjacent uplands owned by the CYCC. Preliminary cultural resource assessment reports have identified this borrow area as highly sensitive for potential pre-contact archaeological resources. If selected as a borrow site, the Proponent will likely be required to complete a site-specific archaeological inventory prior to site disturbance.

Implementation of Alternative B or D with Options 1 or 2 will curtail use of the golf course during the process of moving or filling the low-lying golf holes (estimated at 20 months). This construction period will result in loss of revenue to CYCC. Alternative C, with its tidal exclusion dike at the mouth of Mill Creek eliminates the need for additional flood protection measures for CYCC and other Mill Creek properties. In Alternative C the CYCC golf course remains unchanged and will

continue to experience periodic flooding and land subsidence issues due to its low elevation and underlying marsh peat.

I note that comments from CYCC's environmental consultant and a technical memorandum prepared by Woods Hole Group (dated March 4, 2016) present divergent conclusions regarding the potential impacts of the various project alternatives (including Alternative C) on groundwater and flooding on CYCC property. The Proponent will implement a surface water and groundwater monitoring program prior to any changes to tidal range in the Herring River. This monitoring program will include establishing baseline groundwater conditions and collecting data to detect future project-related groundwater elevation changes on the golf course. Groundwater monitoring wells will be located at key locations within the Mill Creek sub-basin and other parts of the floodplain. The monitoring and mitigation program should be established in agreement with the CYCC and include quantifiable and objective criteria to determine when additional mitigation may be necessary. Monitoring should be implemented regardless of the selected action alternative and mitigation should be implemented for Alternative B or D.

Project costs include reconstruction of the golf course and offsets of business losses during the construction period as part of the overall funding for the restoration project. The Proponent and CYCC continue to work towards development of a conceptual framework to address anticipated impacts and mitigation to the golf course. As noted in the FEIR, if an agreement on the framework by CYCC and HRRC is achieved prior to the preparation of the project's permitting applications, the golf course work will be proposed as part of the initial phase of design, permitting, and funding for the restoration project. If an agreement cannot be reached prior to preparation of permit applications:

1. Tidal restoration will not be proposed in the Mill Creek sub-basin until a later project phase after mitigation agreements are finalized with the CYCC and other affected Mill Creek landowners;
2. The Proponent will continue to advance permitting and other elements of the project that support tidal restoration in the main Herring River basin; and
3. The Proponent will, in good faith, continue to seek mitigation agreements with CYCC and other affected landowners in the Mill Creek sub-basin.

Residential Properties

Increased tidal exchange under all action alternatives will result in impacts to multiple low-lying properties. Benefits may include the retreat of invasive vegetation and a transition to open marsh and water vistas, resulting in potential increases in property values. Adverse impacts may include tidal flooding of low-lying structures and cultivated vegetation. Any of the action alternatives will result in changes to jurisdictional wetland resource areas on some properties within the project area. These jurisdictional changes will likely occur due to the anticipated landward shift of the 200-foot Riverfront Area resulting in expanded jurisdictional areas on properties already partially located in the Riverfront Area or those that are currently located outside of the Riverfront Area.

Hydrodynamic modeling results, aerial photography, topographic and ground survey data, and property records from town assessor databases were used to assess potential physical and regulatory impacts to these properties. Properties were categorized based upon the frequency of tidal water

reaching the property (e.g., one day per year, monthly high spring tides, daily high tides, etc.) and the character of the land (e.g., non-cultivated, non-landscaped, lawns, gardens, planted trees, etc.) or impacted structures (e.g., buildings including residences, sheds, garages; driveways, private lanes, wells, septic systems). To refine impact data, the Proponent has consulted with individual property owners, and in some cases, acquired more detailed site-specific data. This process will continue as the project advances through the design, permitting, and implementation phases.

The FEIR included a comparative table summarizing the potential number of affected low-lying residential properties for each action alternative:

Physical Impacts due to Restored Tidal Influence	Number of Affected Parcels[a]		
	Alternative B	Alternative C	Alternative D
Natural Vegetation Only Total	126	120	145
Frequent Only[b]	8	7	8
Infrequent Only[c]	46	50	54
Both Frequent and Infrequent[d]	72	63	83
Cultivated Vegetation Only	2	1	2
Frequent Only	None	None	None
Infrequent Only	2	1	1
Both Frequent and Infrequent	None	None	1
Both Natural and Cultivated Vegetation Total	28	24	32
Frequent Only	None	None	None
Infrequent Only	None	None	None
Both Frequent and Infrequent	28	24	32
Total Physically Affected Parcels	**156**	**145**	**179**
Parcels with Affected Structures[ef]			
Frequent	5	4	6
Infrequent	2	2	4
Changes to Riverfront Area			
Parcels with both Riverfront Area Change and Physical Impacts	318	247	322
Parcels with Riverfront Area Change Only[g]	165	126	169

[a] These approximations are based primarily on preliminary desktop analysis and will be refined upon further consultation with individual property owners and development of more comprehensive, site-specific property data.
[b] Entire parcel or structure affected by mean high and mean high spring tides
[c] Affected portion of the parcel or structure impacted only by annual high and storm tides
[d] Parcels contain areas both above and below mean high spring tide
[e] Includes physically affected driveways, wells, and buildings; several parcels include multiple affected structures
[f] Lots with affected structures may also include vegetation and Riverfront Area impacts
[g] No physical impacts expected

The data presented in the FEIR identify the potential scope of properties that will require mitigation measures to facilitate implementation of the Preferred Alternative and maximize tidal restoration within the Herring River estuary. The HRRC has met, and will continue to meet, with potentially affected landowners to discuss potential impacts and mitigation. I note that within the boundary of the Seashore in the Lower Herring River, there are two private properties that will be flooded by the initial phases of project implementation. No tide control structures are located between these properties and the Chequessett Neck Road Dike. At present, a voluntary acquisition is being negotiated for one of the properties. According to the FEIR, as no other flood mitigation measures may be feasible, the NPS may consider an eminent domain taking in the absence of a willing seller.

Other low-lying properties that may be impacted by the project will be subject to an ongoing process by the Proponents to identify the properties, assess impacts, and work with substantially-affected landowners on mutually acceptable solutions to mitigate impacts. The FEIR indicated that those properties with predicted impacts to structures will require additional analysis (i.e., on-site survey, soils testing, etc.). A suite of potential mitigation measures include: elevating or relocating driveways and landscaping; relocating wells; construction of small berms or flood walls; moving or elevating structures; and compensation for lost value or voluntary sale of easements or other interests in land.

As the majority of structurally affected private properties are located within the Mill Creek or Upper Pole Dike Creek sub-basins, numerous measures will be implemented to provide overlapping and redundant protection of restored tidal flow in these sub-basins, including:

1. The tide control structure at the reconstructed Chequessett Neck Road Dike will be opened incrementally. Tidal ranges and water levels throughout the project area will be monitored to ensure that the river/estuary system is responding as modeling predicts and no adverse impacts will occur.
2. Additional tide control structures will be installed to provide additional tidal control and will be designed and operated to create a tidal regime specific to each sub-basin. These structures will be opened and monitored similar to the Chequessett Neck Road Dike tide gates.
3. Site-specific mitigation measures will be employed for individual properties to prevent tidal flows from impacting structures. These mitigation measures will be constructed with the explicit consent and cooperation of landowners under the terms of site-specific landowner agreements.
4. The effectiveness of all individual impact mitigation practices will be specifically monitored to ensure they are working properly, maintained, and in good condition. The exact nature and duration of this monitoring will vary based on site-specific circumstances, but will be specified within each landowner agreement. Baseline data should be gathered prior to taking actions that may impact individual properties. Monitoring will likely include use of surface water instrumentation and groundwater wells placed downgradient of areas of concern. For those properties where wells may be impacted, the monitoring should include evaluation of drinking water quality.

Wetlands and Waterways

The project is proposed as an Ecological Restoration Limited Project in accordance with newly promulgated MassDEP regulations. These regulations include provisions for Combined Applications and Limited Project status for eligible ecological restoration projects. Projects that "may result in the temporary or permanent loss of Resource Areas and/or the conversion of one Resource Area to another when such loss is necessary to the achievement of the project's ecological restoration goals" may be approved in accordance with 310 CMR 10.24(8) and 310 CMR 10.53(4). As noted in the FEIR, there are no thresholds for the amount of alteration/loss allowed if it is determined that the project complies with applicable Ecological Restoration Limited Project provisions. The FEIR discussed project characteristics that, in the opinion of the Proponent, make it eligible for approval as an Ecological Restoration Limited Project. These include:

- It meets the definition of an Ecological Restoration Limited Project (310 CMR 10.04) because "its primary purpose is to restore or otherwise improve the natural capacity of an Resource Area(s) to protect and sustain the interests identified in M.G.L. c. 131 s.40, when such interests have been degraded or destroyed by anthropogenic influences";
- It will be implemented in accordance with a Habitat Management Plan approved by NHESP;
- It will be carried out in accordance with any TOYs or other conditions recommended by DMF;
- It will not involve any work on or adjacent to a Coastal Dune or Barrier Beach;
- The FEIR and subsequent NOIs will clearly demonstrate the extent and severity of impairments to the Herring River estuary, the magnitude and significance of the project benefits to protect and sustain the interests of the WPA, and that any unavoidable adverse impacts to existing Resource Areas will be minimized while achieving the project's ecological restoration goals;
- BMPs will be used to avoid and minimize construction-period impacts; and
- It will not increase flooding or storm damage impacts to the built environment (e.g., buildings, wells, driveways, roads, etc.). Potential impacts will be avoided through implementation of site-specific flood prevention measures in accordance with recognized design standard and formal agreements with landowners.

The Proponent will be required to provide all supporting data and design details, as necessary, to demonstrate that the project can be approved as an Ecological Restoration Limited Project by MassDEP. This should include details of flood impact mitigation measures and landowner agreements to ensure protection of private properties.

The Proponents will submit a 401 WQC/c. 91 application for a Combined Permit. Although the project will involve dredging of more than 100 cy in an ACEC and Outstanding Resource Water (ORW) it will be permitted with a 401 WQC, per 310 CMR 10.12(1)(l). The 401 WQC application will include: details regarding removal, handling, and placement of sediment entrained in former tidal channels and other measures required to improve tidal circulation and accretion of marsh surface elevations; additional information about sediment

chemistry, including plans for additional sampling and characterization of metals and organochloride pesticides potentially mobilized during the project; stormwater management considerations; and details regarding BMP's for construction, TOY restrictions, erosion and sediment control, and construction sequencing.

The placement of fill and the new construction, substantial alteration, or expansion of existing structures below the historic (pre-Chequessett Neck Dike) MHW line may be subject to c. 91 jurisdiction. According to the FEIR, no structures or fill within the Herring River floodplain (with the exception of the Bound Brook culvert) have c. 91 licenses. License applications will be submitted for all fill and structures below the historic MHW, including:

- The Chequessett Neck Road Dike;
- The Mill Creek dike and tide control structure;
- Fill placed to elevate portions of the CYCC golf course;
- New culvert (or bridge) and access improvements along High Toss Road;
- New culverts and fill placed along reaches of Pole Dike Creek, Bound Brook Island, and Old County Roads; and
- Other small culverts and related fill along roadway segments in the upstream reaches of the project area.

The Proponent reviewed Coastal Restriction Order maps and other documents on file at the Town of Wellfleet Health and Conservation Office. No portions of the Herring River project area were identified within these restricted areas. Although it appears that no portions of the Herring River project are subject to a Coastal Restriction Order pursuant to M.G.L. c. 130, s. 105, should it be determined that any portion of the Herring River estuary is under a Coastal Restriction Order, an amendment to said Order may be necessary.[5]

Salinity of Surface Waters

The project is strongly influenced by the geographic extent of tidal inundation with saline water, the variable salinities of that water, the frequency and depth of inundation (both during daily cycles and infrequent storm events), and the volume of tidal water (i.e., tidal prism) moving in and out of the estuary. Existing conditions within Wellfleet Harbor include salinity ranges between 30 and 32 part per thousand (ppt). Construction of the Chequessett Neck Road Dike has limited upstream mean tide range to only 2.2 feet compared to 10.3 feet downstream of the dike. Because of this altered hydrology, saline waters during high tide currently extend 1.2 miles upstream of the dike. Monitoring data between 2006 and 2010 conducted by the Seashore confirm that waters within the upper estuary are consistently fresh, with other data documenting that saline waters never reach High Toss Road during normal tides.

Under the Preferred Alternative, the predicted mean high spring tide water surface elevation of approximately 5.6 feet in the Lower Herring River will restore tidal influence to approximately 890 acres of the former Herring River floodplain. High salinity water will consistently reach the Lower Herring River, Middle Herring River, Lower Pole Dike Creek, and

[5] Email from Patti Kellogg, MassDEP, July 14, 2016

Mill Creek sub-basins, and the eastern half of the Duck Harbor sub-basin, while salinity levels will remain low (generally below 5 ppt) in the Upper Herring River, Upper Bound Brook, and Upper Pole Dike Creek sub-basins. All three of these upper sub-basins will be subjected to small tidal fluctuations, and salt marsh species will not be expected to dominate these areas, except possibly in locations immediately proximate to the tidal channels. These salinity changes will result in permanent, estuary-wide changes in the penetration of high salinity water into lower and mid-floodplain sub-basins, critical to achieving the desired transition from a degraded freshwater wetland to a functioning estuarine wetland. Salinity is a critical factor in the presence or relocation of non-native *Phragmites* within the Herring River estuary. The project's impact on *Phragmites* is discussed later in this Certificate.

Water and Sediment Quality

The Herring River is designated as a Class SA water (the highest coastal and marine class) under the Massachusetts Surface Water Quality Standards (314 CMR 4.00) requiring excellent habitat for fish, other aquatic life and wildlife, and primary and secondary recreation. The Herring River is also designated by the Commonwealth as an ORW. The Herring River estuary does not meet its targeted designations under Massachusetts' regulations due to its degraded water quality conditions and has been listed on the 303(d) list of impaired waters under the federal Clean Water Act (CWA). The Herring River segment between Herring Pond and High Toss Road is impaired for metals and pH, while the segment from south of High Toss Road to Wellfleet Harbor is impaired for pathogens.

Degraded conditions are associated with low dissolved oxygen concentrations, highly acidic water resulting from the oxidation of organic matter and iron-sulfide minerals in salt marsh soils, increased dissolved iron concentrations in locations with the lowest rates of flushing, and dissolved aluminum concentrations above levels of concern within some portions of the estuary. The lack of tidal flushing within the Herring River estuary has resulted in an accumulation of nutrients. High organic matter production in salt marshes results in high concentrations of carbon and nutrients in marsh soils. Reflooding sediments within the estuary will release accumulated ammonium-nitrogen into receiving waters. This aspect of marsh restoration will be a focus of ongoing nutrient monitoring. While pesticides were used historically within the system for mosquito control, samples analyzed did not exceed NOAA guideline values. Finally, high fecal coliform concentrations (likely from wildlife in the estuary and watershed) have kept the Herring River downstream of the dike permanently closed for shellfishing in some parts and only conditionally approved in other parts.

Under the Preferred Alternative, the project is expected to reduce system residence times upstream of High Toss Road by a factor of 33 (200 days vs. 6 days), resulting in regular tidal flushing of the Herring River estuary with well-oxygenated water from Wellfleet Harbor. The maximum extent of tidal exchange is projected to be 889 acres in the Preferred Alternative compared to existing conditions (70 acres). Increased tidal exchange and reduced residence times are expected to maintain dissolved oxygen concentrations above State water quality standards at all times. However, summertime dissolved oxygen levels could remain low in ponded areas and obstructed ditches that are not regularly flushed by tidal waters. Tidal flushing is also expected to reduce acidification within the mid-portion of the Herring River estuary

where saline water will again saturate drained peat. Restored salinities will reduce the leaching of aluminum and iron from the soils to receiving waters in concentrations that stress aquatic life. Decreased decomposition and increased saturation of soil pore spaces with water will also prevent further subsidence of the marsh surface. Improved tidal flushing will dilute and remove nutrients from the system with each tide cycle and the gradual reintroduction of tidal exchange is expected to allow ammonium-nitrogen to be slowly released, avoiding nitrogen loading that could contribute to algal blooms in receiving waters. Fecal coliform concentrations are also expected to substantially decrease with regular tidal flushing and will likely allow for the removal of the Herring River from the 303(d) list for pathogens.

Sediment Transport and Soils

Sediment transport analyses of the existing system found that normal tidal flow velocities are sufficient to initiate sediment movement, but only in the vicinity of the Chequessett Neck Road Dike. This study also confirmed that the system is flood-dominant; meaning that net transport of sediment is into the Herring River. The Chequessett Neck Road Dike has caused a substantial reduction in flow velocity during flood tides in the area immediately downstream of the dike (as compared to pre-dike conditions), which likely has resulted in settling and deposition of suspended sediment during the slack flood tide in this area. When the Herring River was diked in 1909, sediment transport processes were interrupted and both the salt marsh and the underlying peat began to subside and the former tidal channel system completely or partially filled with sediment. According to the FEIR, much of the marsh surface upstream of the Chequessett Neck Road Dike is currently at elevation between one and three feet; up to three feet lower than marsh surface downstream of the dike relative to modern mean sea level. This difference is attributable to both subsidence from pore-space collapse and peat decomposition on the upstream side of the dike and sediment accretion on marsh located downstream of the dike. The FEIR identified the various types of soils within the project area, as determined and classified by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS). Approximately 80 percent of the Herring River floodplain is comprised of hydric soils.

Opening the dike and increasing tidal exchange will mobilize sediment that has accumulated within the existing channels, including a flood-tidal shoal located just upstream of the Chequessett Neck Road Dike, and the smaller ebb-tidal shoal that has formed just downstream of the Chequessett Neck Road Dike. Restoration of tidal flows will resaturate drained peat, increase peat accumulation through the stimulated growth of marsh vegetation, reduce subsidence, and enhance sediment delivery to the marsh leading to an increase in marsh elevation. Changes in the tidal water surface elevation and subsidence of the marsh surface will be monitored to ensure a successful transition back to a salt marsh with healthy vegetation.

The Preferred Alternative will enhance sediment transport throughout the Herring River estuary. Three classes of sediment transport are anticipated to occur: bedload, suspended load, and suspended fines. Fine sediments that have accumulated in the tidal channels upstream and downstream of the Chequessett Neck Road Dike will be temporarily mobilized as suspended load and suspended fines. Over a longer period, bank and bed erosion will increase the dimensions of the restored tidal conditions. Finally, increases in tidal flow will alter the long-term sediment transport patterns, providing a source of marine sediment to the marsh surface.

Incremental increases in tidal flows will gradually increase the width and depth of channels due to bank erosion and erosion of the channel bed. As tidal flows increase, a much deeper, wider and well-defined channel is expected to form from just below the Chequessett Neck Road Dike upstream to the Middle Herring River and Lower Pole Dike Creek sub-basins. Coarser-grained sediments are expected to mobilize within the bedload along the bottom of tidal channels just upstream and downstream of Chequessett Neck Road Dike slightly seaward toward Wellfleet Harbor. Finer-grained sediments will be transported predominantly upstream, eventually settling out in the upper sub-basins of the Herring River. Very fine particles of sediment will remain in suspension and may be transported in either direction.

The FEIR described the potential impacts of sediment transport on tidal channels and marsh elevations and identified the three sources of sediment as inorganic matter from Wellfleet Harbor, upland sediment sources, and organic matter. While the rate and depth of sediment accretion cannot be quantified with certainty, the Preferred Alternative will increase the areas of potential sediment mobilization upstream of the Chequessett Neck Road Dike. Assuming a 10-foot high tide gate opening (the maximum), the potential area of sediment mobilization will range from 58 acres during normal tidal conditions to approximately 217 acres under 100-year storm conditions. This is substantially greater than the 0.1-acre of potential sediment mobilization under existing conditions. Areas of increased erosion upstream of the dike will be mostly confined to the future location of a more defined Herring River Channel. Areas of potential sediment mobilization downstream of the dike during normal tidal conditions will increase by 75 percent (from 56 to 98 acres) over existing conditions and by 50 percent (153 to 230 acres) during 100-year storm events.

The project will result in estuary-wide, beneficial changes to hydric soil types within the floodplain by increasing pore space, soil pH, and organic content as the soils are subjected to tidal inundation. Local changes in soil texture are also possible dependent upon the different erosional and/or depositional forces placed upon varying soil types.

Vegetation

The FEIR summarized current wetland habitats and vegetation within the Herring River floodplain based upon vegetation mapping conducted by the Seashore. The FEIR included refined vegetation cover type data to: project transitions from freshwater and upland habitat to tidally-dependent estuarine habitats; estimate changes to the coverage, and potential expansion, of non-native, invasive species common reed (*Phragmites australis*); and assess potential impacts to freshwater dependent State-listed rare species habitat.

The FEIR compared existing cover type acreages to those predicted under each alternative in each sub-basin. All action alternatives will result in widespread change of existing, degraded freshwater wetlands to estuarine sub-tidal and intertidal habitats. The restoration of tidal inundation and associated soil saturation and salinity is anticipated to result in the mortality of upland shrubland and woodland vegetation in approximately 700 acres of the project area. The proposed vegetation management plan will address the removal of woody debris as necessary to limit obstructions in tidal channels and hindrance to the establishment of marsh

grasses. In areas that have experienced subsidence monitoring data will be used to inform adaptive management decisions regarding supplementing the sediment supply, removing blockages to salt water circulation, and planting appropriate native species. These actions may also influence the extent and type of vegetation in the marsh system.

Many changes in wetland habitat and vegetation will occur in conjunction with the project, notably the extensive restoration of salt marsh vegetative communities, primarily in the Lower Herring and Middle Herring River, and Lower Pole Dike Creek sub-basins. Due to the low salinity levels expected in the upper reaches of the system, little if any salt marsh vegetation will colonize the Upper Herring River, Upper Bound Brook, and Upper Pole Dike Creek sub-basins. Within the Duck Harbor and Lower Bound Brook sub-basins salt marsh species are expected to colonize marsh areas adjacent to tidal channels and in some areas extend landward across the marsh surface. Subsided, former salt marsh areas within the Middle and Upper Herring River, Lower and Upper Pole Dike Creek, Duck Harbor and Lower Bound Brook sub-basins will be subject to sediment accretion and thus support a mix of salt marsh, brackish, and tidal freshwater plant communities.

Based upon refined salinity modeling and data, full implementation of the Preferred Alternative is estimated to restore approximately 868 acres of the 1,006-acre project area as intertidal habitat. Of this, approximately: 585 acres will be subjected to regular water column salinity levels of 18 ppt or higher; 99 acres will be affected by salinity between 6 and 18 ppt; 98 acres will be affected by freshwater tidal flow with salinity consistently below 6 ppt; and 86 acres will be tidally influenced sub-tidal, open water habitat with a salinity gradient ranging from approximately 30 ppt in the downstream reaches to 0 ppt in the upper reaches.

The 585-acre restoration area will consist of low and high salt marsh, intertidal mud flats, and open water salt pannes and pools. Habitat changes will occur based on variation in marsh surface elevation, frequency of tidal inundation, and salinity levels. These variables limit the ability to model and predict precise acreage estimates or the locations of specific intertidal habitats. The 99-acre area that will be subject to brackish tidal flow (6 - 18 ppt) will experience vegetation changes depending upon actual salinity levels and the extent and duration of tidal inundation. It is anticipated that these vegetation habitat changes will result in a substantial reduction in the extent of existing shrub, woodland, and forested habitats and an increase in the overall extent of emergent freshwater marsh species and limited expansion of moderately salt tolerant species in higher salinity zones. According to the FEIR, the vegetation community changes within the 98-acre freshwater tidal zone are difficult to predict given the subtle hydrologic change. Overall, the Preferred Alternative, upon full implementation, will result in the loss or substantial reduction of several existing upland and freshwater habitat types with virtually all of the existing forest, woodland, dry shrubland, and heath/old field habitat replaced with intertidal marsh. Some areas of existing wet shrubland and varied freshwater and wetland-upland transition habitats will persist on the periphery of the intertidal area above the reach of mean high spring tides.

Invasive *Phragmites* (common reed) primarily occupies approximately 70 acres within the Lower Herring River and Mill Creek sub-basins, with scattered small stands in Middle Herring River and Upper Pole Dike Creek. Changes in salinity (greater than 24 ppt) and tidal

ranges in the Preferred Alternative are expected to reduce the coverage of common reed in the lower reaches of the Herring River system (Lower and Middle Herring River, Mill Creek, and Lower Pole Dike Creek). However, according to the FEIR, common reed may migrate, and potentially expand, in the mid to upper portions of the Herring River where salinities will be brackish. The FEIR indicated that it is less likely that common reed will expand into remaining freshwater areas that will. Approximately 150-250 acres of brackish habitat within the project area may be susceptible to invasion by common reed.

Several management actions will be undertaken to limit the expansion of common reed within the estuary. Prior to increasing tidal range, the NPS will treat stands of common reed with herbicide above High Toss Road within the Seashore boundary. The NPS will also work with the Towns and project partners to treat significant stands of common reed on private lands, with a goal of controlling the species in the project area before tides are restored. According to the FEIR targeted management techniques will be used to limit potential impacts to native species. Techniques may include the use of backpack sprayers in large, dense areas of common reed, while "cut and drip" or "glove" herbicide application techniques will be used for areas of common reed that are less dense and interspersed with native vegetation. Regrowth and potential expansion of common reed throughout portions of the estuary subject to mid- to lower salinity levels will be monitored and follow-up actions taken as necessary as part of the AMP.

Aquatic Species and Fisheries

The FEIR listed the types and abundance of estuarine finfish, macroinvertebrate, and anadromous and catadromous fish species, and shellfish within the Herring River and Wellfleet Harbor based upon the results of aquatic fauna inventories and wildlife observations. The estuary downstream of the Chequessett Neck Road Dike is characterized by estuarine species that are dependent on marine conditions, while the abrupt change in salinity and tidal flushing in the Lower Herring River basin between the dike and High Toss Road results in a dramatic change in species richness and abundance, with species more tolerant of lower salinities becoming most dominant. Upstream of High Toss Road only freshwater or anadromous/catadromous species are found.

The FEIR assessed potential impacts to aquatic species under each project alternative based on known life histories and habitat requirements, and their past and present occurrence in the Herring River estuary and Wellfleet Harbor. This analysis used the projected mean high spring tide from the hydrodynamic model to approximate the extent of tidal influence and estuarine habitat.

Total estimated estuarine habitat under the Preferred Alternative will be approximately 878 acres. Approximately 11.5 miles of mainstem tidal creek for use by resident and migratory and anadromous species will be restored upon full implementation of the Preferred Alternative. Areas upstream of the dike where salinity penetrates are expected to experience an increase in diversity and population of resident estuarine fish species. The Preferred Alternative will create more habitat available for spawning of certain species. Freshwater fish species habitat will be reduced in the lower sub-basins; however, in the upper basins improved water quality and levels are expected to benefit these species. However, exactly how much habitat is available for fish

species will be dependent on accessibility. As the number and location of tidal creeks, marsh surface depth, and hydroperiod all play a role in accessibility for various species and life stages, these factors will be considered during implementation of the AMP. The new dike will benefit all species of anadramous and catadramous fish, including river herring, hickory shad, white perch and American eel through better fish passage, while improved water quality and salinity levels will increase the amount of nursery habitat for juvenile fish.

The FEIR described the existing conditions of the shellfishing industry, limitations on commercial and recreation harvesting, and aquaculture. Four commercially important species were identified: northern quahog (*Mercenaria mercenaria*), eastern oyster (*Crassostrea virginica*), bay scallop (*Argopecten irradians*), and softshell clam (*Mya arenaria*). Currently, shellfishing is prohibited in a 90-acre area immediately downstream of the Chequessett Neck Road Dike and within the Herring River due to poor water quality caused by fecal coliform bacteria. Finfishing is an important commercial industry and recreational activity, with bluefish (*Pomatomus saltatrix*) and striped bass (*Morone saxatilis*) as the two predominately fished species in Wellfleet Harbor. Estuaries provide habitats for finfish to spawn and grow, with many species dependent upon estuarine conditions for at least some stage of their lifecycle. The project will benefit commercial and recreational finfishing by improving habitat and water quality.

Softshell and hard clams will likely be able to colonize areas upstream of the dike within their preferred salinity ranges. According to the FEIR, it is unlikely that oysters will establish themselves naturally upstream of the dike, unless the bottom substrate of the river hardens naturally with restoration. Increased tidal flows will erode sediments in the existing tidal creek upstream and downstream of the dike; it is not known how much deposition will occur or how much sediment will be mobilized in areas of new or existing erosion. While softshell and hard clams can move up and down in the sediment column, they are not likely to be affected by sedimentation. However, oysters will be susceptible to burial by excessive sedimentation. The incremental opening of the dike will limit mobilization of sediment all at once or over short periods of time. For sediment that will mobilize as part of the restoration process, impacts to oysters are expected to be temporary due to the fine-grained nature of the mobilized sediment. The particle size of mobilized sediment and predicted flow velocities will be inadequate to deposit sediment within established aquaculture areas in Wellfleet Harbor as sediment transport processes in Wellfleet Harbor are far more dependent on tidally-driven forces in Cape Cod Bay then whatever forces may be exerted by a new, larger tidal opening at the Herring River. It is anticipated that the project will enable shellfish habitat areas currently closed to shellfishing to be reopened subject to the approval of DMF and the Town of Wellfleet. The project is not expected to negatively impact aquaculture resources in Wellfleet Harbor.

Wildlife and Rare Species Habitat

Over 450 species of amphibians, reptiles, fish, birds, and mammals depend on the diversity of upland, wetland, and coastal ecosystems found in the Seashore and nearby environs. Depending on the species, the Seashore may provide habitat all year round, or only during nesting season, migration, or winter. The FEIR identified known species and described suitable habitat for freshwater marsh birds and upland birds, salt marsh birds, mammals, reptiles and

amphibians. Much of these data were derived from ongoing Seashore monitoring and surveying efforts.

The project will result in habitat changes that will affect the distribution of terrestrial wildlife. Mammals, reptiles, and amphibians will gradually relocate to suitable habitat as the estuary transitions. No significant adverse impacts on regional populations are anticipated. While gradual, there will be a substantial change in the composition of birds species that use the area for nesting, foraging, migration, etc. based upon the corresponding changes to vegetation within the floodplain. Changes in avian community structure include an overall increase in species abundance and a shift from a community of generalist species to one dominated by waterfowl, shorebirds, and wading birds. Species dependent on woodland, shrubland, or heathland will become less abundant and will relocate to the periphery and upper extents of the 890-acre area affected by mean high tide or other adjacent upland areas.

There are six State-listed wildlife species within the project area that are currently listed as rare, threatened or endangered by the Natural Heritage and Endangered Species Program (NHESP) and regulated in accordance with the MESA. These wildlife species include: three birds, American bittern (*Botaurus lentiginosus*), least bittern (*Ixobrychus exilis*), and northern harrier (*Circus cyaneus*); two reptiles, diamondback terrapin (*Malaclemys terrapin*) and eastern box turtle (*Terrapene c. Carolina*); and one invertebrate, water-willow stem borer (*Papaipema sulphurata*). The FEIR also noted the presence of two federally listed threatened and endangered species under the Endangered Species Act: the rufa red knot (*Calidris canutus rufa*) a shorebird, and the northern long-eared bat (*Myotis* septentrionalis). The FEIR described each of the aforementioned protected species as well as their current status within the Herring River estuary.

The FEIR evaluated impacts to rare species based on the results of the hydrodynamic modeling and the projected changes to vegetation and habitats resulting from increased tide range and salinity. A comparative analysis of impact to each species was provided for Alternatives B and D. This analysis estimated potential acreage available as potential nesting, foraging, roosting, migratory, or breeding habitat (as applicable for each species) as well as unsuitable habitat within the project area. While the project will likely affect State-listed species and their habitats, not all impacts will be adverse in nature.

The following is a summary of the project's impact on protected species.

- **Northern Harrier**: while small habitat changes may occur in the Bound Brook sub-basin where nesting pairs have been recorded, areas suitable for harrier nesting will remain unchanged or may increase. The project will provide improved habitat for foraging.
- **American Bittern and Least Bittern**: while these species primarily use freshwater marsh habitats, they both also use brackish marsh habitats. Existing foraging, resting, or migratory habitat for these species will be affected or shifted within the project area.
- **Diamondback Terrapin**: while these species may be temporarily affected during the dike construction process as they currently use the small amount of salt marsh habitat upstream of Chequessett Neck Dike for nesting. Over the long-term the project is expected to restore hundreds of acres of nesting, nursery, wintering and foraging habitat in the Lower Herring River, Mill Creek, Middle Herring River, Lower Pole Dike Creek

sub-basins and portions of the Duck Harbor sub-basin (up to 30 times more habitat than existing conditions).

- **Eastern Box Turtle**: the project will restore more saline and/or wetter conditions which will render approximately 883 acres as unsuitable habitat. As the estuary transitions, turtles are expected to move to adjacent uplands. Turtles may be restricted in movement throughout the estuary in comparison to existing conditions, and will likely move to the periphery of the project area into upland areas. The FEIR noted that approximately 3,870 acres of suitable habitat is located adjacent to the project area in the Seashore.
- **Water-Willow Stem-Borer**: this nocturnal moth feeds almost exclusively on water-willow (*Decodon verticillatus*), a plant species with a low tolerance to frequent inundation by salt water. The FEIR assumed moth habitat was concomitant with observed water-willow stands and mapped wet shrubland and wet deciduous forest types. The Preferred Alternative will reduce water-willow habitat from an estimated 386 acres to approximately 131 acres. Approximately 265 acres of adjacent suitable habitat will remain unchanged. The project will affect the distribution of water-willow within the estuary's ecosystem, and may die off in certain sub-basins and increase in others. The project is not expected to have a negative impact on the regional population.

A more detailed plan and protocol to monitor potential impacts to rare species will be presented to NHESP in the draft Habitat Management and Monitoring Plan. It will be reviewed pursuant to MESA's habitat management exemption provisions (321 CMR 10.14(15)). NHESP comments indicate that it "appears that the proposed project will qualify for MESA Habitat Management Exemption…". Baseline data collection for listed species commenced in the spring of 2015 to inform the AMP.

Historic and Archaeological Resources

Potential impacts to archaeological resources will be associated primarily with the footprints of construction activities, as well as any other ground-disturbing activities, including borrow or construction staging areas. Additional surveys and data collection may be required prior to flooding of archaeological sites or archaeologically sensitive areas.

The NPC and MHC have executed a PA to address Section 106 compliance and facilitate the long-term implementation of the project and AMP. Under the PA, and the appropriate MHC and NPS archaeology permits, Phase 1B intensive/locational investigations are underway for proposed work areas near the Chequessett Neck Road Dike, CCYC golf course, and Mill Creek. A Phase 1A Archaeological Sensitivity Assessment was previously conducted within the Area of Potential Effect (APE) in 2011. The APE is defined as areas in the estuary below the 10-foot contour elevation, and certain upland areas where project impacts may occur, such as areas around CYCC, the Chequessett Neck Road Dike, and several low-lying roads including High Toss, Bound Brook Island and Pole Dike Roads, and the former Cape Cod Railroad bed. The NPS, MHC and Tribal Historic Preservation Officer (THPO) continue to consult regarding the scope of additional archeological investigations and mitigation measures necessary to implement the project.

No structures located in the Herring River estuary are listed in the National Register of Historic Places. However, a former tidal gristmill once spanned an historic dike at Mill Creek. Additionally, the Atwood-Higgins House, listed on the National Register in 1976, and other buildings associated with the house lie within 100 meters of the APE in the area associated with the restoration project near the confluence of Bound Brook and the Herring River on the eastern tip of Bound Brook Island. Other historic structures may be identified and evaluated as the extent of the project impacts are finalized; steps necessary to identify and evaluate historic structures in the APE are defined in the PA.

Climate Change Adaptation and Greenhouse Gas Emissions

The effects of predicted sea-level rise and climate change were considered throughout the preparation of the hydrodynamic modeling process that was used to inform the selection of the Preferred Alternative. The project is expected to function as a buffer to climate change, by improving the extent and health of wetlands to diffuse storm surges and stormwater runoff and act as a carbon sink.

The hydrodynamic model used for project planning, design and mitigation needs assessment evaluated a maximum impact scenario consisting of a coastal storm in Wellfleet Harbor of a similar magnitude to the "storm of record" lasting for three days forced through the rebuilt Chequessett Neck Road Dike with all tide gates completion open across the proposed 165-foot span. The Mill Creek Dike will be built to a crest elevation of at least 9.5 feet, two feet above the maximum storm-driven tide elevation in the Lower Herring River. Any constructed mitigation measure to prevent tidal flow impacts to low-lying roads or private properties will be designed based on the maximum storm-driven high tide elevation. According to the FEIR, the amount of freeboard provided for flood protection measures will vary and be determined based on site specific measures. To assess the potential impact of an extreme storm (and sea-level rise that may occur within the next 50 years), the hydrodynamic model was used to simulate the 1,500-year storm event. This 1,500-year storm event (less than 0.07 percent chance of occurring in any year) consisted of a storm event with tides peaking at 11.9 feet through three cycles with all tide gates open on the Chequessett Neck Road Dike. An 11.9-foot tide is the most severe storm that can occur prior to overtopping the Chequessett Neck Road Dike. Under this scenario, the maximum high tide in the Lower Herring River will be 8.8 feet, 0.7 feet below the crest of the Mill Creek Dike.

Furthermore, the Proponent evaluated the Preferred Alternative in light of various forecasted sea level rise scenarios in USACE guidance documents.[6] According to this analysis, the most extreme sea-level rise scenario will increase mean high water in the Lower Herring River from 4.3 to 4.6 feet by 2060 with the restoration project fully implemented. The analysis concluded that the amount of freeboard incorporated into the design of the project and its mitigation measures is sufficient to ensure continued protection against surface water impacts for at least the next 50 years. The FEIR acknowledged the challenges of predicting and analyzing the specific impacts of sea-level rise within the project area beyond 50 years. Within the 50-100 year timeframe sea-level rise impacts will become more severe – A CZM report estimates an

[6] *Sea-Level Changes Considerations in Civil Works Programs*. USACE Engineer Circular 1165-2-212 (2011) and *Water Resource Policies and Authorities: Incorporating Sea-Level Change Considerations in Civil Works Programs*. USACE Circular 1165-2-211.

increase by four to six feet by 2100 – and future managers and stakeholders of the Herring River will need to revisit the tide control infrastructure and mitigation measures currently proposed. The FEIR did consider the feasibility of increasing the height of the Mill Creek Dike as a climate adaptation measure when selecting the preferred design. I encourage the Proponent to continue to consider adaptability during the selection of mitigation measures for private property owners and the final design of tidal control structure at Upper Pole Dike Creek.

Construction Period

The FEIR addressed construction-period impacts associated with the major project elements, including the Chequessett Neck Road Bridge, Mill Creek Dike and CYCC.

Chequessett Neck Road Dike

The FEIR presented a traffic management plan to be implemented during the construction of the Chequessett Neck Road Bridge in order to maintain traffic flow and avoid long detours. Estimated average daily traffic volume on the road is 811 vehicles, with a summertime increase to 1,067 vehicles. The project will include the construction of a temporary bypass route on the eastern side (upstream) of Chequessett Neck Road to allow for a one-lane signalized alternating two-way traffic setup. The bypass route will consists of a temporary prefabricated modular steel bridge that will span approximately 190 feet across the Herring River. A cantilevered walkway platform will be provided as a bypass route for pedestrians and dismounted cyclists. This design will allow for the bypass of surface water around respective active work areas and avoid and/or minimize impacts to wetland resource areas. Temporary sheeting will be installed to form the embankments that will serve as temporary bridge abutments, as well as northbound and southbound approaches from those portions of the existing roadway that will remain outside the construction area. An estimated 6,400 sf of salt marsh and LUO will be impacted by the placement of the sheeting and approximately 6,300 cy of fill material to construct the two roadway approaches. These wetland resource areas will be subject to tidal action in the post-construction state.[7]

The FEIR identified several potential areas suitable for construction staging, laydown, and storage. The sites are generally proximate to the construction site and include areas that were previously disturbed (6,000 sf), currently paved roads and parking areas (15,000 sf), and an undisturbed site immediately adjacent to the Griffin Island side of the construction area (3.25 acres). Use of the adjacent undisturbed area could likely avoid construction costs and limit trucking given its immediate proximity to the dike; however, it would require the clearing of approximately two acres of upland vegetation, grading and may impact rare species habitat (eastern box turtle) and/or areas of potential cultural or archaeological sensitivity. The other potential staging areas are smaller and up to 1.3 miles from the project site, rendering them less practical. The undisturbed site could be constructed to avoid Herring River floodplain and associated wetland resource areas. Studies for turtle use and cultural resources were conducted in spring 2015 and the Proponent will continue to work with NHESP, SHPO and THPO during permitting to minimize and mitigate unavoidable impacts. Other potential staging areas may be used for longer-term staging and materials storage and will only be used during the vacation off-

[7] Email from Tim Smith, NPS, July 11, 2016.

season. These areas are already disturbed/paved; impacts to cultural or natural resources are not expected. Staging areas will be restored as closely as possible to the original vegetated condition upon project completion.

Construction of the bridge will result in temporary loss of wetland habitat and short-term increases in sedimentation. Mitigation will include erosion and sedimentation control BMPs and maintenance of freshwater flow throughout the construction period.

Mill Creek Dike

Dewatering and other associated work associated with construction of the Mill Creek Dike will temporarily impact approximately 105,000 sf (2.4 acres) of vegetated wetlands. To mitigate these impacts the Proponent will implement erosion and sedimentation control BMPs and will maintain freshwater flow throughout the construction period. These altered areas will be subject to tidal flow upon project completion and are not expected to suffer long-term impacts.

The following access routes continue to be evaluated to access the Mill Creek Dike construction site.

- CCYC Golf Course Access – this route includes approximately 2,235 feet along dirt roads and carts paths within the CYCC golf course. Disturbance will be limited to active portions of the course, limiting impacts to natural and cultural resources. This option requires approval, coordination and an access easement from CYCC.
- Access from Old Chequessett Neck Road (a/k/a Snake Creek Lane) – this route will include a 650-foot long newly cleared access path from the end of Old Chequessett Neck Road. It will require approximately 3,600 sf of wetland fill. Most of the route is located on NPS property; however, access easements will be required from one or two private landowners.
- Access from Chequessett Neck Road – this route will traverse approximately 1,890 feet from Chequessett Neck Road to the south side of the Mill Creek Dike construction zone. It is located entirely within NPS land, but will require clearing of a 12-foot path along the entire route length through undisturbed upland and may require some grading and slope stabilization to keep the route entirely within NPS property.

Staging areas will be determined based upon selection of an access route. The Proponent will conduct additional field studies, including cultural resource investigations, engineering design, and consultations with landowners to identify the most suitable access route and staging location. Final estimates of potential land clearing and temporary or permanent wetland impacts should be provided in local and State wetland permitting applications along with confirmation of access rights and any specific construction-related restoration mitigation actions.

CYCC

As noted previously, either option to mitigate potential tidal impacts to the CYCC will result in impacts to either undisturbed upland areas or wetland resource areas that are generally

maintained as part of the golf course. The FEIR did not address potential traffic-related impacts should an off-site borrow site be required to meet the fill volumes necessary to achieve Option 2 (fill of low-lying golf holes). The selection of a final mitigation alternative will be subject to approval by the Proponent and CYCC. This final agreement should include additional clarity on construction period coordination and sequencing to minimize both environmental impacts and limit the closure period of the golf course.

Low-lying Properties

Implementation of mitigation measures on low-lying properties will be subject to the agreed upon terms and conditions of individual landowner agreements. Some mitigation measures will impact regulated wetland resource areas and will be subject to review per the proposed regulatory strategy outlined previously. I anticipate that the design and construction of mitigation measures will be completed in a manner that avoids, minimizes and mitigates impacts to wetland, fisheries, cultural, and rare species resources. Construction BMPs should be used to reduce any potential erosion and sedimentation impacts.

Low-lying Roadways and Culverts

Temporary impacts to wetland resource areas are anticipated during the construction process to elevate low-lying roadways. These impacts are anticipated to occur within a 3-foot temporary work zone beyond the limits of grading. These areas will be restored to preconstruction conditions following the completion of work.

These roadways are too narrow to maintain even a single lane of traffic during construction; therefore, closures will likely be necessary during reconstruction of each roadway section. The FEIR described three potential detour loops that will be implemented in phases based upon the roadway segment under construction. In some instances, access may be limited to local traffic. The Proponent should work with affected property owners to ensure sufficient communication of construction phasing, detours, and assurances of property access at all times for both property owners and public safety personnel.

Construction of replacement culverts will require open cuts through existing roadways. Culvert replacement will likely require dewatering below the proposed bedding subgrade. It may be accomplished using either a well point system or a sheet pile cofferdam system and sumps. A temporary by-pass will be required at each stream crossing during culvert installation to maintain water flow. All roadway work should be completed consistent with a Stormwater Pollution Prevention Plan (SWPPP) to reduce potential erosion and sedimentation impacts.

Secondary Restoration Actions

Secondary restoration actions (i.e., vegetation management, sediment management, and channel improvements) are proposed to maximize the effects of tidal restoration. More specific information and guidelines governing these activities will be included in the AMP and developed through the ROG.

Vegetation management and marsh sediment supplementation activities will be prioritized for completion during the winter months when the ground is partially or completely frozen to limit soil erosion and potential sedimentation. Assisted redistribution of sediment trapped within the floodplain is proposed to occur before tidal flow is restored in each sub-basin. Sediment augmentation may require the import of materials from outside the floodplain. These sediments will be of suitable particle size and free of contaminants. The FEIR estimated that up to approximately 250 acres may require sediment augmentation which will be conducted on a sub-basin by sub-basin basis in coordination with incremental tidal restoration and the AMP. Additional BMPs will include completing as much work as possible by hand, using low ground pressure heavy equipment and marsh mats, siltation fencing, and haybales. Areas prone to erosion, such as streambanks adjacent to high velocity tidal flows, will be planted to stabilize exposed soils.

Fisheries and Shellfisheries Resources

Construction of the new dike and other infrastructure improvements such as upstream culverts or road improvements will likely cause local, temporary adverse impacts to both fish and macroinvertebrate species. The project will implement BMPs to minimize siltation and impacts to water column turbidity near construction activities. The project includes adoption of Essential Fish Habitat (EFH) recommendations made by NOAA including: 1) use of cofferdams to isolate in-water work and use of sediment curtains or similar BMPs during their installation and removal, and 2) no in-water construction between March 1 and June 30, although once cofferdams are in place, work may occur behind them at any time of the year so long as adequate fish passage is provided. Additional TOY restrictions have been proposed by DMF for the Herring River. These include:

Species	TOY Period
Alewife	April 1 to June 15; September 1 to November 15
Blueback Herring	April 1 to June 15; September 1 to November 15
American Eel	March 15 to June 30; September 15 to October 31
White Perch	April 1 to June 15
Winter Flounder	February 1 to June 30
Shellfish	May 1 to November 15
Combined Resources	February 1 to November 15

As evident from the table, if all TOYs are followed strictly, the remaining work window of late November to early February will be inadequate for the scale of proposed work activities. DMF has indicated that, contingent upon the type, location, timing and duration of work, construction activities can occur within these TOY restrictions if certain mitigation measures are implemented (i.e., cofferdam, silt curtains, maintain a channel of free-flowing water at a sufficient width and depth for diadromous fish passage). The Proponent should continue to coordinate with DMF and NOAA on specific TOY restriction recommendations for individual construction activities. If work cannot be completed outside recommended TOY restriction periods, the Proponent should consult with DMF and NOAA to determine appropriate construction methodologies to avoid impacts to existing aquatic resources including diadromous fishes, winter flounder and shellfish.

Mitigation and Section 61 Findings

The project consists of an ecological restoration project designed to restore native tidal wetland habitat to upwards of 950 acres of the Herring River floodplain by re-establishing tidal flow. It is expected to significantly improve water quality, rare species habitat, fisheries, and recreational opportunities throughout the Herring River floodplain while improving its resiliency and ability to adapt to the effects of climate change. Construction of project elements and restoration of tidal flow will result in direct and indirect alteration of wetlands, rare species habitat and other environmental resources. The FEIR has identified an organizational structure and regulatory framework that is intended to guide project implementation while avoiding, minimizing and mitigating environmental impacts and providing continued opportunities for consultation and input.

The FEIR included significant discussion of potential impacts and commitments to avoid, minimize and mitigate environmental impacts. Avoidance and mitigation is incorporated into the design of the project including: incremental increases in tidal flow guided by the AMP to balance ecological goals with flood control measures to allow the highest tide range practicable while protecting vulnerable properties, including roads and homes; monitoring; improvements to public access and recreation opportunities; vegetation management; restoration of tidal channel and marsh surface elevation; and, construction of tide control structures at Mill Creek and Upper Pole Dike Creek under certain Alternatives. Full restoration of the Mill Creek and Pole Dike Creek sub-basins will not occur unless and until provisions are in place to prevent structural impacts to private property. Site-specific mitigation measures will be employed for individual properties to prevent tidal flows from impacting structures. These mitigation measures will be constructed with the explicit consent and cooperation of landowners. Agreements with landowners will be executed to memorialize mutually-agreed upon design, implementation, and monitoring of mitigation measures on private property.

The FEIR also provided draft Section 61 Findings for use by State Agencies. These draft Section 61 Findings should be revised in response to this Certificate and provided to State Agencies to assist in the permitting process and issuance of final Section 61 Findings. General mitigation measures noted in the draft Section 61 Findings include:

- The restoration, for the most part, will occur on previously developed parcels and along existing roadways and infrastructure;
- Any new structures will have exterior facades which will compliment and be consistent with local aesthetics. Vegetative screens will be used if it is determined that they are necessary for aesthetic reasons;
- The Proponent will continue to consult with the ROG and expert agencies during the design and construction phases if a regulated resource may be affected;
- Contractors will be required to thoroughly clean-up sites before a contract is considered complete;
- Contractors will be required to properly handle and store possible contaminants and hazardous substances;
- Access roads will be dampened to minimize construction dust, as necessary;

- Debris will not be burned or buried on site as a means of disposal; and
- No construction work will normally be performed during evening, holiday, or weekend hours.

Conclusion

Based on a review of the FEIR, comment letters and consultation with State Agencies, I find that the FEIR adequately and properly complies with MEPA and its implementing regulations. Outstanding issues will be addressed during State and local permitting, the proposed regulatory structure, and the AMP. The Proponent and State Agencies should forward copies of the final Section 61 Findings to the MEPA Office for publication in accordance with 301 CMR 11.12.

July 15, 2016
Date

Matthew A. Beaton

Comments received:

Undated	Judith Stiles
6/29/2016	Heather L. Davis
6/29/2016	Jodi Birchall
6/30/2016	Nutter on behalf of Chequessett Yacht and Country Club
7/1/2016	Office of Coastal Zone Management
7/1/2016	Mass Audubon
7/2/2016	Laura Runkel
7/7/2016	Massachusetts Department of Environmental Protection – Southeast Regional Office (MassDEP-SERO)
7/7/2016	Association to Preserve Cape Cod
7/8/2016	Cape Cod Commission
7/8/2016	Division of Marine Fisheries
7/8/2016	Division of Fisheries and Wildlife – Natural Heritage and Endangered Species Program

MAB/HSJ/hsj

Herring River Restoration Project Regulatory Oversight Group

December 12, 2022

DRAFT

Project Updates - Permitting

- Permits needed for construction in hand:
  - MEPA Certificate and Record of Decision - 2016
  - Cape Cod Commission Development Regional Impact approval - 2020
  - §401 Water Quality Certification - 2021
  - Approval under §404 General Permit – 2021
  - US Coast Guard Advance Approval - 2021
  - Notice of Intent for Ecological Restoration Limited Project (ERLP) – Wellfleet and Truro Orders of Condition received and recorded.
  - MGL Ch. 91 Waterways Licenses – License for Chequessett Neck Road issued and recorded; other licenses pending completion of final design.

Project Updates - Fundraising

- $49,870,000 grant agreements approved & executed by Town:
  - USDA/NRCS $27,200,000
  - MassDER - $22,670,000
- Grants pending
  - NOAA - $14,690,000 application to Transformational Habitat Restoration Grant Program
- Funding for marsh/vegetation management
  - NPS/NPF funding for vegetation management and final design
  - NAWCA ≈$2M grant – Ducks Unlimited

Project Updates – Construction

- Chequessett Neck Road Bridge and Water Access Facility
  - CNR Bridge bid opening 9/22/2022
  - Contractor Notice of Award approved 10/18/22
  - Site mobilization & vegetation work (est. 12/2022 – 1-2/2023)

- Owners Project Representative

- Final design underway and bid advertisements est. mid 2023 for:
  - Mill Creek Water Control Structure
  - Low road elevation culverts
  - Property Impact Prevention

CNR Bridge Anticipated Construction Timeline

- <u>Fall 2022 – Summer 2023</u>

  Construct Temporary Bypass Bridge

- <u>Summer 2023 – Winter 2023</u>

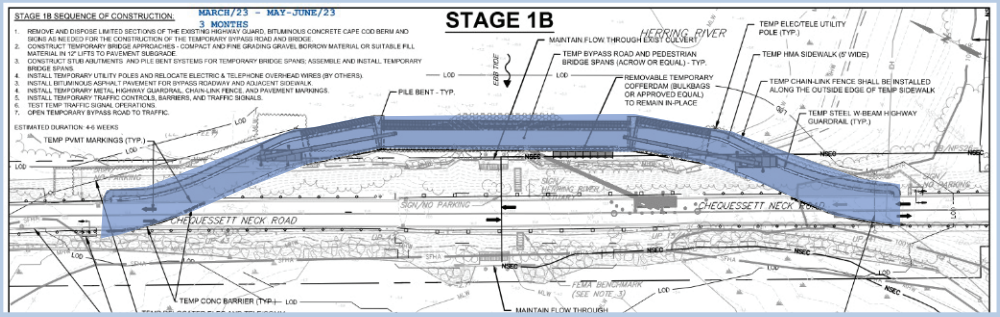
  Construct Southern Bridge Pier and Abutment Area

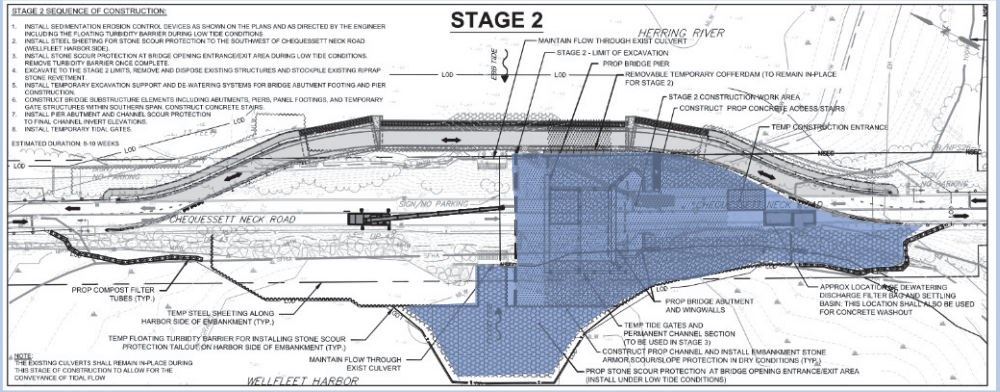
- <u>Winter 2023 – Summer 2024</u>

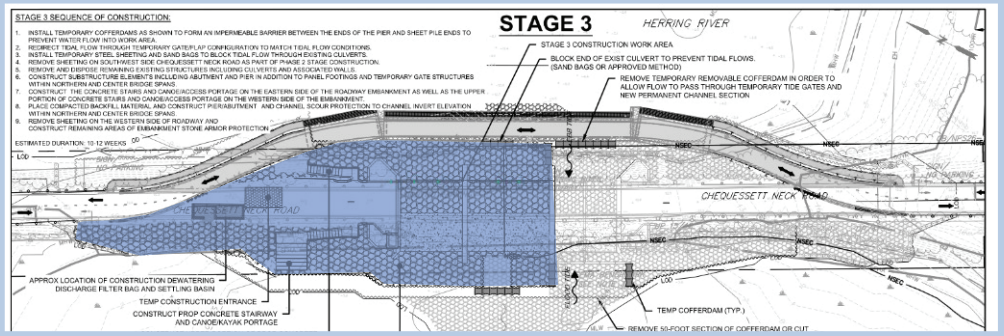
  Construct Northern Bridge Pier and Abutment Area

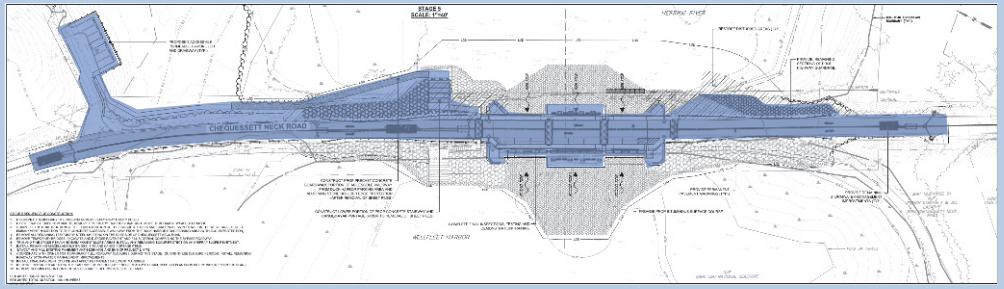
- <u>Summer 2024 – Spring 2025</u>

  Construct Bridge Superstructure, Roadway and Duck Harbor Road Water Access Facility





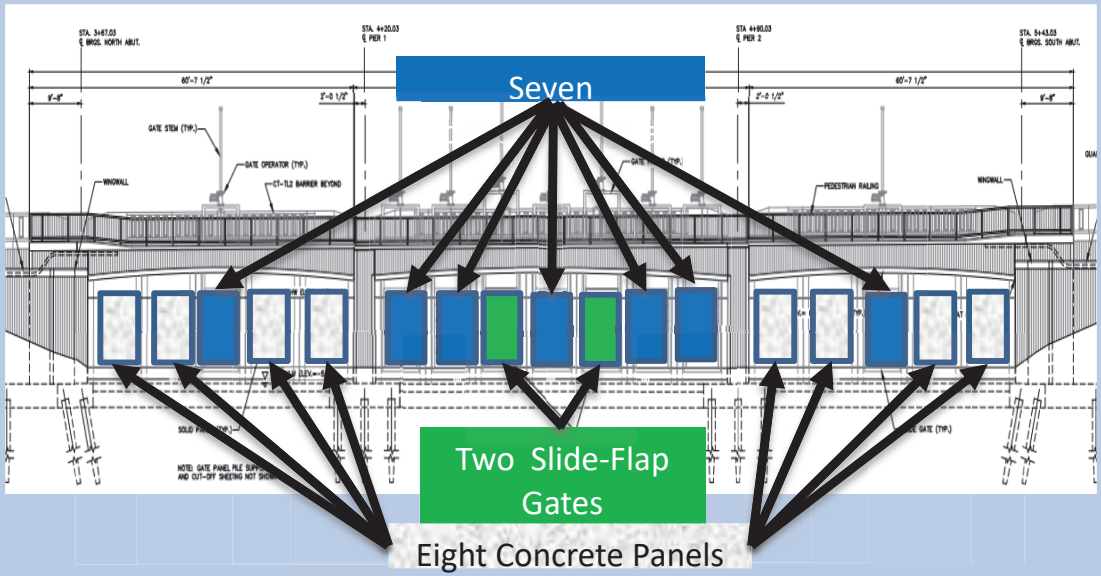




Initial Gate Management Policy

Year 1

- Months1-2: Gates set to maintain existing tidal condition
- Months 3-12: Progressive openings to reach MHW ~0.2 to ~1.8 ft (Lower River)
- Month 12: 1.8 ft MHW - threshold where tides overflow stream/creek banks, flood marsh surfaces
- Vegetation management
- Initiate Post-construction monitoring

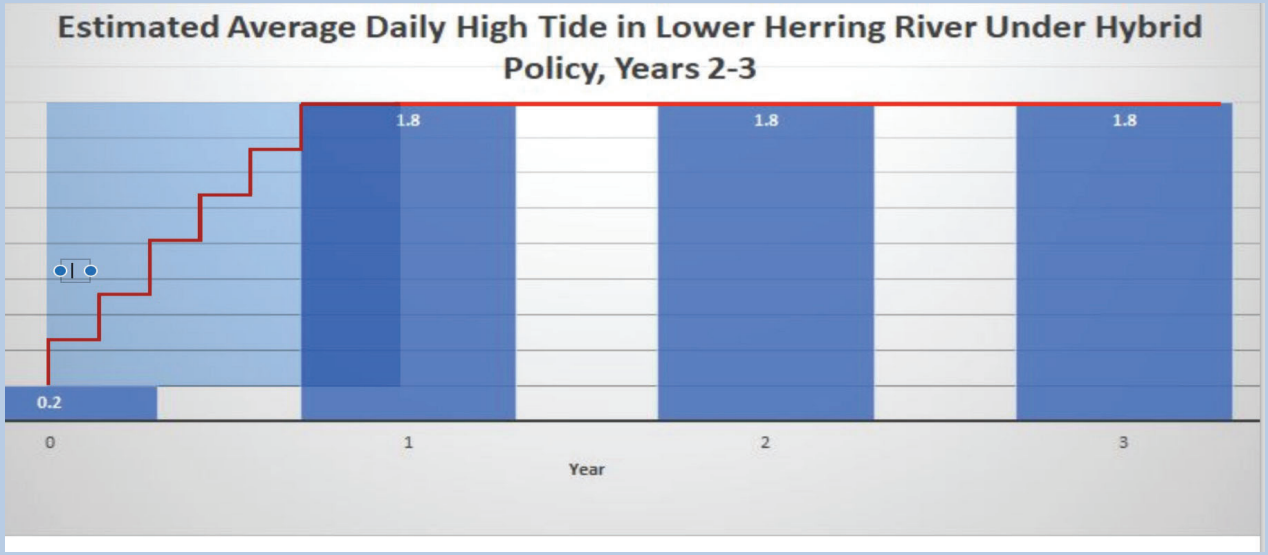


Fuss & O'Neill

Initial Gate Management Policy

Year 2-3

- Hold gates at MHW ~1.8 feet in Lower River for two years
- Intensive data collection
- Year 3: continued vegetation management
- Pilot Project: remove spoil berms & restore marsh elevation
- Authorize one short-term event-based larger tide gate opening during Annual High Tide or storm surge to collect data on sediment deposition

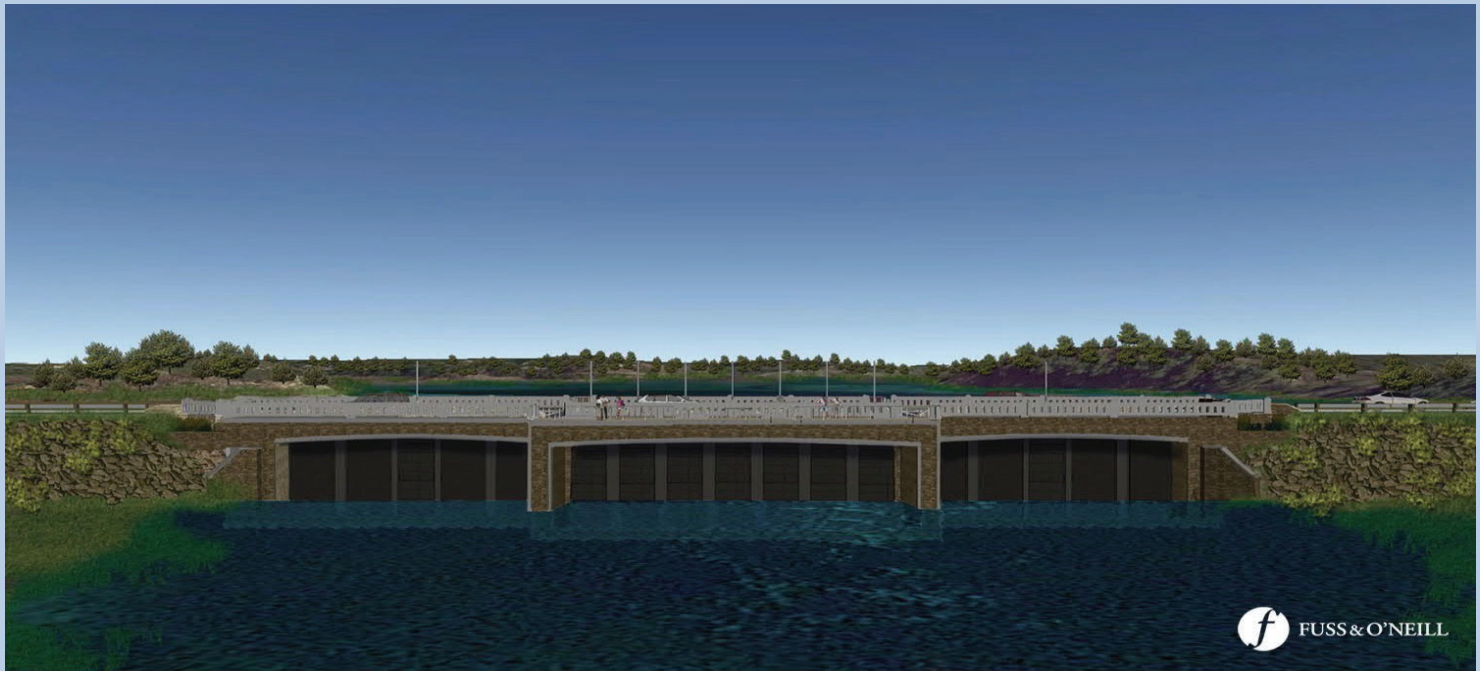


T Smith, CCNS

Initial Gate Management Policy

Features:

- Continuous monitoring
- Flexibility to adjust gate management based on monitoring data
- Monitoring data used in modeling to improve predictive data for subsequent decision-analysis
- Formulate longer-term management strategy based on assessment of Years 1-3 data



Herring River Restoration Project

Herring River Stakeholder Group; Wednesday, November 2 2022

Summary of Restoration Activities Planned for 2022-2025

Initial Vegetation Clearing

Demonstration Sediment Management Project

Herring River Restoration Project

Initial Vegetation Clearing

- **Primary Purposes of Vegetation Management**
  - Enhance/promote growth of salt marsh vegetation
  - Avoid accumulation of dead material in tidal creeks and channels
  - Improve/manage aesthetics through removal of dead above ground vegetation
  - Promote Blue Carbon Benefits; Retain Carbon Within the Marsh Soil

Herring River Restoration Project

Initial Vegetation Clearing

Expected Sequence of Activities Through 2025 ("Year 1" of Tidal Restoration)

- Winter 2022/2023: Start Duck Harbor Restoration
- Winter 2023/2024: Clear Trees, Shrubs, and Vines in Area Flooded Within Year 1 of Tidal Restoration (Prior to Inundation)
- Fall-Winter 2024/2025: Mowing Phragmites (Prior to Inundation)

Initial Vegetation Clearing: Duck Harbor Restoration

Winter 2022/2023:
Clearing Dead Trees in Duck Harbor

- Recurring Beach Overwashes Starting in 2021
- Die-off of Woody Vegetation
- Natural Recruitment of Salt Marsh Vegetation

Initial Vegetation Clearing: Duck Harbor Restoration

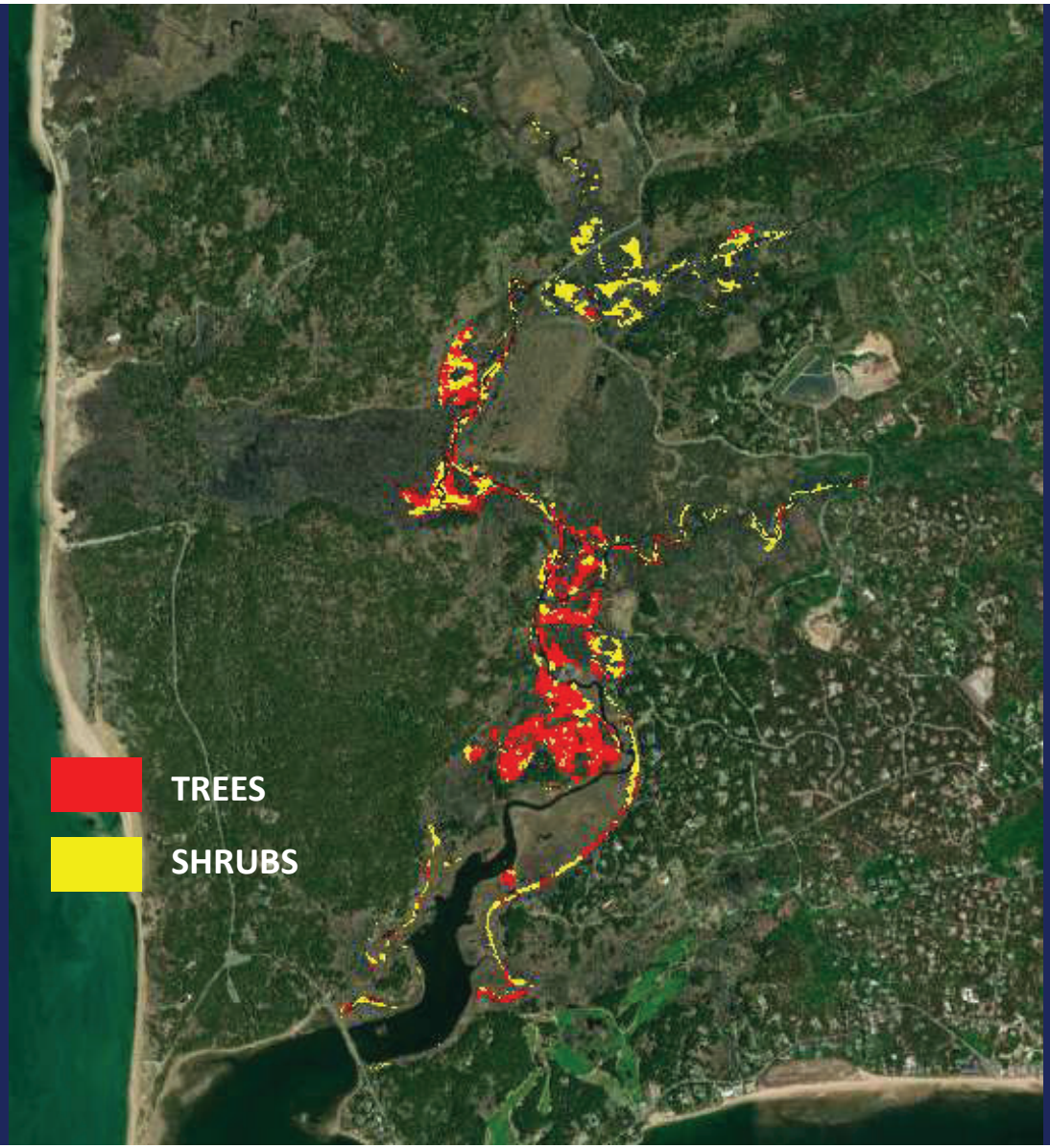
Winter 2022/2023:

- Up to ~120 Acres to be Cleared
- Heavy Duty Mulching
- Starting December 2022 –January 2023
- Significant Monitoring Component to Understand Affects of Vegetation Clearing
- Follow On Adaptive Management
- Marine Debris Cleanup

Initial Vegetation Clearing: Trees & Shrubs

Winter 2023/2024: Clear Trees, Shrubs, and Vines in Area Flooded Within Year 1 of Tidal Restoration (Prior to Inundation)

- ~62 Acres
- Heavy Duty Mulching
- NPS/Ducks Unlimited Contracts
- Funded by National Park Foundation and/or North American Wetlands Conservation Act Grant



Initial Vegetation Clearing: Phragmites

Fall-Winter 2024/2025: Mowing Phragmites
(Prior to Inundation)

- ~45 Acres
- Brush Mowing & Removal
- NPS/Ducks Unlimited Contracts
- Funded by National Park Foundation and/or North American Wetlands Conservation Act Grant

Herring River Restoration Project

Herring River Stakeholder Group; Wednesday November 2, 2022

Summary of Restoration Activities Planned for 2022/2023

Demonstration Sediment Management Project

Demonstration Sediment Management Project


Elevation
High
Low


Cape Cod National Seashore
Massachusetts
National Park Service
U.S. Department of the Interior
Herring River Channelization 1923

Demonstration Sediment Management Project

Objectives:

- Remove Anthropogenic Spoil Berms to Improve Surface Water Flow and Restore Marsh Surface
- Beneficially Use Spoils for Marsh Surface Elevation Rebuilding
- Restore River Flow in Natural Herring River Channel
- Develop Methods for Sediment Management to be Used on a Large Scale Throughout the Project
- Design and Permit a Surface Augmentation Project in Massachusetts
- Address Questions About How Sediment Management in the Herring River Can Maximize Blue Carbon Benefits (carbon sequestration and methane emissions)

Demonstration Sediment Management Project

Project Elements:

- 6,000 – 9,000 Cubic Yards in Berms
- Needs Ground Survey Data, Sediment Characterization and Testing, Design Plans, and Permitting
- Funded by North American Wetland Conservation Act Grant Funds
- Consultant for Project Design to be Hired in Nov./Dec. 2022
- Design and Permitting through 2023
- Construction to Begin in 2024
- Area Affected by Tides in 2025

Herring River Restoration Project

Herring River Stakeholder Group; Wednesday November 2, 2022

Summary of Restoration Activities Planned for 2022-2025

Funding, Project, and Timeline Summary:

- North American Wetlands Conservation Grant (NAWCA)
  - $2 million Granted to Ducks Unlimited
  - Ducks Unlimited Managing Funds and Contracts
  - Sediment Management/Berm Grading Project Design and Construction; ~$800,000; October 2023 – 2025
  - Vegetation Management; ~$800,000, December 2023 - 2025

- National Park Foundation Donations (NPF)
  - $230,000 (so far); Funding Managed by Cape Cod National Seashore
  - Duck Harbor Restoration: Vegetation Clearing, Debris Removal, Monitoring and Adaptive Management
  - December 2022 - 2023

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Steve Spear	USDA Natural Resources Conservation Service	stephen.spear@usda.gov

Herring River Restoration Project – Phase 1 Environmental Permits

MEPA Certificate on the Final EIR
http://www.herringriver.org/Files/MEPACertificate1.pdf

NEPA-NPS-Record of Decision on the EIS/EIR
http://www.herringriver.org/Files/2016-09-15_CACO_Herring%20River%20ROD_Signed.pdf

Cape Cod Commission Development Regional Impact Decision
https://www.capecodcommission.org/resource-library/file?url=%2Fdept%2Fcommission%2Fteam%2Freg_lib%2FRegulatory+Home%2FREGULATORY+CLERK+FILES%2FCCC+Decisions%2FDecisions%2F2020+Decisions%2F2020-06-11+Herring+River+Final+Decision.pdf

Combined Permit §401 Water Quality Certification
https://drive.google.com/file/d/1vEdr2ke5S1PC18Vr2Q8UhZJgl36DMxRz/view?usp=share_link
Combined Permit §401 Water Quality Certification Amendment 1
https://drive.google.com/file/d/1oYJmKgcNCmtNhhDBRwEwNtNFXSMQWyeL/view?usp=share_link

Authorization under §404 General Permit
https://drive.google.com/file/d/12cZzBXj5NP21CmOnxUmfh2gsInpSJzdV/view?usp=share_link
https://drive.google.com/file/d/1ver7ehlJ9ml1TUEwY_CAdUJ4GivorZbo/view?usp=share_link

US Coast Guard Advance Approval
https://drive.google.com/file/d/1DVUXRcTxwBkac6mBGm6IDLJy_5lBRSBP/view?usp=share_link

Order of Condition for Ecological Restoration Limited Project (ERLP) – Wellfleet
https://drive.google.com/file/d/1F-U5J14q1XD2PKrNoRHwGBRaqcNfwY9u/view?usp=share_link

Order of Condition for Ecological Restoration Limited Project - Truro
https://drive.google.com/file/d/1w90kSURapH-BbHH38hEaa97KTKCr03Mv/view?usp=share_link

MGL Ch. 91 Waterways Licenses – Chequessett Neck Road Bridge (Licenses for other project elements pending completion of final design)
https://drive.google.com/file/d/13dZ2M4BnM_I6QzuMrs16oG_Dlj32cChv/view?usp=share_link