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Waquoit Bay Nat... al Estuarine Research Reserve
Falmouth, MA
Research Pier and Float Construction
December, 2008

Exhibit B

Project Narrative

Introduction

The Waquoit Bay National Estuarine Research Reserve (WBNERR Reserve) is a 2800 acre living laboratory and regional scientific, educational and recreational resource, with its headquarters facilities located at the northern head of Waquoit Bay. The Reserve is administered by the state's Massachusetts Department of Conservation and Recreation (DCR) in partnership with the federal government's National Oceanic and Atmospheric Administration (NOAA). Most of the Reserve lands were originally acquired by the Commonwealth of Massachusetts in the early 1980's. In 1988, these state lands and waters were designated a National Estuarine Research Reserve (NERR) for the purpose of intensive environmental study in order to improve the public's understanding of coastal ecosystems and human influences on them. The Reserve's overarching goal is to improve public and private decision-making regarding coastal resources. Since Waquoit Bay is a representative example of the shallow bays typical of southern New England and the northern Mid-Atlantic region, research and educational activities at the Reserve directly contribute to the stewardship of this much larger coastal region as well. The Reserve works with many public and private partners to preserve land and water and related ecosystems, investigate compelling issues facing our coast, and provides education to students, teachers, coastal resource managers and the general public.

The Reserve fulfils its research mission by being a platform that provides scientists with the infrastructure and information to support and guide their work. For infrastructure, the Reserve provides researchers with an estuarine base of operations, facilities, and a range of logistical support, including boat support to access our estuarine waters, salt marshes and barrier beaches. For information, the Reserve maintains an intensive environmental monitoring program aimed at providing scientists with a rich set of current and past environmental data to create a broad and detailed context for their studies. The Reserve undertakes or hosts between 30 and 50 research and monitoring projects every year (see attached Current Project List for 2008). These projects are carried out by Reserve research staff and visiting researchers from other scientific, academic, corporate and governmental institutions throughout the region and country.

Because of the facilities available at the WBNERR headquarters property at the head of Waquoit Bay, almost all research and educational activity is either concentrated here or embarks or debarks from here. For reasons of convenience and accessibility, a large portion of the field research carried out is often sited in the littoral zone here at the head of the Waquoit Bay, directly adjacent to the WBNERR's Boathouse facility. For

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example, almost all of the hydrological studies at WBNERR, which are focused on the physics, chemistry and biology of nutrient-laden groundwater interaction with estuarine waters, have been and are currently located here. At the same time, all boat activity, for field research and sampling and to regularly service and maintain the WBNERR's year round continuous (every 15 minutes) underwater monitoring systems, is concentrated here in front of the WBNERR Boathouse, where dingy tenders and a 9-boat mooring field are maintained. During peak activity in summer, dozens of boat landings occur daily, with loading and unloading of equipment often intermingled with researchers sampling and setting up experimental equipment on the same beach.

During periodic federal reviews of WBNERR operations, staff and visiting researchers have noted the conspicuous lack of dock / pier infrastructure at WBNERR. The lack of such infrastructure currently has several drawbacks on WBNERR's research, education and stewardship mission. The most obvious is the inconvenience to boat operations. All WBNERR boats must land and embark from the beach in front of the boathouse. This restricts vessel size, with boats larger than 16' often grounding out before reaching the beach. Vessels larger than 23' usually cannot land, load or unload here. For example WHOI's smallest coastal water research vessel (Limulus) is 25' with a 2'draft and so cannot access the WBNERR landing area. Prop wash from the outboards and inboards scours deep holes on the subtidal shore in front of the boat house and is an inevitable but continual and excessive disturbance to the benthos within the landing zone. Excessive wear and tear on research boat hulls from constant beach landings is also a problem, which reduces the active life of WBNERR boats. All of WBNERR's current vessels, including our 23' aluminum hull vessel, require frequent hull bottom repair for this reason. Bottom paint in the forward areas lasts no more than a few weeks. It is also difficult and sometimes impossible to carry heavy or bulky scientific equipment down the narrow set of concrete stairs to the beach area and then load it onto boats. A well-designed dock / pier infrastructure would alleviate all of these problems.

A less obvious, but perhaps more critical problem for WBNERR is the need for infrastructure at the headquarters facilities that extends out from land into deeper water, for the purpose of physically supporting research and estuarine monitoring. Since a significant portion of research activities tend to be sited in the littoral zone at the head of bay, because of the location's ready access to adjacent facilities (dorms, offices, laboratory, parking, power, lights, water, internet, etc.), it would be highly useful to have underwater monitoring equipment mounted to a permanent structure at this same location to provide real-time, continuous measurements of a suite of parameters relevant to almost all estuarine research (e.g., Temperature, Salinity, Dissolved Oxygen, Water Level, pH, Turbidity, Chlorophyll, Nutrients). A dock / pier structure would provide the necessary support and ease of access to maintain such monitoring equipment. Such infrastructure would also provide WBNERR's visiting researcher's with a platform to mount other automated scientific equipment modules as part of their research efforts. Such scientific instrument–supporting infrastructure (i.e., docks) within the greater Waquoit Bay estuarine system is currently only available at private dock facilities remote from much of

the research activity. In fact, it is this latter inconvenience that has been most noted by researchers during federal reviews.

WBNERR regularly hosts educational activities for students and teachers, and almost all of the associated field activities occur in the littoral zone here at the head of the bay, next to WBNERR's classroom and meeting rooms. Currently, there is no access to deeper water for associated sampling and observation activities as even very shallow water activities are restricted by the lack of boots and waders for more than a few individuals at a time. A dock / pier would significantly extend WBNERR's educational capabilities for field activities and student observation at its headquarters facility.

Finally, WBNERR also has a responsibility as steward for the natural resources of the area. This activity involves overseeing the 330 acre Washburn Island, many miles of Reserve shoreline, and over 900 acres of open-water including the bay's rich shellfish habitat. Resource protection, enforcement and rapid response capability to emergencies on Washburn, barrier beaches and Waquoit's open waters would be much be much better achieved if a dock facility and boat tie-up was available to state and local natural resource personnel in the immediate area. The potential consequences of a delayed response were highlighted this past summer when a camper-caused wildfire burned about 2 acres on Washburn Island before local emergency personnel arrived at the scene.

Existing Conditions and Functions

The site is located on the north shore of Waquoit Bay. Waquoit Bay is designated as an Area of Critical Environmental Concern (ACEC) and the Cape and Islands Ocean Sanctuary by the Commonwealth of Massachusetts. As such is subject to the highest environmental review.

The 2008 Priority Habitat and Estimated Habitat map produced by the Massachusetts Natural Heritage and Endangered Species Program (NHESP) shows the entire Waquoit Bay including the site to provide both Priority Habitats of Rare Species as regulated under the Massachusetts Endangered Species Act (MESA) and Estimated Habitats of Rare Wildlife as regulated under the Massachusetts Wetlands Protection Act Regulations (WPA).

The Massachusetts Division of Marine Fisheries (DMF) has mapped Waquoit Bay including the site as Approved for the taking of Shellfish (01/01/99 map). Approved areas are open for harvest of shellfish for direct human consumption subject to local rules and state regulations.

The site is presently occupied by a 2-story wood framed boathouse that houses the WBNERR research facilities. The building has been in existence since the late 1800's. It was purchased the DCR in 1987 and renovated for use by WBNERR. The bottom floor is at beach level and is used for equipment storage and laboratory functions. The upper story is used for meeting rooms and office space.

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CLE Engineering, Inc. conducted a topographic and hydrographic survey of the project area on June 10, 2008. A plan depicting the water depth within 100'of the proposed pier and floats, mean high water and mean low water, and general topography of the surrounding area was prepared (Exhibit C). Additionally a coastal wetland resource inventory and an eelgrass bed survey were made. No eelgrass beds were found in the study area by CLE's biologist while conducting a visual survey by snorkel and mask. The following green macroalgea are found on site:

- *Cladophora vagabunda*
- *Enteromorpha instestinalie*
- *Ulva lactuca*
- *Codium fragile*

The red algae *Glacilaria tikvahiae* is also present at the site.

Project Description

The purpose of the project is to construct a wooden pile-supported pier, ramp and float to provide access to navigable waters. The proposed pier is designed to be supported on 1 foot diameter greenheart wooden piles. It is proposed to construct a 182.5' long 4' wide pier from which extends an 18' long by 3' foot wide ramp to access a 10' by 20'wooden float. The pier is to be constructed on 9 bents each consisting of 2 12" diameter "greenheart" timber piles. The pre-fabricated aluminum ramp will be fastened to the pier by a hinged connection. The float will be of wooden construction with enclosed foam floatation. The float will be secured by 4 wooden piles and will be located in water that is deep enough to keep the float off the bottom at all times. The ramp and floats will be removed at the end of each research season as determined by the degree of ice build up in the bay and stored off the beach. The piles will also be used to mount monitoring equipment which will be accessible by staff and eliminate some of the need to beach boats for equipment loading, deployment and monitoring. Additionally, the pier has been designed to tie into the existing deck above the existing boathouse stairway where it will result in the minimal impact to the coastal wetland resources.

Resource Areas Impacts

The project is located within the Waquoit Bay National Estuarine Research Reserve and as such is regulated under the Ocean Sanctuary Act and the Falmouth Wetlands Bylaw and Regulations (FWR). FWR 10.16(1)(e) prohibits new docks unless there is a demonstrated public benefit. The Ocean Sanctuary Act prohibits the construction of structures on the seabed unless it can be clearly demonstrated that the structure is of "public necessity and convenience".

The WBNERR is a publicly funded research facility, receiving 70% of its funding from the National Oceanographic and Atmospheric Administration and 30% of its funding

from the Massachusetts Department of Conservation and Recreation. As described above, the Waquoit Bay National Estuarine Research Reserve provides the location and means to conduct intensive research on the estuarine ecology and environment of Waquoit Bay that is then applicable to other similar locations throughout the United States. The research is used to provide valuable data and guidance to its various partners and constituency including other research facilities, municipalities and private entities. Over two hundred scientific studies have been published based on the research undertaken in Waquoit Bay. The research and educational information provided by WBNERR has been used to improve surface and groundwater quality through improved land use practices and sewage disposal technologies. The proposed research dock is necessary to accommodate the dozen or so researchers that may be working at the facility at any time. The dock will eliminate the need to pull dinghies on to the beach for loading and off loading, the research vessels on the moorings. It will provide a safer platform for the loading and unloading of heavy equipment and personnel to and from the research vessels. Perhaps, more importantly, the outer piles on the pier will provide the infrastructure for mounting scientific research and monitoring equipment that is proximate the Reserve area most routinely used for intensive research as noted above. Visiting school children and other groups will benefit from the ability to walk out on the pier and stable float system to participate in the educational programs run by WBNERR. The overriding public benefit of the WBNERR research pier justifies its operation in the ACEC and the Ocean Sanctuary.

The coastal resource areas as defined in the WPA Regulations (310 CMR 10.00) and the Town of Falmouth Wetlands Bylaw and Regulations (Chapter 235, FWR 10.0) in proximity to the proposed project include:

- Land Subject to Coastal Storm Flowage (Zone V18 El.15) Coastal Bank
- Coastal Beach
- Land Under the Ocean
- Land Containing Shellfish

Land Subject to Coastal Storm Flowage (310 CMR 10.02 and FWR 10.38): The southernmost portion of the site is within Land Subject to Coastal Storm Flowage as shown as the 100 yr flood elevation (Zone V18 El 15) on the Falmouth FIRM). The project involves the construction of a wooden pile supported pier fastened to the existing wooden deck of the upper story of the boathouse, occupying approximately 280 square feet area above the Land Subject to Coastal Storm Flowage. There is no fill proposed in Land Subject to Coastal Storm Flowage other than the wood piles supporting the pier, a stairway between the existing concrete pad at the base of the boathouse, and the pier itself.

Coastal Bank (310 CMR 10.30 and FWR 10.30): The pier has been designed to minimize impacts and will be incorporated into the existing deck of the research facility and the concrete stairs to the concrete landing and boathouse apron. There will be no impact to the Coastal Bank immediately adjacent to and west of the existing stairway and

proposed pier. The pier stringers will be fastened to the existing concrete stairway and deck by bolted brackets.

Coastal Beach (310 CMR 10.27 and FWR 10.27): Six (6) wooden piles will be driven to a minimum depth of 15' or to refusal into the Coastal Beach which was identified as the sandy area between the concrete landing pad/apron and the Mean High Water line. Each of the 12" diameter piles will occupy approximately 0.8 square feet below the surface of the beach for a total of approximately 5 square feet of impact. The piles will be of "green heart" lumber, a naturally decay resistant wood that does not require the addition of preservatives.

Land Under the Ocean (310 CMR 10.25 and FWR 10.25): Sixteen (16) wooden "greenheart" piles will be driven to a minimum depth of 15' or to refusal Land Under the Ocean. Each of the 12" diameter piles will occupy approximately 0.8 square feet below the surface of the beach for a total of approximately 13 square feet of impact.

Land Containing Shellfish (310 CMR 10.34 and FWR 10.34): Waquoit Bay in the vicinity of the site is listed as open to shell fishing as shown on the attached Massachusetts Division of Marine Fisheries – Designated Shellfish Growing Area map dated 07/01/99. As such it is considered Significant to Land Containing Shellfish under 310 CMR 10.34. The installation of the 18 piles will impact approximately 15 square feet of Land Containing Shellfish.

Salt marsh (310 CMR 10.32 and FWR 10.32): A narrow patch of salt marsh vegetation was located along the upper limit of the coastal beach to the west of the concrete apron of the boathouse. Spartina patens, seaside goldenrod, sea lavender, beach grass and other high marsh species were noted above the wrack line in the sandy beach substrate at the bottom of the Coastal Bank. There is no work proposed in this marginal salt marsh.

Compliance with Performance Standards

Pursuant to 310 CMR 10.00 and FWR 10.00, the above listed Resource Areas are to be regulated in order to contribute to the following public interests:

- Flood control,
- Erosion and sedimentation control
- Storm damage prevention,
- Prevention of pollution,
- Land containing shellfish,
- Protection of marine fisheries,
- Protection of wildlife habitat,
- Agriculture,
- Aesthetics,
- Recreation,
- Aquaculture.

The pier, ramp and float are proposed to extend seaward approximately 182.5' from the existing deck of the boathouse research facility, and 140' from the Mean High Water Mark, 40' beyond the 100' limit established by the Dock and Pier regulations in FWR 10.16(1).

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CLE notes that FWR 10.16 limits the float size to 100 square feet and requires the applicant perform a shellfish survey. In consideration of the overriding public benefit provided by the Waquoit Bay National Estuarine Reserve, the applicant has respectfully requested a variance in accordance with FWR 10.13.

Land Subject to Coastal Storm Flowage: Land Subject to Coastal Storm Flowage is significant to storm damage prevention and flood control. It is likely to be significant to Wildlife habitat, Recreation, Aesthetics, Erosion and sediment control and Water pollution control. The pile-supported pier has been designed to withstand forces from wave action, ice, wind and uplift from storm surges. The piles securing the floats will be cut off at elevation 17, 2' above the 100 year flood elevation of 15 NGVD in order to ensure the floats will not lift off the piles in the event of the 100 year storm in the unlikely event they are not removed prior to the storm. A portion of the deck will be of an open grate design to allow for the passage of storm waves from below, thereby reducing uplift forces. The pier has been designed in the traditional wooden pile style in consideration of the Aesthetic impacts.

Coastal Bank: Coastal Banks are significant to storm damage prevention and flood control. Banks may be significant to Wildlife habitat. The slope of the Coastal Bank adjacent to the existing stairway is 1.2h: 1v. The vegetated Bank adjacent to the existing stairway from the deck to the beach will not be impacted as the pier is designed to be incorporated into the existing stairway, extending approximately 18" over the Coastal Bank. There will be no structures constructed on the Coastal Bank and the ramp will be supported above the Coastal Bank allowing sunlight to reach vegetation below so the pier will not adversely affect the Coastal Bank's ability to prevent storm damage or provide sediment to the Coastal Beach.

Coastal Beach: Coastal Beaches are significant to storm damage prevention, flood control, protection of Recreation, Aesthetics and Wildlife habitat. The installation of 6 wooden piles in the Coastal Beach will not likely interfere with any minimal sediment transport currently occurring there. It will not adversely affect the storm damage prevention functions of the adjacent Coastal Bank as they will function to break up wave impacts prior to hitting the Bank. The area is not currently used for Recreation, however lateral passage will be provided beneath the pier. The pier has been designed to be similar in appearance to piers typically seen in Falmouth in order to minimize Aesthetic impacts. The small impact (5 square feet) of surface area displaced is not likely to be significant to Wildlife habitat, and in fact the 6 piles in the intertidal zone are likely to provide and anchoring substrate for rockweeds and habitat for periwinkles and mussels.

Land Under Ocean: Land Under the Ocean is likely to be significant to marine fisheries, shellfish, storm damage prevention, flood control, protection of Wildlife habitat, Aesthetics and Recreation. Water dependent projects that may affect land under the ocean shall be designed and constructed using the best available measures, so as to minimize adverse impacts to the following Resource area values:

- Water circulation
- Distribution of sediment grain size
- Water quality
- Finfish habitat
- Important food for Wildlife
- Clear line of sight
- Navigable waters
- Water quality
- Finfish habitat
- Shellfish habitat

The proposed pier, ramp, and float system has been designed to minimize adverse impacts to the Land Under the Ocean by constructing the pier on sixteen (16) driven wooden piles. The floats will be fastened to four (4) piles located in water depths ranging from 4.5' to 4.9' at extreme low tide (MLLW), deep enough to keep the bottom of the float 3' off the bottom at all times. The small (12") diameter piles are spaced sufficiently far apart (20') to not adversely impact water and sediment circulation as recommended in the DEP's "Small Docks and Piers – A Guide to Permitting Small, Pile Supported Docks and Piers" and the CZM's "Guidelines for Dock and Pier Construction in ACECs and Ocean Sanctuaries". The piles are proposed to be driven by vibratory hammer and will not result in the alteration of the bottom topography thereby eliminating any increase in storm damage or erosion of Coastal Beaches, Coastal Banks or Salt marshes. Additionally, the 16 piles in the subtidal zone are likely to provide an anchoring substrate for rockweeds and habitat for periwinkles and mussels. A few of the existing moorings owned by WBNERR will be relocated in order to accommodate the pier and float and to provide clear access to navigable waters.

Land Containing Shellfish: Land Containing Shellfish is significant to the protection of shellfish and marine fisheries, as well as the interests and values of land containing shellfish, Recreation and Aquaculture. The direct impact to Land Containing Shellfish is limited to 15 square feet resulting from the installation of 18 wooden piles. The proposed float will occupy 200 square feet of water sheet above Land Containing Shellfish with the attached boats occupying approximately 100 square feet each at most.

WBNERR has had discussions with both the Town of Falmouth and Town of Mashpee Shellfish Wardens regarding the proposed dock. As mitigation for the project and to provide an additional public benefit, the Falmouth Shellfish Warden will be provided access to the dock from which to operate his boat to perform his duties in the interest of protecting Land Containing Shellfish.

The 1' diameter wooden piles will be placed sufficiently far from each other (4' along each bent, 20' between bents) so as not to impede water circulation or sediment transport. The lowest point of the lowest horizontal structural members of the pile supported pier will be approximately 6.5' above the seafloor, providing adequate clearance and public access to the Land Containing Shellfish. The subtidal area of the piles will likely provide surface area to which macroalgae, periwinkles and mussels can attach, thus providing a greater surface area for shell fish than the area of seabed occupied by the piles.

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Salt Marsh: Although the pier will not be situated in or over salt marsh, there are a number of salt marsh species adjacent to the existing concrete apron at the boatshed. In accordance with the regulations and design standards, the pier will utilized grated decking for the first 43' from the existing boatshed deck to the second set of piles (second bent). The open grate will allow sunlight to penetrate to the ground and vegetation below, eliminating any adverse effects of shading.

Construction Materials and Methodology

The pier, ramps and floats will be constructed of widely accepted materials, proven to suitable for the location. The piles will be 12" diameter greenheart timber, a naturally decay resistant wood that does not require the use of preservatives. Fasteners shall be either galvanized or stainless steel to resist corrosion. The decking will be an open grate type to allow sunlight to the vegetation and beach beneath it. The grate provides 45% of its surface area to remain open area. The grated deck will extend from the boathouse seaward to the second bent at which point the deck will be constructed of timber planks with ¾" gaps to allow sunlight penetration. The floats shall utilize enclosed floatation to eliminate the potential for Styrofoam to beak off and litter the shoreline.

The wooden piles will be driven from a barge-mounted crane using a vibratory hammer to drive the piles to design depth. The contractor will be responsible for procurement of an off site staging area for the staging of equipment and loading of the barge; no heavy equipment will be stored on site. The nearshore piles will be driven during high tide to allow the barge to be positioned as close as possible to shore and to avoid grounding out. Upon completion of the pile driving, the pier will be constructed using conventional hand held power tools.

Mitigation Measures

The Special Conditions listed in FWR 10.16 (1)(i) require the following:

1. Boats at the dock shall not be allowed to leak oil or other pollutants into water, nor shall oil or fuel be stored on the dock or pier.
2. Motor boats shall not be run in gear while tied to the dock since prop wash disturbs shellfish beds, stirs up sediment and causes bank erosion.
3. Off-season storage of temporary/season docks and floats shall be in upland areas.
4. The street address or business name shall be clearly displayed on the seaward face of the dock, using three-inch numbers/letters of a contrasting color.
5. If the use of the dock or pier causes actual damage to any resource areas through prop dredging, bottom scouring, oil or hazardous discharge, or destruction of shellfish resources, the dock or pier may be ordered removed at the owner's expense in accordance with the provisions of FWR 10.16. The owner shall be responsible for all costs to include attorney's fees incurred by the Conservation Commission in enforcing this special condition.
6. If construction is not completed and a Certificate of Compliance issued within three years of the issuance of this permit, or affirmance of this permit after appeal,

this permit is void. An applicant my request an extension of this time provided that such request is submitted at least 30 days prior to the end of the time.

7. If this permit and the plan of reference are not properly recorded in the Barnstable Registry of Deeds within 30 days of issuance, or 30 days of affirmance after appeal, this permit is void.
8. Normal maintenance and repair of a dock or pier is allowed. No extension, alteration or change from the plan of reference is permitted without first obtaining a modification to this permit in accordance with Conservation Commission procedures.
9. Boats shall be tied or attached only in those areas of the pier or dock so identified on the plan.

In addition to the above, the following conditions and restrictions are proposed:

1. The Falmouth Shellfish Warden will be provided access to the dock from which to operate his boat to perform his duties in the interest of protecting Land Containing Shellfish.
2. Absolutely no release is allowed into the waterway of any petroleum product, epoxies, resins, admixtures, touch-up coatings or the like. Accidental releases shall be reported to the Harbor Master, Engineer, and, if applicable, the Coast Guard. The Contractor shall have on site sufficient sorbent pads and booms to contain an accidental spill.
3. Construction will only be allowed during the hours of 7:00 a.m. to 7:00 p.m., Monday thru Saturday, with the exception of towing of barges to and from the site.
4. Debris from construction operations is to be cleaned up on a regular basis and disposed of off site at a properly designated facility. Floating debris and cuttings shall be contained in the work area by floating booms and shall not be allowed to drift about the cove. Organic debris (epoxies, etc.) is considered releases and shall be cleaned up immediately in accordance with an approved plan.
5. No refueling of construction equipment shall be permitted within 100' of any coastal resource area.
6. No heavy equipment or vehicle will be allowed on the beach.

As demonstrated above, the construction of the pier, ramp and float will minimize impacts to the resources protected under the Massachusetts Wetlands Protection Act and the Falmouth Wetlands Bylaw and will meet the performance standards as required in the state and local regulations.