

Chapter 11. A Regulatory Framework for Shoreline Structures

Summary of Issues and Recommendations

The Massachusetts Waterways (Chapter 91) Regulations (310 CMR 9.32 (1)) prohibit the licensing of new, non-commercial structures (i.e., private docks and piers) within ACECs unless “such structures are consistent with a resource management plan adopted by the municipality (municipalities) and approved by the Secretary of Environmental Affairs.” The Pleasant Bay resource management plan is charged with developing a resource-based framework to assist state and local officials in managing anticipated demand for new structures in light of the following issues:

- ***Environmental Impacts of Docks and Piers.*** The harmful effects docks and piers can have on the marine environment include blocking wind and tidal flow, shading vegetation, chemical leaching from materials, and impacts from construction and removal. In many areas of Pleasant Bay, these impacts are pronounced because of the concentrations of shellfish, eelgrass and marsh within 150 feet of shore. Although currently there is a moratorium on the licensing of new docks and piers, there is the physical potential for a doubling of these structures. Many land parcels that could support a dock or pier are located in sensitive resource areas, and where existing structures are already concentrated.
- ***Environmental Impacts of Erosion Control Structures.*** Currently, approximately 4.3 miles of Pleasant Bay’s shoreline is protected by erosion control structures. Although use of hard structures (i.e., revetments and bulkheads) may be called for in some areas of the Bay, there is concern that hard structures may be installed where soft structures (i.e., sand bags and fiber rolls) could work as well. Continued growth in the use of hard structures could diminish the Bay’s natural erosion and nourishment processes, resulting in a loss of beach area and vegetated marsh. Areas in danger of losing beach area include private properties as well as prominent public areas such as Jackknife landing in Chatham, Bay Beach in Harwich, and the Orleans landing at Route 28.

Recommendations to address these issues are:

- Establish a permanent moratorium on new licenses for docks or piers in areas identified by the plan as “resource sensitive”.
- In all remaining areas, continue the existing moratorium on new licenses for docks and piers until new performance standards and design criteria, as developed by the Pleasant Bay Management Alliance, are adopted into regulation by the respective towns and approved by the state. Applications for docks and piers in towns in which new performance standards and design criteria have been adopted may be considered for licensing under Chapter 91.
- Continue the existing moratorium on new licenses for docks and piers in freshwater ponds within the ACEC pending the completion of a freshwater resource assessment.

- Adopt new performance standards and design criteria, as developed by the Pleasant Bay Management Alliance, for docks and piers in allowable freshwater areas.
- Develop performance standards and design criteria for licensing marsh walkways in areas where preservation of marsh resources could not otherwise be achieved.
 - Continue to monitor the cumulative direct and secondary impacts on resources from docks and piers.
 - Encourage use of alternatives to hard erosion control structures.
 - Develop new performance standards and design criteria for erosion control structures. Continue the existing moratorium on erosion control structures requiring a Chapter 91 license until the performance standards and design criteria, as developed by the Pleasant Bay Management Alliance, are adopted into regulation by the respective towns and approved by the state. Applications for erosion control structures in towns in which new performance standards and design criteria have been adopted may be considered for licensing under Chapter 91.
 - Encourage local conservation commissions to adopt the performance standards and design criteria, as developed by the Pleasant Bay Management Alliance, for erosion control structures not requiring a Chapter 91 license.
 - Protect areas of special concern, (i.e., the southern shore of Big Bay) from loss of beach and vegetation that may be exacerbated by hard structures.
 - Monitor erosion rates in the Bay.

11.0 Overview

Numerous studies have documented the impacts shoreline structures can have on natural resource conditions, on navigational safety, and on public access along the shoreline. Concern that growth in the number of shoreline structures, and the boating activity some structures support, could harm the Bay's sensitive resources was among the primary reasons that the four towns sought to have Pleasant Bay designated as an Area of Critical Environmental Concern. The Massachusetts Waterways (Chapter 91) Regulations (310 CMR 9.32 (1)) prohibit the licensing of new, non-commercial structures (i.e., private docks and piers) or fill within ACECs unless "such structures are consistent with a resource management plan adopted by the municipality (municipalities) and approved by the Secretary of Environmental Affairs. Once a resource management plan is in place, consistency with the plan's guidelines for structures will be a requirement of licensing.

Shoreline structures within the Pleasant Bay ACEC require a number of state and local permits. Any structure built in whole or in part below mean high water encroaches on public tidelands or public access rights and requires a license from the state Department of Environmental Protection, Division of Wetlands and Waterways (known as a "Chapter 91 license"). Although Chapter 91 regulations apply in all towns, there are significant variations in permitting procedures and requirements at the local level. All four Bay towns require approval from the local conservation commission. Orleans, Chatham, and Brewster have additional permits required by other town by-laws. However, it is widely perceived that the different licensing procedures and specifications for shoreline

structures in the four towns need to be coordinated to ensure that the impacts of structures on the Bay's natural resources can be adequately managed.

The resource management plan's objective for shoreline structures is to replace the existing moratorium with a new framework to assist state and local officials in managing anticipated demand for new docks, piers, and erosion control structures in Pleasant Bay. This framework must be based on an understanding of how structures influence natural resource conditions, and the public's safe use and enjoyment of the Bay.

In developing the new regulatory framework, the resource management plan assesses the *direct impacts* from the construction and use of new, privately-owned structures, the *secondary impacts* from activities the structures support, and the *cumulative impacts* of all structures in the system. The emphasis on the direct, secondary, and cumulative impacts of structures is based on the recognition that environmentally sensitive areas such as Pleasant Bay may experience long-term resource degradation from the combined impacts of all structures in a system.¹

This chapter looks first at the nature and extent of natural resource impacts caused by docks and piers, and provides specific resource management recommendations for addressing those impacts. A similar discussion of issues and recommendations is provided for erosion control structures.

11.1 Resource Management Issue: Environmental Impacts of Docks and Piers

The potential for significant growth in the number of docks and piers in Pleasant Bay is of particular concern because of the sensitivity of natural resources. The enclosed nature of many sub-embayments, where structures tend to be located, can exacerbate the impacts structures have on those resources.

- ***Blocking Wind and Tidal Flow.*** Pleasant Bay has numerous salt ponds, rivers, and enclosed areas where adequate water circulation is restricted by natural features. In enclosed areas, wind action on surface waters can become a primary mechanism of circulation. Because they are protected from strong currents and storm forces, enclosed areas are also popular for docks and piers. Docks and piers create friction which restricts the wind's ability to circulate water. The size and spacing of pilings can alter the flow of water and sediments moved by tides and wave action.²

¹ Massachusetts Executive Office of Environmental Affairs, Massachusetts Coastal Zone Management. *Guidelines for Dock and Pier Construction in ACECs and Ocean Sanctuaries.* Boston, Massachusetts. December, 1988.

² Poole, Bruce M.. *Diagnostic/Feasibility Study for Lagoon Pond Oakbluffs/Tisbury, MA.* SP Engineering, Inc. Salem, Massachusetts. 1987. The report calculated that a fifty foot pier, situated perpendicular to the wind, could reduce current velocities by fifty per cent. The report also shows that such changes could cause impacts on adjacent shoreline areas. An area of adjacent shoreline equivalent to two to three times the length of the structure could experience wrack algae accumulation, sand deposition, and changes in shellfish populations.

- *Shading.* Docks and piers can decrease the amount of light that reaches the bottom. Shading affects many forms of aquatic vegetation including macroalgae (seaweeds), phytoplankton (microscopic plants which drift freely and are a food source for many organisms), and eelgrass (a major habitat for shellfish and fin fish). In eelgrass beds, a pier with boards closer than one inch spacing will prohibit plant growth beneath the structure and two to four feet on either side.³ Both the height and orientation of a dock or pier affects the amount of light that is able to penetrate to the bottom, thereby influencing the viability of vegetation. For example, a north-south orientation causes significantly less shading over the course of a day than a dock with an east-west orientation. Similarly, a dock which is elevated twelve feet above bottom sediments may have little or no impact on vegetation.
- *Species Habitat.* Docks and piers are believed to provide habitats for different species. In shallow waters such as Pleasant Bay, piers tend to support filter feeders and shellfish predators that may filter out shellfish larvae or compete for phytoplankton food. Sea squirts, red sponge, barnacles, jellyfish polyps, mussels, anemones and crabs are among the shellfish predators that tend to locate in shallow water pier habitats.⁴
- *Chemical Leaching.* Wood used in the construction of most docks and piers in the Bay has been treated with an anti-fouling ingredient such as creosote, tributyltin (TBT), cuprinol, or chromated-copper-arsenate (CCA). Orleans is the only Bay town to prohibit use of CCA-treated lumber. Although scientific studies are not conclusive, there is evidence that these chemicals leach at different rates and have toxic impacts on marine organisms.⁵ A new breed of plastic compounds are emerging on the market to provide a long-lasting, non-fouling alternative to treated wood. The environmental impacts of these alternative materials are not well known.⁶
- *Construction Impacts From Seasonal Piers.* Most docks and piers in Pleasant Bay are seasonal structures that must be removed during cold weather months to protect them from storm and ice damage. However, the process of re-installation in early Spring may disturb the plants and animals imbedded in the substrate, and cause turbidity. Orleans regulations encourage the use of stub piles – which remain in the ground year-round – to support seasonal piers.

³ Poole, Bruce M.. *Diagnostic/Feasibility Study for Lagoon Pond Oakbluffs/Tisbury, MA.* SP Engineering, Inc. Salem, Massachusetts. 1987.

⁴ Poole, Bruce M.. *Diagnostic/Feasibility Study for Lagoon Pond Oakbluffs/Tisbury, MA.* SP Engineering, Inc. Salem, Massachusetts. 1987.

⁵ The Poole study cited that many of these chemicals on docks and piers cause mortalities in larval organisms and shellfish thousands of feet from their locations for many years. Other studies, some sponsored by the wood products industry, present less severe results on the levels of toxicity and their impacts on surrounding organisms

⁶ Orleans is the only Bay town which prohibits use of CCA treated lumber. The MCZM guidelines for docks and piers in ACECs and Ocean Sanctuaries require that treated wood used must be of a non-leaching variety.

These environmental impacts may be more pronounced when considering the concentrations of shellfish, eelgrass, and marsh vegetation found within 150 feet of Pleasant Bay's shoreline, where the impacts of docks and piers are focused. The environmental impact of a dock is influenced by the physical features of the surrounding water body, and the intensity of recreational uses in the vicinity. Together, these natural and human use factors influence the total direct impact a structure can have on its surroundings. Also of concern are secondary impacts generated by the use of docks and piers, such as boating. As discussed in Chapter 10, impacts from boating include discharge of petroleum and hydro-carbon by-products, motor exhaust, discharge of marine sanitary waste, bank erosion, turbidity, and leaching of toxic anti-fouling chemicals. These impacts are exacerbated during the summer boating season when the biological productivity is at its peak, and in areas with poor water circulation.

11.1.1 Assessing Cumulative Impacts from Docks and Piers

The current state and local permitting processes for docks and piers looks at the impacts a single proposed structure will have *in situ*, and on a case by case basis. This approach overlooks the contribution that a single structure can have on conditions in a larger marine system, and does not provide a basis for assessing the claim that "one more" dock will not significantly alter that system. To protect the integrity of the estuarine system, management strategies for docks and piers in Pleasant Bay must be based on an awareness of the cumulative impacts – direct and secondary – of all structures in the system. The cumulative impacts of docks and piers are difficult to measure because they encompass a variety of dynamic forces. Present knowledge about the direct impacts structures have on resources, detailed inventories of natural resources in the Bay, and indicators of natural resource conditions, including water quality and the vitality of shellfish and vegetation, all suggest that the cumulative impacts of structures in the Pleasant Bay system are significant and would increase with the addition of structures. The resource-based assessment described in the following section provides a foundation for reformulating the regulatory framework governing docks and piers in Pleasant Bay to account for cumulative impacts.

11.1.2 Resource-based Assessment of Dock and Pier Impacts on Pleasant Bay

The assessment of impacts from docks and piers in Pleasant Bay is based on nine factors that represent the biological, physical, and human use characteristics within an affected area. These are:

- *Enclosed Water Bodies.* Enclosed water bodies are more susceptible to poor flushing, softer sediments that are easily re-suspended, and high levels of nutrients that degrade water quality. Among other things, poor water quality threatens shellfish that usually settle in quiescent waters. Enclosed areas are popular for mooring boats and other recreational uses. Docks and piers can further restrict water circulation in these areas.

- *Water Depth.* Adequate water depth within 150 feet of fringe marsh, or of mean high water (MHW) if no fringe marsh is present, is crucial to prevent scouring from motor boat propellers. “Prop scour” can damage shellfish, re-suspend sediments that are detrimental to water quality, and destroy vegetation. Generally, a four foot water depth at low tide is sufficient depth to avoid “prop scour” from an outboard motor, but a greater water depth may be needed to avoid such impacts from inboard motors.
- *Shellfish Habitat.* Shellfish habitat within 150 feet of fringe marsh, or of mean high water (MHW) if no fringe marsh is present, is susceptible to impacts from the installation, presence, or use of docks and piers. Habitat is defined as an area that has the characteristics for supporting one or more of the five predominant species in the Bay: clams, quahogs, scallops, mussels, and oysters. Habitat characteristics include sediment type and grain size, water circulation, water chemistry, plant communities and food supply.
- *Eelgrass.* Eelgrass located within 150 feet of fringe marsh, or of mean high water (MHW) if no fringe marsh is present, provides an important habitat where animals can forage and find protection, and is susceptible to impacts from the installation, presence, or use of docks and piers.
- *Fringe Marsh.* Fringe marsh is a wetlands resource that can be affected by structures. The presence of fringe salt marsh along the shore is a resource to be protected in installing or removing a dock or pier.
- *Density of Existing Structures.* The density of existing structures is measured as the ratio of existing docks to the total number of waterfront parcels that could have a dock. This ratio relates to the potential cumulative impacts of structures, as well as the visual impacts from the addition of structures.
- *Moorings.* The number of moorings within a 500 foot radius of existing docks is an indication of boating congestion in the area.
- *Navigational Channel.* This criteria looks at the presence or absence of a navigational channel within 500 feet of mean low water (MLW). This refers to the amount of area that could be used for docks if they were built 125 feet from the fringe marsh.
- *Recreational Activity.* This criteria refers to the intensity of a variety of recreational uses in the area just beyond where docks and piers are placed.

Recognizing the diversity of subsystems within the Pleasant Bay estuary, the nine factors were evaluated for geographic subsections of the study area. Evaluating factors within subsections rather than the Bay as a whole facilitated the assessment of local cumulative impacts within a sub-system of the Bay. The assessment of factors within

each subsection was based on resource inventories developed for the resource management plan, as well as field observations.

The results of the assessment indicate that a significant portion of the Bay's shoreline is extremely resource-sensitive. Key factors in the determination of resource sensitivity are, primarily, the enclosed nature of the local water body, and the presence of significant shellfish habitat, eelgrass and fringe marsh resources within the area directly affected by a structure. In many instances these are also areas of intense boating and recreational activity. The potential cumulative impacts from the licensing of additional docks and piers in resource-sensitive areas threatens extensive and fragile natural resources in those areas.

Areas considered relatively less sensitive are those areas in which resources, although possibly present, are less abundant and less susceptible to impacts from docks and piers. Among the nine factors, human use factors tended to be more prominent than biological or physical factors in these areas.

On the basis of this assessment it is possible to identify areas of the Bay where resource conditions warrant a permanent moratorium on the licensing of docks and piers, and areas where resource conditions indicate that consideration should be given to licensing structures.

11.2 Recommendations to Address Environmental Impacts of Docks and Piers

11.2.1 Revise the Moratorium on Docks and Piers

Summary: The assessment of natural resource conditions throughout the Bay supports a revision to the existing moratorium on the licensing of docks and piers within the ACEC. Specifically, the following revisions are proposed:

- There should be a permanent moratorium on new licenses for docks and piers in areas identified by the plan to be “resource sensitive” (see following figure).
- In all remaining areas (see following figure), the existing moratorium on new licenses for docks and piers should be continued until new performance standards and design criteria for licensing of docks and piers in those areas, as developed by the Pleasant Bay Management Alliance, are adopted into regulations by the respective towns and approved by the state. The new performance standards and design criteria are described in sections 11.2.1, 11.2.2 and 11.2.3 of the plan, below.
- In towns in which the performance standards and design criteria developed by the Alliance have been adopted, applications for new licenses for docks or piers in areas not identified by the plan as “resource sensitive” may be considered for licensing under Chapter 91.
- The existing moratorium on new licenses for docks and piers in freshwater ponds within the ACEC should be continued pending the completion of a freshwater resource assessment and analysis. Based on the resource assessment and analysis, freshwater ponds should be identified as either “resource sensitive”, or as areas where docks and piers may be allowed. In the event that the assessment identifies freshwater areas where docks and piers may be allowed, the existing terms of the

moratorium should continue until new performance standards and design criteria for licensing freshwater docks and piers, as developed by the Pleasant Bay Management Alliance, are adopted into regulation by the respective towns and approved by the state.

Implementation: The Alliance Steering and Technical Resource Committees would work closely with local conservation commissions to (1) conduct a freshwater resource assessment and analysis, and (2) begin formulating new performance standards and design criteria for areas where docks and piers may be allowed. Consultant services may be required to assist in conducting the resource assessment or developing new performance standards and design criteria. Technical assistance would be requested from the state DEP, Divisions of Wetlands and Waterways, Massachusetts Coastal Zone Management, state DEM, Cape Cod Commission, state Division of Marine Fisheries, NOAA, Army Corp. of Engineers, and regional scientific institutions.

Funding: Funding for developing the scope of issues for (1) the freshwater resource assessment, and (2) the performance standards and design criteria, is incorporated in the FY 1999 budget for the Alliance.

Time Frame: The scope of issues for (1) the freshwater resource assessment, and (2) the performance standards and design criteria, would be developed within twelve months of the adoption of the plan by the towns and the state. The new performance standards and design criteria for salt and freshwater areas would be developed within eighteen months of the adoption of the plan.

11.2.2 Develop Performance Standards for Permitting New Docks and Piers

Summary: New performance standards for licensing of a dock or pier within an allowable area (see 11.2.1) should be developed. Issues that should be addressed by the performance standards include:

- whether and to what extent the proposed structure will adversely affect marine (or freshwater) resources (shellfish, eelgrass, habitats, etc.) or water quality;
- whether and to what extent the proposed structure will benefit resources, such as by protecting marsh grass, or enhancing shellfish habitat;
- whether the public, represented as several individuals or a representative group, can demonstrate a need for the proposed structure;
- whether the proposed structure will seriously alter or otherwise endanger the ecology or appearance of the Bay, or its seabed, or subsoil;
- whether the proposed structure can be demonstrated to be a “necessity” or a “luxury”, and whether other existing structures in the vicinity can adequately meet the need to be served by the proposed structure;
- whether the structure will allow for legally shared use by multiple parties;
- whether public access will be improved or limited by the proposed structure;

- whether and to what extent other facilities or Bay uses may be affected by the proposed structure; and
- whether there is a plan and adequate resources for sustained care and maintenance of the proposed structure.

Proponents should be responsible for conducting an assessment of resource impacts, and for demonstrating how the proposal responds to the performance standards. To ensure consistency and comprehensiveness, proponents should be required to conduct the assessments in accordance with specifications developed for use in all Bay towns.

Implementation: See 11.2.1

Funding: See 11.2.1

Time Frame: See 11.2.1

11.2.3 Develop Design Criteria for Permitting New Docks and Piers

Summary: Uniform design specifications for the licensing of docks and piers within an allowable area of the Bay should be developed. Design specifications should encompass:

- minimum required water depth;
- maximum length, width, and height of structure;
- size and spacing between planks and pilings;
- requirements for seasonal and permanent construction;
- design and orientation;
- site specific considerations (including visual impacts);
- materials;
- public access requirements; and
- maintenance requirements.

Implementation: See 11.2.1

Funding: See 11.2.1

Time Frame: See 11.2.1

11.2.4 Develop Performance Standards and Design Criteria for Marsh Walkways and Related Structures

Summary: Performance standards and design criteria should be developed for allowing construction of marsh walkways and related structures⁷. Performance standards should ensure that such structures are only allowed in areas where preservation of marsh areas could not otherwise be reasonably achieved. In such cases, design criteria should be developed to minimize the displacement of wetlands resources, and to minimize impacts on vegetation from shading. In all cases, Section 10(a) permits to allow bottom anchor floats and associated ramps should be prohibited.

Implementation: The Alliance Steering and Technical Resources Committees will work closely with conservation commissions to develop the standards and criteria for marsh walkways. The standards and criteria for marsh walkways should be developed along with the standards and criteria outlined in 11.2.2 and 11.2.3 above.

Funding: See 11.2.1

Time Frame: See 11.2.1

11.2.5 Continue to Monitor Cumulative Direct and Secondary Impacts from Docks and Piers

Summary: A system for monitoring the cumulative direct and secondary impacts from docks and piers should be developed. Measurable and reliable indicators of direct and secondary impacts should be identified and monitored. At a minimum, issues that should be reflected in indicators are:

- water quality and circulation;
- submerged and marsh vegetation;
- shellfish and finfish habitat; and
- public access.

Most of the indicator data will be generated by the ecological inventory and monitoring program (see 9.2.1), the water quality monitoring program (see 9.4.3), and the shellfish and finfish assessment (10.2.2). Based on this information, areas designated in the plan as potential areas for licensing new structures could be determined to be resource sensitive and therefore inappropriate for such structures.

Implementation: The Alliance Steering and Technical Resource Committees would work with local conservation commissions, natural resources officers, and shellfish officials to ensure that issues relative to the on-going monitoring of dock and pier impacts are incorporated in the studies noted above. Additional data collection and analysis needed, if any, would be identified. Technical assistance would be requested from the Massachusetts Division of Waterways, Massachusetts Coastal Zone Management, Cape

⁷ For the purposes of the resource management plan, the definition of “marsh walkway” (also referred to as “catwalk” or “plankwalk”) is an elevated structure used as a walkway to traverse fresh or salt meadow, marsh, meadowbank, dune or beach.

Cod Commission, and regional scientific institutions. Consultant services could also be required.

Funding: Funding for ensuring that monitoring indicators are incorporated in the studies noted above is included in the FY 1999 budget for the Alliance.

Time Frame: Indicators for monitoring cumulative impacts would be identified within twelve months of adoption of the plan by the towns and the state, and incorporated into appropriate phases of the inventory and monitoring program, water quality monitoring program, and fisheries assessment.

11.3 Resource Management Issue: Environmental Impacts from Erosion Control Structures

Currently, approximately 22,627 feet of Pleasant Bay's shoreline is protected by erosion control structures. There are 103 revetments, 25 bulkheads, and only five soft solutions in the study area. Although use of hard structures may be required in some areas of the Bay, there is concern that hard structures may be installed in situations where soft solutions could work as well. A proliferation of hard structures could diminish the Bay's natural erosion and nourishment processes, resulting in the loss of beach height and vitality, and vegetated marsh.

Under normal circumstances, winds, currents and tides hit a coastal bank and, depending on the profile of the bank and its vegetation, erode the bank's sediments. Eroded sediments, usually sand, are then transported by winds and currents to the beach at the base of the bank, to elsewhere along the adjacent shoreline, or back out to sea. This natural action ensures that beaches are replenished with sand which is continually removed by tides and storms, and adds nutrients to intertidal and fringe marsh vegetation.

The main impact of hard structures is to transport wave energy down the shoreline where it can result in harm to other properties, and prevent naturally-occurring beach nourishment. Within Pleasant Bay there is indication of beach loss from erosion control structures. Regular beach nourishment is a frequent mitigation requirement for the licensing of hard structures. In practice, however, beach nourishment is often unfeasible, neglected, or poorly executed, resulting in expenses for owners without the intended mitigation effects.

The southern portion of shoreline around "Big" Pleasant Bay are showing a loss of sand and a change to stony beaches. This occurs because fresh sand is no longer provided by the erosion of the protected bluffs. These areas encompasses Jackknife Harbor in Chatham, Bay Road Beach in Harwich, and the Route 28 beach area and town landing in Orleans. This area constitutes the only public beach-front on the Bay, as well as a number of private properties. Protection against the loss of these beach areas is warranted. The southeast shore, where there are few erosion control structures, remains sandy or covered with beach grass.

Hard structures can have impacts on other resources and public access, as well. Use of heavy equipment in the construction of erosion control structures or for gathering nourishment sand from down-drift areas can crush near-shore shellfish and vegetation. Local shellfishermen have noted that shellfish beds in areas traversed by heavy equipment can be destroyed and may require several years to revive, if ever.

Revetments, sea walls and other hard structures are also notorious for impeding lateral access along the shoreline. This effect is exacerbated as beaches at the base of the structure are washed away and not effectively re-nourished. Structures seeking a Chapter 91 license are now required to install signs stating that persons with legal public access may traverse the structure. Stairs and platform walkways are required to provide safe passage for fishers, fowlers, and navigators. Most erosion control structures on the Bay were built before the Chapter 91 public access requirements were in effect, and are not designed to allow for safe passage. Also, many newly licensed structures are not in compliance with licensing requirements for public access. Structures built above mean high water are not held by such requirements, even though those structures may end up below mean high water due to erosion or sea level rise

The observed cumulative effects of hard structures on natural resources and public access in Pleasant Bay are significant. As a result, there is increasing concern that the number of hard structures be limited in number and size, and that alternatives to hard structures be utilized whenever they can be shown to provide ample protection of shoreline properties. Soft structures are already preferred by state and local permitting agencies because they provide substantial protection with minimum interruptions to beach nourishment and natural habitats. While soft structures may require frequent maintenance to remain effective, they may be less costly than hard structures in the long run.

11.4 Recommendations to Address Environmental Impacts of Erosion Control Structures

11.4.1 Develop a Resource-based Framework for Evaluation of Erosion Control Structures

Summary: A resource-based framework for evaluating the impacts of erosion control structures should be developed. The framework should include a shoreline assessment of physical features and resource conditions relevant to the impacts and effectiveness of erosion control structures. At a minimum, the shoreline assessment should include:

- width of bordering fringe marsh;
- distance of landward marsh to the toe of the bank;
- soil type;
- cause of the erosion, i.e., sea level rise;
- value of the resource as a sediment source;
- height of the bank;
- vegetation;

- relative slope;
- orientation of bank or dune;
- presence of structures;
- length of structures along shoreline;
- presence of building;
- distance of building to bank;
- incidence of episodic storms;
- tidal action;
- distance from mean high water to toe of bank;
- erosion rate (see 11.4.2).

The shoreline assessment should rely on clearly defined the variables and parameters to measure or characterize each feature. The assessment should be used to evaluate the effectiveness of local regulations in protecting resources, and to:

- identify appropriate regulatory changes, including performance standards and design requirements for structures see (11.4.4);
- identify the relative sensitivity of specific portions of the shoreline to the impacts of erosion control structures;
- develop maintenance and mitigation requirements for structures; and
- develop a system to monitor impacts of structures over time.

Implementation: The Alliance Steering and Technical Resource Committees would work closely with local conservation commissions to develop the shoreline assessment and the standards and criteria for erosion control structures. Technical assistance would be requested from the Massachusetts Division of Waterways, Massachusetts Coastal Zone Management, Cape Cod Commission, and local scientific institutions. The standards and criteria for erosion control structures would be developed along with the standards and criteria outlined in 11.2.2 and 11.2.3 above.

Funding: See 11.2.1

Time Frame: See 11.2.1

11.4.2 Establish and Monitor Erosion Rates Along Pleasant Bay Shoreline

Summary: Shoreline Change Maps generated by Massachusetts Coastal Zone Management do not include information on erosion rates for the shoreline of Pleasant Bay. Information on historic erosion rates is necessary for evaluating coastal wetlands resources in terms of their value for storm protection, and sediment supply. A primary reason for monitoring erosion rates is to determine or document the need for a shoreline structure. A program to monitor erosion rates for the shoreline of the Pleasant Bay ACEC should be undertaken.

Implementation: The Alliance Steering and Technical Resource Committees, local conservation commissions, and Cape Cod Commission, would work with Massachusetts Coastal Zone Management to include Pleasant Bay in the MCZM shoreline change mapping program.

Funding: Funding for working with MCZM to include Pleasant Bay in the Shoreline Change Mapping Program is included in the FY 1999 budget for the Alliance.

Time Frame: Discussions with MCZM would begin within twelve months of the adoption of the plan by the towns and the state.

11.4.3 Encourage Alternatives to Hard Structures

Summary: Local and state permitting agencies should be urged to ensure that alternative measures to hard structures are utilized wherever possible to mitigate the effects of coastal bank loss. Use of hard structures should be carefully reviewed in areas where they could decrease the sediment supply. Areas of special concern include the southern shore of “Big” Pleasant Bay. These areas, which include public beaches and other access points, are experiencing stony beaches and loss of vegetation due to erosion. Other areas may be identified through the shoreline resource assessment (see 11.4.1).

The selection of erosion control measures should include consideration of the following alternatives to hard structures:

- bank restoration;
- designing the structure appropriate to the rate and cause of erosion;
- re-contouring of existing bank elevations;
- vegetative plantings such as dune grass;
- beach nourishment;
- soft engineered structures such as sand bags or fiber rolls; and
- relocation of buildings away from the eroding edge.

Implementation: The Alliance Steering and Technical Resource Committees would review applications for new or rebuilt erosion control structures in accordance with 9.6.2, and would provide comment to local conservation commissions, state DEP Division of Wetlands and Waterways, and Massachusetts Coastal Zone Management concerning the consistency of applications with the resource management plan.

Funding: See 9.6.2.

Time Frame: Upon adoption of the plan by the towns and the state.

11.4.4 Develop Performance Standards and Design Criteria for Erosion Control Structures

Summary: Performance standards and design criteria should be developed for erosion control structures. The performance standards would be used by local and state permitting authorities to assess situations where the use of hard structures can be considered the only feasible alternative for erosion control. In such cases, the design criteria would be used to minimize negative environmental impacts from such structures. The design criteria for hard structures should address:

- designing the height of the structure to allow sediment release during extreme storm events;
- requiring “rough face” surfaces that tend to displace wave energy and cut down on “end effect” erosion;
- constructing hard structures as far landward of mean high water as practicable;
- requiring construction to be staged from the landward side of the structure to minimize construction impacts on existing beach front, fringe marsh, and shellfish resources;
- requiring vegetative covering and beach nourishment, either immediately following construction or when conditions allow; and
- requiring structures to be constructed with stairs, platform walkways, or other acceptable design which would allow safe public access. Future erosion of beach-front should be considered and addressed in the structure design (See 13.2.1);
- requiring compliance with beach re-nourishment guidelines see (9.6.3).

Design criteria would also be developed for soft structures.

The existing moratorium on erosion control structures requiring a Chapter 91 license should be continued until the performance standards and design criteria, as developed by the Pleasant Bay Management Alliance, are adopted into regulation by the respective towns and approved by the state. Conservation Commissions are encourage to adopt and apply the same performance standards and design criteria for erosion control structures that do not require a Chapter 91 license.

Implementation: See 11.4.1

Funding: See 11.4.1

Time Frame: See 11.4.1