

Proposal to Cape Cod Water Protection Collaborative  
Shared Watersheds, Shared Responsibilities Grant Program

Assessment of resource impacts, permitting requirements and cost allocation methods associated with the Muddy Creek dike re-installation

Proposal Contents

1. Completed Application Form
2. Letters of Support from Watershed Communities
3. Memorandum of Agreement forming the Pleasant Bay Resource Management Alliance
4. Background information from Massachusetts Estuaries Project

## A. General Information

### 1. Name and address of the applicant(s)

Pleasant Bay Alliance (herein "Alliance")  
C/o Town of Chatham, fiscal agent  
549 Main Street  
Chatham, MA 02633

### 2. Project name

Assessment of resource impacts, permitting requirements and cost allocation methods associated with the Muddy Creek dike re-installation.

### 3. Project summary, including objectives

The project will assess the wetland and habitat resource impacts associated with re-installation of a dike in Muddy Creek. The dike would restore the upper Creek to a freshwater system for the purposes of natural nitrogen attenuation in a heavily overloaded subembayment of Pleasant Bay. The resource impacts would then be balanced against nitrogen attenuation and associated habitat restoration impacts to determine the overall feasibility of re-installation, in concert with other nitrogen management strategies under consideration by the towns. The project will also identify a critical path for permitting and will recommend cost allocation strategies for re-installation and maintenance of the dike.

### 4. Requested funds

\$35,000

## B. Detailed Project Information

### 1. Project objectives

Objectives of this project are to:

- *Take the next step in examining the recommendation made by the Massachusetts Estuaries Project (MEP) to fully explore the potential of natural nitrogen attenuation in one of the most overloaded subembayments in the Pleasant Bay system.*

The Muddy Creek subembayment is a meandering tidal river that discharges into the main basin of Pleasant Bay through two undersized culverts located under Route 28, and is within the Pleasant Bay ACEC. The subwatershed for Muddy Creek is shared by Chatham (~25%) and Harwich (~75%). Septic nitrogen load reductions needed to achieve threshold nitrogen levels range from 75% in upper Muddy Creek to 100% in lower Muddy Creek.

The long, narrow configuration of the Creek, coupled with inadequate flushing allowed by the roadway culverts, compounds the impacts of watershed development resulting in poor water quality conditions. A hydrodynamic analysis conducted as

part of the MEP looked at three scenarios to improve flushing and thereby improve water quality in Muddy Creek. (See enclosed: Ramsey, Tidal Flushing Analysis of Coastal Embayments in Chatham, MA, chapter VI, pp. 86-89) One scenario would revert the entire Muddy Creek into a freshwater system. This scenario was rejected based on the potential loss of significant salt marsh at the lower end of the Creek. A second alternative would enlarge the culverts to improve flushing. However, water quality modeling indicated insufficient potential water quality improvement to justify this scenario. A third and preferred alternative tested would re-install an historic dike located mid-way up the Creek, thereby reverting the upper portion to a fresh water system, and improving tidal flushing in the lower portion. The project would enable the towns to fully assess the merits of this scenario and identify the natural resource, cost allocation and regulatory issues that need to be addressed during implementation.

- *Respond to MassDEP's request for information on wetlands delineation, which is necessary to fully explore the potential resource benefits and impacts of natural nitrogen attenuation in the Muddy Creek.*

The Towns of Chatham and Harwich approached MassDEP to explore the feasibility of obtaining permits necessary for the dike re-installation. To further assess the feasibility of issuing permits for the project, MassDEP requested (1) water quality modeling to characterize the improvements achievable with the dike re-installation and (2) delineation of wetlands that would be affected by the re-installation. MassDEP also indicated that a condition of permits would need to be a commitment of some landside management strategies.

The Town of Chatham conducted the water quality modeling under the MEP, which showed that “the long-term result of this restoration of fresh water conditions will be the lowering of the nitrogen transport from the upper to lower basins to a level equivalent to [approximately] 70% of the [combined] watershed and atmospheric nitrogen loading.” The analysis also showed that to achieve similar levels of nitrogen reduction, one-third of the homes would need to be placed on sewers with discharge outside of the watershed. (See enclosed: Howes, Technical Memo to Chatham re: Muddy Creek: Modeling Scenario, August 21, 2006)

To address the need for landside management strategies, the Town of Chatham comprehensive wastewater management plan calls for sewerage of portions of the Muddy Creek subwatershed. Harwich, through a significant public and private effort, purchased more than 60 acres of land adjacent to Muddy Creek for conservation. In addition, the potential for enlarging the culverts under Route 28 will continue to be explored as part of planned improvements to Route 28 by Mass Highway.

The information requested by MassDEP that remains outstanding is the delineation of wetlands and an assessment of potential impacts on those resources and associated habitats. The project would generate the information requested by MassDEP, and provide a regulatory and cost allocation road map for state and local approvals and implementation.

- *Examine the potential impacts and benefits--in terms of nitrogen attenuation, and impacts to wetlands resources and habitat-- that would be achieved by re-establishing an historic dike in Muddy Creek, and thereby reverting the upper portion of the Creek to a freshwater system.*

MassDEP has a policy that places higher priority on saltwater wetlands than on freshwater wetlands. Re-installation of the dike would be expected to displace some saltwater wetlands and associated habitat upstream of the dike, and could improve the health of saltwater wetlands and associated habitat downstream of the dike.

Delineation and quantification of these resource impacts is needed to balance the benefits of natural nitrogen attenuation with other significant resource impacts. The re-installation of the dike offers potential significant nitrogen removal in the near term without the need for extensive public or private investment in infrastructure. However, such improvements must be weighed against offsetting or excessive damage to estuarine resources that would result. The project would provide the critical information and decision making methodology needed to weigh likely impacts and benefits, and make a determination on the feasibility of the dike re-installation.

- *Augment a four-town effort to address excessive nitrogen in the shared Pleasant Bay system.*

Through the Alliance, the Orleans, Chatham, Harwich and Brewster communities have a lengthy and productive history of cooperation in managing a cherished resource. Specifically, through the Alliance the four towns have sponsored the MEP technical analysis and resulting TMDL development, and are jointly pursuing watershed based implementation strategies and policies. This project will provide needed verifiable information to inform the involved communities about the likely impacts and benefits of a potential nitrogen management strategy that could mitigate a major nitrogen source in the Pleasant Bay system.

- *Provide replicable analytical frameworks, strategies and tools for assessing the potential impacts and benefits of natural attenuation of nitrogen that would likely result from reverting a marine water body to a freshwater system.*

While the precise extent and nature of resources will be unique to Muddy Creek, the need to balance the benefits of natural nitrogen attenuation with the potential resulting loss or damage to other estuarine resources is not unique to this situation. The analyses and methodologies used to assess the impact and benefits of this project would be applicable to other communities seeking to revert marine systems to freshwater systems in order to achieve attenuation. The cost allocation methods recommended for installation and ongoing maintenance of the dike would also provide a model for replication in other communities.

## 2. Detailed project description

The project has three components: the resource assessment component, and the regulatory component, and the cost allocation component.

*Resource assessment component:*

Task 1. Delineate existing marine and freshwater wetlands and associated habitats throughout Muddy Creek that would be affected by the re-installation of the dike.

Task 2. Estimate and characterize the anticipated changes to wetlands and associated habitat throughout Muddy Creek that would likely result after re-installation of the dike. Provide a timeline for change.

Task 3. Identify anticipated changes to hydrology and any anticipated impacts to private property that would likely result after re-installation of the dike.

Task 4. Recommend a monitoring program for wetland resources to be used if the dike is re-installed.

*Regulatory component:*

Task 5. Review state and local permitting requirements and issues and provide a critical path and timeline for permitting.

*Cost allocation component:*

Task 6. Provide a framework for cost allocation among towns for state and local permitting, construction, maintenance and monitoring associated with the dike re-installation, including recommendations for memoranda of agreement or other codifying documents.

## 3. Description of how the proposed project meets the eligibility criteria in the guidance

*The project will enhance municipal efforts to better understand the management opportunities available to communities to manage nutrient loads from multiple communities.*

Current controllable watershed nitrogen loads would need to be reduced by 54% and 75% for upper and lower Muddy Creek, respectively, in order to meet target threshold loads. The large required load reductions are due in large part to the natural configuration of the Creek and inadequate flushing through two under-sized culverts running under Route 28, which connects Muddy Creek to the main basin of Pleasant Bay.

Hydrodynamic and water quality improvements from three alternative management scenarios have been modeled and the re-installation of an historic dike has been identified as a preferred alternative. However, further information and analysis is

needed to fully understand the benefits and impacts of this management alternative alone, and in combination with other management strategies under consideration, including enlarging the roadway culverts, and sewerage of developed neighborhoods in the subwatershed. The project will provide the information necessary to complete these other assessments.

*The project will enhance municipal efforts to evaluate the merits and costs of different management scenarios involving more than one town.*

The re-installation of the dike is expected to result in various impacts. These include the positive benefits of nitrogen attenuation through reversion of the upper Creek into a fresh water system. Benefits also include lower residence times in the down stream portion of the Creek, which would be expected to improve water quality and marine habitat conditions in that portion of the Creek, and lower the amount of nitrogen flowing from the Creek into greater Pleasant Bay. Less desirable likely impacts include the loss of saltwater wetlands in the upper portion of the Creek due to the conversion to a freshwater regime as well as changes in hydrology. Impacts to shorefront properties resulting from changes in habitat and regime are also unknown and need to be explored. The project will enable the communities to fully explore and compare the potential benefits and impacts that would be expected from the dike re-installation.

*The project will enhance municipal efforts to better understand the impact of multiple town nutrient loading on the water quality of a specific bay.*

The study of the dike re-installation is the first concrete multi-town implementation effort to achieve nitrogen reduction targets in the Pleasant Bay watershed. If implemented, the dike re-installation would generate near term nitrogen reduction benefits in Muddy Creek and Pleasant Bay. It would also provide an early model of inter-municipal cooperation.

*The project will enhance municipal efforts to evaluate options for cost apportionment among towns.*

The project will result in creation of a framework for cost allocation among towns for design, permitting, construction, maintenance and monitoring associated with the dike re-installation.

*The project will enhance municipal efforts to evaluate/develop innovative approaches to intermunicipal cooperation.*

The study of the dike re-installation is the first concrete multi-town implementation effort to achieve nitrogen reduction targets in the Pleasant Bay watershed. If implemented, the dike re-installation and the framework for cost allocation among towns for permitting, construction, maintenance and monitoring, would provide a

template for future inter-municipal nitrogen management projects. This template will be of use to the Pleasant Bay communities and other shared watershed communities.

**4. Detailed timeline for the project, including an explanation of any need to extend the completion date beyond one year**

This project would be completed within twelve months of receipt of the grant award. While some aspects of the project, such as delineation of wetland resources, may be seasonally dependent, it is expected that all tasks can be completed within the one-year time frame. A time line of project tasks follows:

Month 1	Review and refine scope of the project
Month 2	Issue an RFP(s) and select qualified firm(s) to conduct the delineation, develop permitting critical path, and cost allocation assessment and recommendations
Month 2-5	Conduct the delineation and associated analysis (May be seasonally dependent).  Develop permitting critical path.  Assess/recommend cost allocation methods and instruments.
Month 6	Review and comment on findings on all three components.
Month 8	Obtain final project report from consultant(s).
Month 9-10	Public dissemination of findings
Month 11	Project report to CCWPC

**5. Detailed description of the inter-municipal cooperation expected as part of this project (include letters of support for project from participating communities)**

This project will be managed and implemented by the Pleasant Bay Resource Management Alliance (Alliance). The Alliance is an inter-municipal organization formed by a Memorandum of Agreement signed by the Boards of Selectmen of the four watershed towns: Orleans, Chatham, Harwich and Brewster. The Alliance was formed in 1998 to implement the locally and state approved resource management plan for the Pleasant Bay Area of Critical Environmental Concern (ACEC) and the watershed. The original resource management plan was updated in 2003 and will be again in 2008. In approving the plan, the Secretary of the Executive Office of Environmental Affairs cited the Alliance as “a model of coordinated municipal and regional planning and management of sensitive resources that other ACECs and communities across the Commonwealth can use as an example.”

The Alliance is governed by a Steering Committee made up of representatives of each member town appointed by their respective Selectmen. The Steering Committee is supported by a Technical Resource Committee (TRC) consisting of municipal officials involved in various areas of resource management. Liaisons to the TRC are provided by the Cape Cod Commission, Coastal Zone Management, Cape Cod National Seashore and Massachusetts DCR. The Alliance manages several on-going work groups to facilitate progress on resource management issues and plan recommendations. Wastewater management issues are the focus of our Watershed Work Group. Participants in this work group include the municipal employees and consultants involved in developing Comprehensive Wastewater Management Plans, as well as other TRC and Steering Committee members. Representatives of MassDEP and the MEP attend meetings regularly. This work group reviewed the progress through the MEP and TMDL development, and will provide strategic oversight to the proposed project. The Alliance’s professional Coordinator provides day-to-day management of the Alliance, its committees and work groups. The Coordinator will be the person responsible for managing this grant-funded project.

A copy of the Memorandum of Agreement forming the Alliance, and letters of support from the Boards of Selectmen of the four watershed communities, are enclosed with this application.

**6. Detailed project budget, including a description of all sources of project funding and local match funds**

The \$35,000 requested will be matched by \$9,220 (26%) in professional staff and volunteer time applied in developing, managing and reporting on work products. Staff time was calculated using a rate of \$44/hour, and volunteer time was calculated using a rate of \$20/hour. In addition, \$13,000 has already been spent in developing underlying water quality and hydrodynamic analyses, for a total local contribution of \$22,220 for this project. A budget follows:

Task	Local Match	Grant Funds	Totals
Assess hydrodynamic impacts of alternatives	10,000 Completed	N/A	10,000
Assess water quality impacts of alternatives	3,000 Completed	N/A	3,000
Delineate wetlands, habitat & report	3,520	22,000	25,520
Permitting critical path & report	700	4,200	4,900
Cost allocation plan	1,500	8,000	9,500
Grant administration & reporting	3,500	800	4,300
Totals	\$9,220 (\$22,220 including completed studies)	\$35,000	\$44,220 (\$57,220 including completed studies)

**7. Describe how the grant funds will move the towns closer to improving water quality**

The project will provide critical information to enable the towns to evaluate the costs and benefits of a management alternative that could help achieve the nitrogen TMDLs for Muddy Creek in Pleasant Bay. Where Muddy Creek is part of and exchanges water with the larger Pleasant Bay system, the project would help assess a strategy for reducing nitrogen and improving water quality in the larger system as well.

**8. Describe how the project fits in with the overall approach to reducing nutrient loading and/or improving water quality**

The project will help to assess a management option for achieving a nitrogen reduction in nitrogen through natural processes, and thereby achieving the nitrogen TMDL for Muddy Creek and the larger Pleasant Bay system. This is an integral component of the nitrogen management efforts undertaken by the Alliance communities. These efforts began with water quality monitoring followed by participation in the MEP and development of TMDLs, and are continuing through comprehensive wastewater management planning and implementation.

**9. Describe how the project has a high likelihood of success**

The project has a clear set of objectives and tasks with measurable outcomes. The project also has an effective inter-municipal management structure in place to keep the project moving forward on time and within budget.

The project seeks to provide high quality information to assist the towns of Chatham and Harwich and MassDEP in assessing the merits of the dike re-installation, and will provide a clear roadmap for proceeding if appropriate.

**10. Describe plans for reporting the project findings**

An outreach plan to disseminate information generated by the project will be developed and implemented by the Alliance. The plan will identify targeted audiences, and will tailor strategies to convey information to each audience. The project will generate a report of findings on resource impacts, regulatory issues and a recommended cost allocation method for construction and maintenance. This information will be forwarded to the CCWCP with a cover memo explaining the implications of the work, and any resulting next steps. A meeting or presentation to CCWPC will be provided if requested. It is anticipated that the final project report will be summarized in a press release, and will be available on the Alliance's website. It is also anticipated that the outreach plan will include briefings to the Boards of Selectmen, Conservation Commissions, Boards of Health and wastewater management committees in Chatham, Harwich, Brewster and Orleans. A press release will also be issued to local media outlets with highlights of the report of

findings. MassDep also will receive a complete copy of the report and findings. Portions of the analysis will also be included in public education and informational materials generated by the Alliance, including the planned *Citizen's Guide to Estuarine Protection* featuring the Muddy Creek subwatershed.

MEMORANDUM OF AGREEMENT  
Between the Towns of Orleans, Chatham, Harwich and Brewster  
TO ESTABLISH THE PLEASANT BAY RESOURCE MANAGEMENT ALLIANCE

Article I. Recitals

WHEREAS, the estuary known as Pleasant Bay lies within the municipal boundaries of Orleans, Chatham, Harwich and Brewster, and

WHEREAS, in 1995 the four towns entered into an agreement to develop a resource management plan (“plan”) to protect the vast natural resources of the Bay, and

WHEREAS, the agreement established as a goal of the plan to have the towns adopt uniform polices and regulations for the management of the Bay, and

WHEREAS, the plan developed in accordance with the agreement provides management recommendations concerning the towns’ policies and regulations relative to water quality, wetlands, wildlife, fisheries, boating, shorelines structures, and public access, and

WHEREAS, the Towns of Harwich, Orleans, Chatham and Brewster have approved the plan and the five-year plan update;

NOW THEREFORE, the undersigned towns, in consideration of the mutual covenants contained herein, hereby agree as follows:

Article II. Policy and Purpose

1. This agreement forms the Pleasant Bay Resource Management Alliance (“Alliance”). Through participation in the Alliance the undersigned towns agree to implement the plan recommendations, acting by and through their designated officers, employees or agents. The towns also agree to seek funding through Town Meeting for implementation of the plan in accordance with the terms of this agreement.
2. Each town participating in the Alliance shall retain authority over the resources and activities within its jurisdiction. The Alliance shall coordinate, and not duplicate or compete with, the functions of existing regulatory and planning organizations in each of the undersigned towns as they pertain to the Pleasant Bay Resource Management Plan.

Article III: Steering Committee

1. A Steering Committee shall be created, with one member appointed by the Board of Selectmen of each undersigned town.
2. The Board of Selectmen of each undersigned town may appoint an alternate Steering Committee member. Such alternate shall not have voting privileges unless authorized

by the appointed Steering Committee member for the town to vote as proxy for said member.

3. The members of the Steering Committee shall serve at the pleasure of the Board of Selectmen of the Town by whom they were appointed.
4. Provided there is a quorum of three-quarters of the members or designated alternates present, the Steering Committee shall act by majority vote.
5. The Steering Committee shall elect a Chairman, Vice-Chairman, and Treasurer/Secretary.
6. During any fiscal year for which a Town Meeting in one or more of the undersigned towns fails to appropriate funds in accordance with the provisions of Article IV of this agreement, the Steering Committee member from such town shall serve as an ex officio member and shall not vote.
7. The Steering Committee shall be authorized to expend funds, subject to the conditions contained herein, from the Pleasant Bay Resource Management Alliance Account. The Steering Committee shall have no authority to contract for services or expend funds in excess of the amount available in said account. All contracts shall be in writing and no contract shall be entered into without a certification of the Town of Chatham Director of Finance.
8. The Steering Committee shall have overall responsibility and accountability for coordinating with officers, employees or agents of the undersigned towns to implement the plan.

#### Article IV: Technical Resource Committee

1. A Technical Resource Committee shall be created, with four members from each of the undersigned towns. The Committee members may include the harbormaster, shellfish constable, conservation agent, town planner, (or their equivalent as determined by the town's Board of Selectmen), of each undersigned town.
2. The members of the Technical Resource Committee representing each town shall be appointed annually by their respective Board of Selectmen. Appointments to the Technical Resource Committee by each of the Boards of Selectmen of the undersigned towns should be made by June 30<sup>th</sup> for the following fiscal year.
3. The Technical Resource Committee shall provide technical assistance, advice, and recommendations to the Steering Committee in the implementation of the plan.

#### Article V: Alliance Account

1. An account shall be established under the jurisdiction of the Town of Chatham Director of Finance to be known as the Pleasant Bay Resource Management Alliance Account ("Alliance Account").
2. The Alliance Account shall be the depository for all non-municipal funds and municipal appropriations made for the implementation of the plan.
3. Expenditures from the Alliance Account shall be authorized by a majority vote of the Steering Committee as provided herein. Any expenditure so authorized shall be

subject to the customary and ordinary requirements for the expenditure of funds in the Town of Chatham.

4. The Steering Committee is authorized to release funds from the Alliance Account for consultant services, or other goods and services related to the Pleasant Bay Resource Management Plan's implementation.

#### Article VI: Budgeting and Reporting

1. The Steering Committee shall prepare a proposed annual budget and operating plan for the coming fiscal year.
2. The proposed annual budget and operating plan shall be presented to the Boards of Selectmen of the undersigned towns per each town annual budget schedule.
3. The proposed annual budget shall indicate the amount of funds requested from the Towns of Orleans, Chatham, Harwich and Brewster for the coming fiscal year, as well as the amount and source of all non-municipal funds. The total amount of funds requested from the Towns of Orleans, Chatham, Harwich and Brewster, shall be apportioned as follows: thirty-five (35) percent to Orleans, thirty-five (35) percent to Chatham, eighteen (18) percent to Harwich, and twelve (12) percent to Brewster. In accord with current practice, all participating towns shall include their share of funds as a line item in their annual town budget.
4. The proposed annual budget shall present the expenditures planned for the coming year.
5. At the end of each fiscal year the Steering Committee shall submit a financial statement and a report of activities to the Boards of Selectmen of the undersigned towns to be publicized in annual town reports.
6. Funds in the Alliance Account not expended by the end of the current fiscal year shall remain in said account and applied toward approved expenditures related to the implementation of the Pleasant Bay Resource Management Plan in the following fiscal year.

#### Article VII: Renewal and Termination

1. The approved plan shall be reviewed and updated as necessary every five years. Any proposed amendments to the approved plan shall be submitted to the Board of Selectmen in each of the undersigned towns for review and may be submitted to Town Meetings in the undersigned towns for approval.
2. This agreement shall expire December 1, 2008 unless prior to that date the undersigned towns take action either to extend or terminate the agreement.
3. Upon termination of the Alliance, the assets remaining in the Alliance Account after all outstanding obligations have been paid shall be returned to the source of funds. If the source of funds is not discernible, then remaining funds shall be distributed among the undersigned towns in accordance with Article IV. Section 3 of this agreement.
4. This agreement shall be subject to the applicable provisions of General Laws, Chapter 40, Section 4A governing contracts between municipalities except such provisions of

*Memorandum of Agreement to Establish the Pleasant Bay Resource Management Alliance*

Chapter 40, Section 4A requiring Town Meeting approval in which case each town's process shall be governed by applicable provisions of that town's Home Rule Charter.

Executed this      day of                      , 2007 by

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Chatham Board of Selectmen

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Harwich Board of Selectmen

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Orleans Board of Selectmen

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Brewster Board of Selectmen