FINAL
Project Modification Report and
Environmental Assessment

TOWN POND RESTORATION
(Boyd's Marsh)
Portsmouth, Rhode Island

US ARMY CORPS
OF ENGINEERS
New England District

July 2002

TOWN POND RESTORATION
PORTSMOUTH, RHODE ISLAND
SECTION 1135 PROJECT MODIFICATION REPORT
CORPS OF ENGINEERS, NEW ENGLAND DISTRICT

EXECUTIVE SUMMARY

New England District has prepared this study for habitat restoration at Town Pond in Portsmouth, Rhode Island under the authority contained in Section 1135 of the Water Resources Development Act of 1986 (PL99-662), as amended. The modern historical condition of the Town Pond area was tidally influenced open water prior to a Corps navigation improvement project placing dredged material in the area in the early 1950's. At that time, tidal exchange to the interior marsh was effectively halted. New England District formulated and evaluated several restoration alternatives of salt pond or salt marsh habitat.

The recommend restoration alternative is to restore a combination of fifty-percent salt marsh-fifty percent open water/intertidal habitats with on-site disposal of excavated material. This was selected as the best overall plan for habitat restoration, aesthetic acceptability and affordability. An estimated 99,800 cubic yards of existing dredged material would be excavated to promote restored tidal exchange to Town Pond. Over time, the interior marsh will be transformed from a lower value brackish habitat to a high value salt pond and salt marsh habitat.

Other details of the plan would protect nearby freshwater resources, allow continued maintenance access to the existing electric transmission lines, and provide for public access to and viewing of the restored habitat. A post-construction monitoring plan to measure the success of the restoration and provide data to support operational corrections, if needed, will be implemented under Corps guidance for a five-year period. After five years, Federal involvement in monitoring will be concluded.

The estimated construction cost of the recommended restoration plan is $1,867,000. The total project cost, which includes study costs, plans and specifications preparation, contract administration and construction phase support, is estimated at $2,551,000. Section 1135 projects are cost shared with a 75 percent Federal and 25 percent non-Federal contributions proportional share. The Federal cost would therefore be $1,913,000 and the non-Federal cost $638,000. The Rhode Island Department of Environmental Management is the non-Federal sponsor, and would be responsible for providing all lands, easements, right-of-way and disposal areas needed to construct the project.

New England District prepared this report with the cooperation of the Rhode Island Department of Environmental Management, the Town of Portsmouth and the Aquidneck Island Land Trust.

TOWN POND RESTORATION

PORTSMOUTH, RHODE ISLAND
SECTION 1135 PROJECT MODIFICATION REPORT
CORPS OF ENGINEERS, NEW ENGLAND DISTRICT

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PART I - INTRODUCTION

1. STUDY PURPOSE AND SCOPE

The purpose of this study is to develop and evaluate alternatives intended to provide for restoration of salt marsh or salt pond habitat at Town Pond in the town of Portsmouth, Rhode Island. The merits of each of the alternatives are examined with respect to habitat restoration, engineering feasibility, changes and impacts to environmental resources, and cost. New England District will recommend implementation of one of the several restoration alternatives.

The modern historical condition of the Town Pond area was open water with a twice-daily tidal exchange from Mount Hope Bay. In the early 1950's, a Corps navigation improvement project for Fall River Harbor placed dredged material in Town Pond and several other locations in Portsmouth. Tidal exchange to the interior marsh was effectively halted.

2. STUDY AUTHORITY

With the support of the Rhode Island Department of Environmental Management, New England District initiated this study for habitat restoration under the authority contained in Section 1135 of the Water Resources Development Act of 1986 (PL99-662), as amended. Section 1135, entitled "Project Modifications For Improvement of Environment", states, in part,

> "The Secretary is authorized to review the operation of water resources projects constructed by the Secretary before the date of enactment of this Act to determine the need for modification in the structures and operations of such projects for the purpose of improving the quality of the environment in the public interest."

The proposed restoration of Town Pond is considered as a project modification to the Corps Fall River Harbor navigation project. The project for deep draft navigation at Fall River Harbor, Massachusetts, was first authorized in July 1930, and included a 30-foot deep channel to access a 25-foot deep anchorage area. Improvements to navigation were authorized under the River and Harbor Act in 1946. Work on a 35-foot deep channel was accomplished in 1950-51.

During this phase, dredged material was placed over a number of areas on Aquidneck Island, a part of the Town of Portsmouth, Rhode Island. Town Pond, also known as Boyd's Marsh, was among the sites where dredged material was placed. Fill placed by the Corps has restricted normal tidal flow to the area. The interior marsh has been transformed from a high value salt marsh to a lower value brackish habitat. The reintroduction of tidal flushing to the area will reestablish the more valuable salt marsh habitat.

Implementation of any alternative plan or combination of alternatives is subject to the recommendation and approval of the Corps of Engineers, as well as approval of the Federal budgets on which its program funding depends.

3. PHYSICAL CHARACTERISTICS AND SETTING

Town Pond is owned by the State of Rhode Island and managed by its Department of Environmental Management (RIDEM). A railroad right of way belonging to the Rhode Island Department of Transportation (RIDOT) and power transmission lines of the National Grid run through the area. The site is on the south side of a railway embankment that runs along the shore of Mount Hope Bay, approximately 0.6 miles east of the Mount Hope Bridge. See Plate 1 for Location Map. A small area of salt marsh exists north of the railway embankment. Founders Brook flows in a northerly direction on the west side of the former Town Pond area, through an old conduit southwest of a 30-foot wide bridge opening in the railway embankment, then under the bridge and out into Mount Hope Bay. The restoration plans that this report will examine are on state owned land. However, some easements for construction access or for riparian rights will be necessary. The Federal Government has already compensated the State for use of the site as a part of the navigation project, so the area is not eligible for Lands, Easements, Rights-of-Way, Replacements and Disposal (LERRD) credit under Corps of Engineers regulations.

The proposed restoration area is a former salt pond where past Corps activities have degraded the quality of the environment. Disposal activities associated with Fall River dredging choked off virtually all of the former tidal exchange in the former Town Pond area. The project area has subsequently become overgrown with common reed and shrubs. The proposed scheme for restoration of productive salt marsh would include the excavation of an area south of the existing railway embankment and regrading of the area to elevations between mean high water and mean sea level (elevation 1.6 feet NGVD 29). Some of the excavated material could be utilized to construct a berm that would act to segregate the saltwater marsh from the freshwater course that flows along the west side of the marsh. The restoration would provide meaningful and productive ecological improvements to an area that can readily support increased populations of marine life.

4. EVALUATION METHOD

The proposed restoration alternatives will be compared using an incremental analysis. The purpose of the incremental analysis is to display and evaluate the fish and wildlife habitat benefits and incremental costs of various restoration alternatives. The incremental cost associated with an alternative is the added cost for each additional unit of benefit.

Fish and wildlife resources may have both economic and ecological value. The Corps of Engineers guidance for performing incremental analysis describes fish and wildlife resources with substantial commercial and/or recreational value as National Economic Development (NED) resources. Fish and wildlife resources with substantial non-monetary, ecological values are defined as Environmental Quality (EQ) resources. The incremental analysis presents the EQ outputs of alternative plans and compares the marginal cost of the various options.

5. ENVIRONMENTAL SETTING

The proposals for salt marsh/salt pond environmental restoration, if constructed, will transform the aesthetics of the marsh from the fields of common reed (Phragmites) that are currently dominant. Many species of plants and wildlife will benefit. Founder's Brook will remain at the same gradient and boundaries that it has today. The project will permit meaningful progress in the area of mosquito control. The former mosquito control contractor for Portsmouth and other Rhode Island towns has testified that Town Pond is one of the most notorious mosquito breeding areas that he is aware of. Since it is not practical to reintroduce tidal flows to 100% of the marsh, some of the boundary areas will remain as pockets of deciduous vegetation or Phragmites.

The proposed restoration plan will help meet national goals for the restoration and improvement of saltwater ecosystems as well as contributing to improved local fisheries without harming the freshwater ponds.

6. ENVIRONMENTAL RESOURCES

The proposed restoration of Town Pond represents an opportunity to enhance local and regional environmental resources. Fish and other aquatic life, marsh vegetation and other wildlife consistent with an adopted model can be expected to benefit from implementation of a restoration project.

If no action is taken to restore the salt marsh and estuarine habitats, it will continue to exist in its present degraded condition dominated by common reed. The site may change to a shrub then forested freshwater wetland over a very long period of time, but the persistence of common reed suggests that this process would be slow, particularly if fires occur in the marsh. The improvements in fish and wildlife resource value that would be generated with the project would not be achieved.

Common reed has relatively low value for fish and wildlife. It also presents a potential fire hazard, makes management of mosquitoes difficult, and has a lower aesthetic value than the natural salt marsh/salt pond system. Periodic tidal flushing of the marsh with salt water will restore estuarine habitat and maintain soil water salinity levels high enough to discourage the growth of common reed.

Historic and Archeological Resources

Coordination with the Rhode Island Historic Preservation Commission indicates there are no cultural resources issues affecting the proposed Town Pond restoration.

Potential Disposal Options

Several potential disposal options for material excavated were identified during the plan formulation phase of the study.

Some or all of the excavated material could be kept on site. This material could be placed in one or more boundary areas of the marsh. On-site disposal would mean handling of the

material would be limited to the project area. It would represent the least expensive means of disposal, but at the expense of area available for restoration. The use of some of the material for a berm that would separate the freshwater resource of Founder's Brook from the new saltwater marsh was proposed in the Preliminary Restoration Plan. The need to retain this freshwater segment of Founder's Brook was confirmed by attendees to the public meeting held at the Providence office of RIDEM on November 16, 1998, many of whom spoke to express the importance of the existing freshwater habitat adjacent to the proposed marsh. A five-foot high berm would have a 15-foot wide crest and a 45-foot wide base. Other material could be placed on the east side of the marsh in a disposal area configured to maximize the horizontal distance from the proposed restoration area to the ponds used for irrigation on the abutting golf course.

Several sites are under consideration for off site upland disposal. The town of Tiverton's landfill is a candidate with a short haul distance from Town Pond to the landfill of about eight miles. The landfill is expected to be open through the year 2008. The town has a need for cap material for the landfill.

The United States Fish & Wildlife Service may require cap material for one of two sites it is remediating near the Sachuest Point Wildlife Refuge in Middletown, Rhode Island. The haul distance to Sachuest Point from Town Pond is approximately ten miles.

The town of Seekonk, Massachusetts also has two sites where cap material may be needed. The haul distance to the town of Seekonk from Town Pond is approximately twenty-five miles.

7. STUDY COORDINATION

An initial public meeting was hosted by the Rhode Island Department of Environmental Management took place on November 16, 1998. Many abutters of the current wildlife refuge at Town Pond attended, along with the Corps of Engineers and a number of state and local officials. Preliminary alternative plans for salt marsh/salt pond restoration were presented. The meeting allowed the participants to share their viewpoints on the proposed restoration and provide input to the local and agency concerns the Corps would consider in its refinement of restoration alternatives.

A presentation featuring examples and benefits of salt marsh restoration took place on March 3, 1999, at the Portsmouth Town Office when Corps of Engineers representatives participated in a regular meeting of the town selectmen. Another meeting at the Portsmouth Town Office was held on May 21, 2001, during which some old and new restoration alternatives were discussed, along with the environmental criteria used in the evaluation and a report on the disposal issues.

Many attendees of these meetings offered evidence that the segment of Founder's Brook adjacent to the marsh was a valuable freshwater habitat as well as a recreational resource and a source of irrigation. To protect that area, construction of a berm is proposed that would separate Founder's Brook from the area of restored tidal exchange. The berm would be constructed of material excavated for the project, and could be vegetated to further stabilize its slopes. The public's access to the berm was another topic of concern expressed by some abutters. Certain types of vegetation could be chosen to naturally inhibit foot travel along the top of the berm. A

new conduit and headwalls would be built to replace the antiquated one southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh.

The berm would be built to a crest elevation of about 10 ft NGVD, high enough to keep the normal range of tidal flows within the new marsh and contain stillwater flood elevations during storm events of approximately 25 years and less. This is at the same elevation as the railroad berm. Because the project modification increases the storage available in the interior marsh, it will not exacerbate the risk of flooding due to storm surges that may attack the area from the direction of Mount Hope Bay. It is the elevation of the railroad embankment that governs inundation of the project area from the highest storm surges coming from the direction of Mount Hope Bay. We expect that this increased storage would reduce the effects of local flooding for all storm events of approximately 25 years and less. The most severe storms will still overtop the railroad embankment and create local flooding conditions.

PART II – PROBLEM IDENTIFICATION

1. EXISTING CONDITIONS

Historically, the Town Pond area was open water with a twice-daily tidal exchange from Mount Hope Bay. Due to the placement of dredged material in the marsh in the 1950s, the tidal exchange essentially ceased. The area became poorly drained and Common reed (Phragmites) became dominant in the area, decreasing the habitat and environmental value of the marsh. With the exception of occasional encroachment, including the establishment of a right-of-way for electric utility transmission lines, there have been no significant man-made changes to the area since the marsh was filled in. The area is recognized as prolific mosquito breeding habitat.

2. FUTURE CONDITIONS WITHOUT A SECTION 1135 PROJECT

If no action is taken to restore the salt marsh and estuarine habitats, it will continue to exist in its present degraded condition dominated by common reed. The site may change to a shrub then forested freshwater wetland over a very long period of time, but the persistence of common reed suggests that this process would be slow, particularly if fires occur in the marsh. The timely improvements in fish and wildlife resource value that would be generated with the project would not be achieved.

3. PLANNING CONSTRAINTS

Any modification of the Fall River Harbor Navigation Project at Town Pond must involve an effective restoration proposal that addresses identified planning constraints as well as the concerns of the sponsor, regulatory agencies and abutters. Among the physical constraints and issues that this study considered are the presence of an active railroad right of way, the presence of transmission lines, the privacy of abutters, a need for public access locations with adequate parking, the protection of freshwater resources and the effects of restoration proposals regarding tidal activity and coastal flooding.

With a goal of reintroducing tidal flows to the interior marsh, the existing 30-foot wide channel opening at the railroad bridge was examined and determined to be more than adequate to convey the anticipated flows. Stone riprap will be placed around each of the two stone abutments to protect them from scour. The Rhode Island Department of Transportation owns the railroad right-of-way. The line is technically active, though train movements are restricted by track condition and the fact that the nearby railroad bridge over the Sakonnet River is out of service.

The electric transmission lines that bisect the marsh are essential to the delivery of electric power to Newport Rhode Island and vicinity according to their owner, National Grid. Thus, due to operational and cost considerations, the idea of relocating the electric transmission lines elsewhere was rejected. Sets of twin poles carry the lines that cross the Town Pond area.

The presence of these poles restricts the possible configurations of a salt pond/salt marsh restoration plan. There is a roadbed that provides maintenance access to the four sets of poles closest to the center of the marsh. It connects with Anthony Road through property now owned by Roger Williams College. Portions of the roadbed that are below the maximum elevation of the normal tide range will be raised and graded to an elevation of 4.6 ft NGVD to prevent overtopping by high tides.

The sponsor and supporting organizations expressed the need to provide public access and viewing of a restoration project. The existing capacity for public parking near the marsh and wildlife refuge is very limited. While the raised berm to be constructed on the west edge of the restoration area would offer a good viewing perspective, concerns expressed by abutters regarding privacy and potential for trespass lead to other locations being considered. A 15,000 square foot parking and viewing area along the edge of Anthony Road is proposed to meet the public access needs. The sponsor may seek to develop further public access opportunities. Access to the marsh interior could utilize the maintenance road that runs past the sets of twin poles that carry the electric transmission lines, but would be dependent on establishment of a permanent easement across private property between the marsh and Anthony Road or the construction of a pathway and boardwalk that skirted the edge of public land between the parking area and the maintenance road.

PART III – CONSIDERATION OF ALTERNATIVES

1. DESCRIPTION OF ALTERNATIVES

The following alternative restoration plans for Town Pond were considered. Each was deemed to have some merit, and each is individually discussed. All elevations are presented in feet NGVD 29.

Alternative 1, No Action Alternative

If no action is taken to restore the salt marsh and estuarine habitats, it will continue to exist in its present degraded condition dominated by common reed. The site may change to a shrub then forested freshwater wetland over a very long period of time, but the persistence of common reed suggests that this process would be slow, particularly if fires occur in the marsh. The

improvements in fish and wildlife resource values that would be generated with the project would not be achieved.

Alternative 2, Restore Salt Marsh and Creek Habitats with Off-Site Disposal of Excavated Material

The existing dredged material would be excavated to elevation 2.88 ft along the inland edge of the project area and slope at 1 percent toward a tidal creek. At the tidal creek the slope would change to 1:3. The main channel would have a 5-ft bottom width and an invert sloping from -1.9 ft at Mount Hope Bay to -1.3 ft at the railroad bridge, then to 0.0 ft at the upstream end. Feeder channels would have a 3.3 ft bottom width.

High marsh would occur between elevation 2.88 ft to 2.72 ft for a width of 16.4 ft. Low marsh would occur between elevation 2.72 ft to 0.46 ft for a width of 226 ft. Mudflat would be created with a one percent slope (may be adjusted to fit design), between the lower limit of low marsh and the upper edge of the channel. The portion of the main tidal creek below elevation 0.0-ft would contain permanent open water. See Plate 2.

A berm would be constructed to separate Founder's Brook from the area of restored tidal exchange. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge. However, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

The estimated excavation quantity is 86,700 CY and the estimated construction cost is $3.05M. All excavated material, except that used for the berm, is assumed to be disposed off-site, 10 miles away, without a fee. Refer to Table 1 for a plan summary and Table 2 for a cost summary of this plan.

Alternative 3, Restore A Combination Of Fifty-Percent Salt Marsh-Fifty Percent Open Water/Intertidal Habitats with Off-Site Disposal of Excavated Material

The existing dredged material would be excavated to elevation 2.88 ft along the inland edge of the project area and slope at 1 percent toward the interior of the marsh for a width of 16.5 ft. From 16.4 ft out, the slope would change to 1:10 for 32.81 ft of width for most of the perimeter. Wider areas of salt marsh would slope from elevation 2.72 ft to the edge shown at variable slopes between 1 to 10 percent. The remainder of the site would slope to the centerline invert at a constant slope (based on distance). The main channel would have an invert sloping from –1.97 ft at Mount Hope Bay to –1.31 ft at the railroad bridge. The centerline invert of the restored pond upstream of the railroad bridge would slope from –3.28 ft at the bridge to –1.97 ft at the upstream end. A weir with a top elevation of –0.20 ft would maintain open water depths between 3.08 ft to 1.77 ft deep with a median depth at the halfway point of 2.43 ft.

High marsh would occur between elevation 2.88 ft to 2.72 ft for a width of 16.4 ft on the 1:100 slope. Low marsh would occur between elevation 2.72 ft to 0.46 ft on a variable slope for an area of approximately 9 acres. Mudflat would occur between the lower limit of low marsh (0.46 ft) and the upper edge of the open water (-0.20 ft). The water surface elevation would be controlled by a weir placed just upstream of the culvert that runs parallel to the railroad bed to maintain permanent open water. The crest of the weir would be placed at -0.20 ft to create a low water elevation 0.66-ft below the lowest elevation of salt marsh to avoid waterlogged soil conditions. The weir would allow periodic flushing of the system if needed and would allow minor adjustments to water levels to be made easily. See Plate 3.

A berm would be constructed to separate Founder's Brook from the area of restored tidal exchange. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge. However, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

The estimated excavation quantity is 141,400 CY and the estimated construction cost is $4.05M. All excavated material, except that used for the berm, is assumed to be disposed off-site, 10 miles away, without a fee. Refer to Table 1 for a plan summary and Table 2 for a cost summary of this plan.

Alternative 4, Restore the Previously Existing Intertidal/Subtidal Habitats with Salt Marsh Fringe and Off-Site Disposal of Excavated Material

The existing dredged material would be excavated to elevation 2.88 ft along the inland edge of the project area and slope at 1 percent toward a tidal creek for a width of 16.4 ft. From 16.4 ft out, the slope would change to 1:10 for 32.8 ft. The remainder of the site would slope to the centerline invert at a constant slope (based on distance). The main channel would have an invert sloping from -1.97 ft at Mount Hope Bay to -1.3 ft at the railroad bridge. Upstream of the railroad bridge there would be no channel. Two potential centerline invert elevations with the same slope would be considered.

Alternative 4A. The centerline invert of the restored pond upstream of the railroad bridge would slope from -1.3 ft at the bridge to 0.0 ft at the upstream end. This would maintain a constant slope from Mount Hope Bay to the upstream end of the project. A weir with a top elevation of -0.20 ft would maintain open water depths between 1.12 ft to 0.0 ft deep with a median depth at the halfway point of 0.53 ft. See Plate 4.

Alternative 4B. The centerline invert of the restored pond upstream of the railroad bridge would slope from -3.28 ft at the bridge to -1.97 ft at the upstream end. This would allow a deeper pond to be created to enhance waterfowl and fisheries habitat value. A weir with a top

elevation of -0.2 ft would maintain open water depths between 3.08 ft to 1.77 ft deep with a median depth at the halfway point of 2.33 ft. See Plate 5.

Under both of these open water alternatives, high marsh would occur between elevation 2.88 ft to 2.72 ft for a width of 16.4 ft on the 1:100 slope. Low marsh would occur between elevation 2.72 ft to 0.46 ft for a width of 22.6 ft on a 1:10 slope. Mudflat would occur between the lower limit of low marsh (0.46 ft) and the upper edge of the open water (-0.2 ft). The water surface elevation would be controlled by a weir placed just upstream of the culvert that runs parallel to the railroad bed to maintain permanent open water. The crest of the weir would be placed at -0.2 ft to create a low water elevation 0.66 ft below the lowest elevation of salt marsh to avoid waterlogged soil conditions. The weir would allow periodic flushing of the system if needed and would allow minor adjustments to water levels to be made easily. An additional 26,800 CY excavation would be required for Alternative 4B to create depths of 1.77 ft to 3.08 ft of permanent open water behind the weir, but the quality of the habitat may be greater.

Also for both options, a berm would be constructed to separate Founder's Brook from the area with restored tidal exchange. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge. However, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

For Alternative 4A, the estimated excavation quantity is 132,400 CY and the estimated construction cost is $3.81M. For Alternative 4B, the estimated excavation quantity is 159,200 CY and the estimated construction cost is $4.38M. All excavated material, except that used for the berm, is assumed to be disposed off-site, 10 miles away, without a fee. Refer to Table 1 for plan summaries and Table 2 for a cost summary of each of these plans.

Alternative 5, Restore Salt Marsh and Creek Habitats with On-Site Disposal of Excavated Material

As with Alternative 2, the existing dredged material would be excavated to elevations that would support salt marsh (mostly low marsh) with creeks to convey tidal flow. There would be approximately 1.20 acres of high marsh, 13.72 acres of low marsh, 0.2 acres of mudflats, and 0.5 acres of tidal creeks. See Plate 6.

A berm would be constructed to separate Founder's Brook from the area with restored tidal exchange. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town

Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge, however, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

Excavated material not used to construct the berm would be placed on a disposal site on the east side of the marsh extending from the edge of the access road along a broad arc that defines the limit of the restoration on the east side. The disposal site is situated to maximize the horizontal distance from the proposed restoration to the ponds used for irrigation on the abutting golf course.

The estimated excavation quantity is 68,300 CY and the estimated construction cost is $2.25M. Refer to Table 1 for a plan summary and Table 2 for a cost summary of this plan.

Alternative 6, Restore A Combination Of Fifty-Percent Salt Marsh-Fifty Percent Open Water/Intertidal Habitats with On-Site Disposal of Excavated Material

As with Alternative 3, the existing dredged material would be excavated to elevations that would support about half salt marsh and half mudflat/open water. There would be 2.33 acres (0.95 hectares) of high marsh, 4.48 acres (1.81 hectares) of low marsh, 2.98 acres (1.20 hectares) of mudflats, and 5.37 acres (2.17 hectares) of permanent open water. A weir with a top elevation of -0.2 ft would maintain permanent open water depths between 2.88 ft to 1.77 ft with a median depth at the halfway point of 2.33 ft. See Plate 7.

A berm would be constructed to separate Founder's Brook from the area with restored tidal exchange. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge. However, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

Excavated material not used to construct the berm would be placed on a disposal site on the east side of the marsh extending from the edge of the access road along a broad arc that defines the limit of the restoration on the east side. The minimum slope is 1:3, although slopes of 1:4 or 1:5 would be preferred, provided there is enough area. The disposal site is situated to maximize the horizontal distance from the proposed restoration to the ponds used for irrigation on the abutting golf course.

The estimated excavation quantity is 99,800 CY and the estimated construction cost is $2.55M. Refer to Table 1 for a plan summary and Table 2 for a cost summary of this plan.

Other Restoration Plans

The preceding six alternatives for restoration are representative of the range of options considered. There are an infinite number of configurations for restoration that could be investigated at Town Pond. It would be possible to adjust any of the alternatives to incorporate more or less excavation and also to change the distribution of excavated material disposal from either on-site to off-site or to some combination of the two. These types of adjustments could be considered in response to a desire to incorporate a locally preferred restoration feature or to tailor a plan to public comments, agency priorities or budget constraints.

TABLE 1 - DESCRIPTION OF PLANS

ALT. 1	No Action Alternative	No changes	No restoration
ALT. 2	Restore Salt Marsh And Creek Habitats and Off-Site Disposal of Excavated Material	Estimated excavation quantity 86,700 CY	23.53 acres restored
ALT. 3	Restore A Combination Of Fifty-Percent Salt Marsh-Fifty Percent Open Water/Intertidal Habitats and Off-Site Disposal of Excavated Material	Estimated excavation quantity 141,400 CY	23.53 acres restored
ALT. 4A	Restore The Previously Existing Intertidal/Subtidal Habitats with Salt Marsh Fringe and Off-Site Disposal of Excavated Material	Estimated excavation quantity 132,400 CY	23.53 acres restored
ALT. 4B	Restore The Previously Existing Intertidal/Subtidal Habitats with Salt Marsh Fringe and Off-Site Disposal of Excavated Material	Estimated excavation quantity 159,200 CY	23.53 acres restored
ALT. 5	Restore Salt Marsh And Creek Habitats with On-Site Disposal of Excavated Material	Estimated excavation quantity 68,300 CY	18.55 acres restored
ALT. 6	Restore a Combination Of Fifty-Percent Salt Marsh-Fifty Percent Open Water/Intertidal Habitats with On-Site Disposal of Excavated Material	Estimated excavation quantity 99,800 CY	16.61 acres restored

TABLE 2 - COSTS OF PLANS (in $000s)

	ALT. 2	ALT. 3	ALT. 4A	ALT. 4B	ALT. 5	ALT. 6
CONSTRUCTION COST (INCL. ESCALATION & CONTINGENCY)	$2,331	$3,186	$2,969	$3,463	$1,625	$1,867
CONSTRUCTION E&D	$123	$184	$174	$203	$84	$107
CONSTRUCTION S&A	$174	$260	$246	$287	$119	$152
REAL ESTATE ACQUISITIONS	$95	$95	$95	$95	$95	$95
FEASIBILITY STUDY	$177	$177	$177	$177	$177	$177
PLANS & SPECS PREPARATION	$152	$152	$152	$152	$152	$152
TOTAL PROJECT COST	$3,052	$4,052	$3,812	$4,377	$2,252	$2,551

TABLE 3 - COMPARISON OF PLANS

ALTERNATIVE	ACRES RESTORED	HABITAT UNITS	DISPOSAL LOCATION	ESTIMATED TOTAL PROJECT COST	ANNUAL O&M COST
2	23.53	13.8	Off-site	$3,052,000	$2,500
3	23.53	25.8	Off-site	$4,052,000	$2,500
4A	23.53	23.0	Off-site	$3,812,000	$2,500
4B	23.53	25.8	Off-site	$4,377,000	$2,500
5	18.55	9.6	On-site	$2,252,000	$2,500
6	16.61	16.0	On-site	$2,551,000	$2,500

2. ENVIRONMENTAL CONSEQUENCES

This section summarizes the environmental consequences of plans developed to restore Town Pond. More complete discussion of the consequences of the various plans can be found in the environmental assessment. All plans involve excavating and grading some of the material that was placed on Town Pond in the early 1950s. The purpose of this project is to restore the estuarine habitats that previously existed, along with their value for fish and wildlife. Except for short-term negative effects, this project will primarily have positive effects on the environment. A list of the most important environmental consequences is presented below.

- The area of estuarine habitat including salt pond and salt marsh will be increased;
- Access to Town Pond by estuarine organisms will be greatly increased, strengthening the ecological link between the marsh and Mount Hope Bay;
- The contribution of the site to estuarine aquatic productivity will be restored;
- The majority of the relatively low value Phragmites will be replaced by higher value salt marsh plants;
- The value of the site for shellfish, fish, and wildlife will be increased; and
- The recreational and aesthetic qualities of the site will be improved.

The specific effects of the project are described in detail in the following sections.

Wetlands, Vegetation, and Cover Types

General

In general, the effect of the project on the vegetation community will be to reduce the amount of Phragmites and replace it with salt marsh vegetation or unvegetated tidal habitats. More detailed predictions of the vegetation community and the factors that control the change in plant species composition follow.

Construction Phase Effects

There will be temporary impacts to wetland, beach, and upland vegetation during the construction period. Vegetation removal in the staging and access areas will temporarily disturb upland vegetation. The size of disturbance of the staging area and access roads will be limited to the minimum necessary for construction access and a line of erosion control devices will be established along the perimeter. These areas will be allowed to revegetate following construction and areas with severe slopes or disturbed soils with a high potential to impact water quality will be replanted to minimize erosion.

A small area of salt marsh will be destroyed to deepen and realign the entrance channel inlet. Salt marsh plants will be removed prior to construction and planted along the new channel alignment to reestablish a salt marsh cordgrass fringe.

Long-term Effects

The most rapid and direct effect of the project on vegetation will be the removal of Phragmites and other vegetation from the restoration area as the site is excavated and graded.

Between 16 and 24 acres of Phragmites will be removed to restore salt marsh and estuarine habitat. The existing Phragmites is above the elevation of tidal influence. Once elevations are established that are flooded by frequent tides, estuarine habitats and vegetation communities will become established.

The major goals of reintroduction of tidal flow with respect to the plant community are to increase the frequency of flooding, to increase soil water salinity to eliminate common reed and to restore conditions that favor the growth of salt marsh vegetation. The minimum level of soil water salinity required to eliminate common reed and restore salt marsh is estimated at 20 parts per thousand (ppt.) based on the pertinent literature (Howard et. al., 1978; Odium et. al., 1984; Kitsch and Gosling, 1986; Garbisch, 1986; Sinicrope et. al., 1990). The salinity in Mount Hope Bay has been recorded at 29 to 30 ppt., which is sufficient to restore salt marsh.

Based on evaluations conducted for the Galilee Salt Marsh Restoration Project (Myshrall, University of Rhode Island, Department of Natural Resources Science, pers. com., May 1999) and the Sagamore Marsh Restoration project, at least eight flooding tides per month are necessary to maintain salt marsh. Portions of Town Pond above the elevation flooded by this tide up to the highest astronomic tide level will likely be composed of a mixture of Phragmites and salt marsh vegetation. The lower limit of the salt marsh should occur at about the mean tide level.

Shellfish and Benthic Invertibrates

Construction Phase Effects

The project will have temporary adverse effects on shellfish and other benthic invertebrates during construction. Relatively immobile benthic organisms in the direct footprint of construction activities (e.g. the inlet channel) will be destroyed. However, larval and adult recruitment will quickly recolonize the disturbed benthic substrates. The surrounding benthic community will experience minor adverse effects due to potential slight increases in turbidity and suspended solids in the vicinity of the channel dredging, and possibly prior to the stabilization of the restored area.

The benthic community in the vicinity of the project consists of detritivores, predators, and suspension feeders. Suspension feeders, including shellfish, feed on materials suspended in the water column and are therefore affected by changes in turbidity. Suspension feeders are able to adjust to short term increases in suspended sediments by temporarily closing their feeding apparatus. When turbidity levels return to normal between short-term periods of soil disturbance, feeding resumes. Therefore, construction impacts to benthic invertebrates are anticipated to be of short duration and low intensity, and well within the tolerance range of benthic invertebrates.

Long Term Effects

The project will have permanent, positive effects on benthic resources. Benthic invertebrates and plants in the area of the inlet channel to be widened and deepened will be destroyed, but will completely recover after the completion of construction. Overall benthic invertebrates in the existing channel will experience a substantial improvement in habitat quality.

Sampling conducted for this study indicated that the number and diversity of benthic organisms declined substantially progressing upstream from Mount Hope Bay toward Town Pond. The project will improve the quality of habitat in the channel and increase the diversity and abundance of benthic organisms in the degraded upstream areas.

Estuarine benthic resources will experience a significant area increase in habitat with any of the restoration alternatives. The long-term effect of the project will be to increase the area of available benthic habitat and improve aquatic productivity and the quality of benthic resources. The increase in detrital export (a building block of estuarine communities) that results from the increase in salt marsh area is expected to increase the capacity of the area surrounding the site to support a productive benthic community.

No changes in salinity in Founder's Brook will occur with the project, so there will be no change to freshwater benthic communities.

Fish

Construction Phase Effects

The project will have minor effects on finfish during construction. Since fish are mobile they can avoid the relatively small area of increased turbidity that may result from construction. Fish that pass through the tidal inlet during construction may be exposed to higher turbidity levels as a result of soil disturbance during construction. However, the increase in turbidity is expected to be slight due to erosion control and construction sequencing. Most estuarine fish are tolerant of periodic increases in turbidity and can pass through areas of higher turbidity. There are no known anadromous fish runs at the project site.

Long Term Effects

The project will have a positive long-term effect on fisheries. The overall quantity of estuarine aquatic habitat available to fish will increase. In addition, the increase in estuarine productivity (e.g. detrital export) will benefit fish that feed directly on the detritus formed by the salt marsh and benthic organisms in the intertidal area. The improvement in aquatic productivity and populations lower in the food web will enhance the support of fish higher in the food web, including commercial fish.

The alternatives with permanent open water (i.e. Alternatives 3, 4A, 4B and 6) will have the greatest positive effect on fish communities due to the presence of permanent fish habitat.

Wildlife

Construction Phase Effects

For all types of wildlife, there will be temporary disturbance of habitat during the estimated 12-month construction period. Some species may temporarily leave the area. Overall there will be a minor temporary decrease in the capacity to support wildlife populations during the construction time frame.

Long Term Effects

Effects of the project on particular wildlife species are summarized in the Environmental Assessment. The quality of wildlife habitat is based on the interrelationship (juxtaposition and interspersion) between three key elements (food, cover, and water). Juxtaposition refers to the distribution between the requirements of a species (i.e., food, cover and water) in relation to each other and the area normally traveled by the species. Interspersion refers to the distribution of habitat components in relation to the habitat as a whole (King, 1938) or the pattern of mixing of habitat types.

The relationship between habitat elements will change with the restoration project. As a result, there will be a change in the relative abundance of the various species of wildlife using the site. However, none of the vegetation types on the site will be completely eliminated, or reduced so significantly that they no longer provide habitat as a result of the project. All of the species presently using the site are expected to remain, although at different population levels.

In general, the change in the vegetation types and the relationship between vegetation types will improve. The area of Phragmites, which primarily provides cover, will be reduced, while salt marsh plant species, which provide food and limited cover, will increase in area. The increase in the area of salt marsh and pond will increase the forage area of the wetland improving the elements of juxtaposition and interspersion. Use of the site by some species associated with the shrub and Phragmites components of the habitat may decline with the reduction in these habitat types; however, since cover is only one of the necessary components of the habitat, the overall quality of the habitat for even these species may improve because of improved plant species diversity.

Birds

The change from Phragmites dominated marsh to salt marsh will result in an increase in bird species that nest and feed in or over the salt marsh and, potentially, a decrease in the species associated with Phragmites and shrub habitats. The following species will probably increase in nesting and abundance: seaside sparrows, sharp-tailed sparrows, meadowlarks, black ducks, and Canada geese. The following are examples of birds that will experience an increase in available feeding area: herons, egrets, ibis, gulls, and terns.

Even species such as the red-winged blackbird that nest in Phragmites and shrub habitats may increase in number as the relationship between the food and cover elements of the habitat changes. The decrease in cover habitat for these types of species is expected to be insignificant. Swallows, which roost in the marsh in concentration during fall migrations, will experience a decrease in vegetation suitable for roosting.

Mammals

Many of the mammals inhabiting Town Pond will benefit from the increase in feeding habitat available following restoration of estuarine habitat. Small mammals such as meadow voles and white-footed mice may experience a decrease in useable habitat area, but an increase in the quality of their foraging habitat. Larger mammals such as deer, raccoons, muskrats, skunks,

otters, and mink will experience a decrease in available cover, but an increase in the quality of the feeding component. They are expected to experience overall positive impacts.

Mosquitoes

The reestablishment of tidal flow and salt pond and salt marsh habitats will change the type of mosquitoes inhabiting the site from freshwater varieties to the more aggressive salt marsh mosquito. However, restoration of tidal flow will also enhance the ability of managers to manage the mosquito population and may result in an overall reduction in the number of mosquitoes. Furthermore, under all of the alternatives, the majority of the restored marsh will be composed predominantly of low salt marsh, intertidal flats, and salt pond, with a small proportion of high marsh. These habitats which experience regular tidal flooding do not produce mosquitoes.

The state of Rhode Island will institute Open Marsh Water Management (OMWM) or other measures to control mosquitoes as needed once the tidal flow is restored. OMWM is a system for controlling mosquitoes where small ponds with permanent reservoirs are created to provide habitat for mosquito-larvae-eating fish. The ponds are connected to other mosquito breeding depressions by radial level ditches (Payne, 1992). When the tide rises and floods mosquito breeding habitat, the larvae eating fish travel to the hatching sites and eat the larvae before they can transform to the adult phase.

This technique can result in a 99% reduction in salt marsh mosquito populations (Capotosto, P.M., Connecticut Department of Environmental Protection, Wetlands Restoration Unit, pers. comm., February 1994). With OMWM the project is expected to result in an overall reduction in mosquitoes.

Threatened and Endangered Species

There are no Federally listed or proposed threatened or endangered species under the jurisdiction of the Fish and Wildlife Service known to exist at the project site with the exception of occasional, transient bald eagles (*Haliaeetus leucocephalus*) or perigrine falcons (*Falco peregrinusanatum*) (Correspondence dated February 25, 1999). Therefore, there will be no adverse impact on Federally listed threatened or endangered species from any project alternative.

The Rhode Island Natural Heritage Program has indicated that at the present time there are no state-listed threatened or endangered species utilizing the project site. Several species that are rare in the state of Rhode Island used the Town Pond area in the past. These include pied-billed grebe, common moorhen, green-winged teal, least bittern, marsh wren, and sora (Correspondence dated February 18, 1999). Therefore, there will be no adverse impact on state-listed threatened or endangered species from any project alternative.

Water Quality

There may be a temporary short-term increase in turbidity and suspended solids in the vicinity of the project during construction and the initial restoration of tidal flow that could temporarily affect water quality.

To minimize potential construction phase water quality impacts, excavation will be constructed behind a temporary berm of existing material. After the majority of grading is complete, the berm will be removed to create the connection to tidal water. Also, appropriate controls on erosion and sedimentation will be employed throughout construction to isolate areas of disturbed soils and construction activity. In addition, construction will take place during the fall, winter, and spring when the metabolic activity of organisms that could be affected by water quality is lowered.

Air Quality

The project will have no long-term impacts on air quality. During construction, equipment operating on the site will emit pollutants including nitrogen oxides that can lead to the formation of ozone. Rhode Island has no permit requirements for construction projects. In order to minimize air quality effects during construction, construction activities will comply with applicable provisions of the Rhode Island Air Quality Control Regulations pertaining to dust, odors, construction, noise, and motor vehicle emissions.

Groundwater Wells And Septic Systems

The proximity of wells and septic systems in the area was judged not to be a concern due to the distances and changes in elevation from the proposed restoration area to occupied dwellings and business establishments. The location of Founder's Brook itself would preclude low-lying septic systems on the west side of Town Pond.

Flooding and Salinity Changes to Surrounding Freshwater Ponds

The project will not increase the flooding potential of surrounding developed areas. The project features have been designed not to increase the flooding potential of Founders Brook and surrounding upland areas with salt water. Founders Brook borders the west side of the Town Pond area. Two features have been incorporated to avoid flooding Founders Brook and upland areas to the west of Town Pond. A broken flap gate on the end of a culvert at the outlet of Founders Brook will be replaced to preclude salt water from entering the brook. In addition, a permanent berm will be constructed to a crest elevation of about 10 ft NGVD between the restored marsh area and Founders Brook. The height of the berm will be sufficient to prevent overtopping up to the 25-year flood elevation. There are no structures on the west side of Town Pond that are below that elevation. On the east side of the Town Pond area the disposal site is situated to maximize the horizontal distance from the proposed marsh restoration to the ponds used for irrigation on the abutting Montaup Country Club.

3. REGULATORY REQUIREMENTS

The attached Environmental Assessment and Finding of No Significant Impact represents an evaluation of the environmental effects of the proposed alternatives pursuant to the National Environmental Policy Act (NEPA) of 1969 and Corps regulations implementing NEPA.

Dredging projects would require state water quality certification pursuant to Section 401 of the Clean Water Act (CWA) and completion of a 404(b)(1) evaluation pursuant to the Section 404 of the CWA.

In Rhode Island, the Coastal Resources Management Council (CRMC) has jurisdiction over Coastal Zone Management issues. A determination regarding the consistency of the project with the approved State coastal zone management program will be provided to the CRMC prior to implementation.

Proposed plans would be coordinated with appropriate state and Federal agencies pursuant to the National Historic Preservation Act, the Federal Endangered Species Act, and the Federal Fish and Wildlife Coordination Act.

4. INCREMENTAL COST COMPARISON OF PLANS

The proposed plans to improve environmental conditions include restoration of combinations of salt marsh and open water intertidal habitats. Project description, project cost, and the number of habitat units, in terms of hectares, created by each plan are shown in Table 4. Costs are discounted at an interest rate of 6 3/8 %. This interest rate, as specified in the Federal Register, is to be used by Federal agencies in the formulation and evaluation of water and land resource plans for the period October 1, 2000 to September 30, 2001. The project economic life is considered to be 25 years.

Column 1 shows plan designators. Each alphanumeric designator represents a management plan. Plan 1 is the no project plan. Plan 2 is the restoration of salt marsh and creek habitats with off-site disposal of excavated material. Plan 3 is the restoration of a combination of fifty-percent salt marsh and fifty-percent water/intertidal habitat creation with off-site disposal of excavated material. Plan 4 (variations a and b) is the restoration of the previously existing intertidal/subtidal habitats with salt marsh fringe and off-site disposal of excavated material. Variation 4B would provide for a deeper pond than variation 4A, thereby enhancing waterfowl and fisheries habitat value. Plan 5 is the restoration of salt marsh and creek habitats with on-site disposal of excavated material. Plan 6 is the restoration of a combination of fifty-percent salt marsh and fifty-percent open water/intertidal habitats with on-site disposal of excavated materials. All plans are mutually exclusive and thus cannot be combined in the analysis. Project cost and the number of habitat units created by the plan, hectares of salt marsh/inter-tidal habitat, are shown in columns 2 and 3, respectively. Project cost includes a discounted sum of annual O & M over the project life as well as the one time implementation cost.

TABLE 4 - INCREMENTAL COST COMPARISON OF PLANS

ALTERNATIVE	TOTAL COST ($000)	HABITAT UNITS (Hectares)	INCREMENTAL COST
1	0.0	1.6	N/A
2	2,905.9	13.8	N/A
3	3,907.9	25.8	$161,500
4A	3,666.9	23.0	$171,300
4B	4,230.9	25.8	N/A
5	2,105.9	9.6	$263,200
6	2,403.9	16.0	$166,900

The incremental analysis identified five cost-effective plans. Best buy plans are a subset of cost effective plans. For each best buy plan there are no other plans that will give the same level of output at a lower incremental cost. There are two best buy plans including the no project alternative.

Increments that comprise the best buy plan curve are Alternatives 1 and 3. The best buy plan curve is the incremental cost curve. Incremental cost and incremental output are the changes in cost and output when the cost and output of each successive plan in terms of increasing output are compared. Incremental cost per output is the change in cost divided by the change in output, or incremental output, when proceeding to plans with higher levels of output.

In the incremental cost curve, incremental cost per unit increases with output, or habitat units. Development of the incremental cost curve facilitates the selection of the best alternative. The question that is asked at each increment is: is the additional gain in environmental benefit worth the additional cost? In this study, the incremental cost curve consists of only two points represented by Alternative 1 (without project) and Alternative 3, which is a combination of salt marsh and inter-tidal restoration with off-site disposal. This plan would provide an additional 25.8 habitat units over the without project alternative at a cost of $3,908,000. The incremental cost per unit is $161,500 per habitat unit. If the local sponsor cannot afford off-site disposal, Alternative 6 is the next best alternative with an incremental cost of $166,900 per habitat unit. Although Alternative 6 is not best buy, it is cost effective and thus economically rational.

PART IV – RECOMMENDED ALTERNATIVE

1. PROJECT DESCRIPTION

Alternative 6, Restore A Combination Of Fifty-Percent Salt Marsh-Fifty Percent Open Water/Intertidal Habitats with On-Site Disposal of Excavated Material was selected as the best plan for habitat restoration, aesthetic acceptability and affordability. The existing dredged material would be excavated to elevations that would support about half salt marsh and half mudflat/open water. There would be 2.33 acres of high marsh, 4.48 acres of low marsh, 2.98 acres of mudflats, and 5.37 acres of permanent open water. A weir with a top elevation of -0.2 ft would maintain permanent open water depths between 2.88 ft to 1.77 ft deep with a median depth at the halfway point of 2.33 ft. See Plate 7. The estimated excavation quantity is 99,800 CY.

Most of the excavated material would be moved to a disposal area on the east side of the marsh, extending from the edge of the access road along a broad arc that defines the limit of the restoration on the east side. The disposal site is situated to maximize the horizontal distance from the proposed marsh restoration to the fresh water ponds located to the east.

A berm would be constructed to separate Founder's Brook from the area of restored tidal exchange. The berm would be 5 feet high with a 45-foot wide at its base and a 15-foot wide crest. The berm would be constructed of material excavated for the project and selected vegetation would be planted to naturally inhibit foot travel along its crest. A new culvert with concrete headwalls would be built to replace the antiquated culvert at the end of the brook that is southwest of the railroad bridge. A new flap gate would be provided at the downstream end of

the culvert where Founder's Brook flows enter the tidal marsh. The channel connecting Town Pond to Mount Hope Bay would be partially relocated and deepened. No channel modifications are proposed at the railroad bridge. However, stone riprap will be placed around each of the two abutments to protect them from scour. It is expected that the Town Pond entrance channel will find a new equilibrium once tidal flow is restored. It is likely to meander less than it does at present due to the increased volume of water flowing in and out with each tide cycle.

The principal construction access is projected to be along a road over property owned by Roger Williams College off Anthony Road. The road is used by an electric utility as a means of maintenance access to segments of its transmission lines in the area. This road would be improved as necessary to handle traffic during construction and continue to serve the utility's needs independent of normal post-construction tides. A permanent easement over the parcel where the current access road leaves Anthony Road and enters the marsh would need to be acquired by the non-Federal sponsor.

2. SCHEDULE FOR ACCOMPLISHMENT

Implementation of the recommendation contained in this report is subject to the Corps review, approval and funding processes and sponsor participation, including execution of a Project Cooperation Agreement (PCA). Upon receiving project approval from North Atlantic Division, the New England District must prepare plans and specifications prior to solicitation of bids and contract award. Construction of the restoration project could begin as soon as the fall of 2002.

3. EXPECTED ENVIRONMENTAL CHANGES

The environmental quality benefits attributed herein are expected to accrue over a period of years after the project is constructed. Post-construction monitoring of similar projects suggests that many of the benefits associated with benthic species will be realized soon after tidal flow is restored to the area. A post-construction monitoring plan for Town Pond was developed with the cooperation of the Rhode Island Department of Environmental Management and the U.S. Fish & Wildlife Service. A description of the plan is included as Appendix EA-E in the Environmental Assessment.

4. COSTS

The total project cost of the recommended alternative, 50% open water and 50% salt marsh with on-site disposal of the excavated material is estimated to be $2,551,000. That amount includes feasibility study costs, plans & specifications, real estate acquisitions and estimated construction cost that includes estimates for Engineering and Design (E&D) and Supervision and Administration (S&A) during the construction phase. Corps section 1135 projects are cost shared at 75 percent Federal and 25 percent non-Federal contributions proportional share. The Federal cost would therefore be $1,913,000 and the non-Federal cost $638,000. See Appendix 7.

5. BENEFITS

In the incremental cost curve, incremental cost per unit increases with output, or habitat units. Development of the incremental cost curve facilitates the selection of the best alternative. The question that is asked at each increment is: is the additional gain in environmental benefit worth the additional cost? In this study, the incremental cost curve consists of only two points represented by Alternative 1 (without project) and Alternative 3, which is a combination of salt marsh and inter-tidal restoration with off-site disposal. This plan would provide an additional 25.8 habitat units over the without project alternative at a cost of $3,908,000. The incremental cost per unit is $161,500 per habitat unit. If the local sponsor cannot afford off-site disposal, Alternative 6 is the next best alternative with an incremental cost of $166,900 per habitat unit. Although Alternative 6 is not the best buy, it is cost effective and thus economically rational.

6. FINANCIAL ANALYSIS

The non-Federal sponsor, the Rhode Island Department of Environmental Management (RIDEM), has indicated its willingness to execute a Project Cooperation Agreement (PCA) for this project. RIDEM has previously partnered with New England District on a similar environmental restoration project that is now completed. RIDEM is aware of its obligations to implement this project and is able to meet its financial obligations.

7. REAL ESTATE CONSIDERATIONS

The Rhode Island Department of Environmental Management is the non-Federal sponsor, and is responsible for providing all lands, easements, rights-of-way and disposal areas needed to construct the project. The proposed construction activities will require permanent and temporary easements for construction access and access for Operation and Maintenance inspection. The restored area itself will be on public land. For planning purposes, the Real Estate Report (Appendix 5) estimated the real estate value of the land and permanent and temporary easements and acquisition costs at $95,000. The Federal Government, as part of the earlier navigation improvement project, may have credited a non-Federal sponsor for the value of the land. The actual acquisition costs for the easements documented by the sponsor will be credited at the time the project is constructed.

8. VIEW OF SPONSOR

The non-Federal sponsor, the Rhode Island Department of Environmental Management (RIDEM) is committed to improvement of habitat in and around Mt. Hope and Narragansett Bays. The recommendation to implement a restoration plan at Town Pond represents a significant opportunity to further that objective. RIDEM desires to participate in the restoration, which is also supported by the Town of Portsmouth and the Aquidneck Island Land Trust.

PART V – CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS

Alternative 6, a restoration plan which consists of a 50% Open Water and 50% Salt Marsh with on-site disposal of the excavated material, was selected as the most cost effective habitat restoration for Town Pond. The adoption of on-site disposal minimizes disposal costs but still allows for future removal and use of the material. There is opportunity, therefore, for future expansion of the restoration.

2. RECOMMENDATIONS

It is recommended that the New England District and RIDEM secure the necessary funds, Federal and non-Federal, to implement the selected plan. The restoration plan is consistent with current administration policy and, if implemented, will provide measurable environmental benefits through modification of the Fall River Harbor Navigation Project.

_____ _____

Date

Thomas L. Koning
Colonel, Corps of Engineers
District Engineer