<u>Milford Pond Aquatic Habitat Restoration Project</u>
<u>Milford, Massachusetts</u>

Environmental Assessment

Finding of No Significant Impact (FONSI)
and
Section 404(b)1 Evaluation

U. S. Army Corps of Engineers
New England District
696 Virginia Road
Concord, MA 01742

April 2014

Page Intentionally Blank

Table of Contents

LIST OF FIGURES

LIST OF TABLES

I. Introduction

A. Purpose and Need

This report provides an assessment of the environmental effects of a habitat restoration project in Milford Pond. The purpose of this habitat restoration project is to address the decline in water quality in Milford Pond and to provide improved aquatic and wetland habitat for native species. Milford Pond is a 120-acre pond located in the center of the Town of Milford, Massachusetts (Figure 1.1). The pond is formed by the impoundment of the Charles River with inflow from Huckleberry Brook, Louisa Lake, an intermittent stream, and 17 stormwater outfalls. The pond outlet water flows over a small masonry dam and continues as the main channel of the Charles River, which flows through the town of Milford and ultimately to Boston Harbor. The overall watershed is 5,440 acres (8.5 square miles) in size, and it extends beyond the municipal boundaries of the town of Milford into the towns of Hopkinton and Holliston (Figure 1.2). Milford Pond was historically a cedar swamp located in the headwaters of the Charles River providing habitat for Atlantic white cedar (*Chamaecyparis thyoides*), and formerly known as Cedar Swamp Pond due to the presence of these trees. In the early 1900's, the cedar swamp was converted into a pond through the cutting of the large cedar trees and construction of an impoundment across the Charles River approximately 100 feet downstream of Main Street. The present dam, reconstructed around 1938, consists of earthen embankments with a cast-in-place concrete primary spillway. This intermediate-sized dam, presently owned by the town of Milford, is approximately 200 feet in length, with a structural height of approximately eight feet.

After completion of the dam in 1938, several sections of the pond had maximum depths ranging from 10 to 12 feet. However, since the late 1970s Milford Pond has shown a decline in water quality due to the deposition of sediment and nutrients from upstream sources in the watershed, as well as from the inflows of the 17 storm drains. The historic cedar swamp led to a thick peat layer at the bottom of the pond that provides nutrients for vegetation. In addition, the sediments that have been deposited in the pond via runoff from the urban and wooded watershed, introduced additional nutrients that create eutrophication and impair water quality in the pond. This has resulted in the proliferation of weed species and a significant decrease in aquatic habitat value. Currently, the average depth of the pond has decreased to approximately 2 feet.

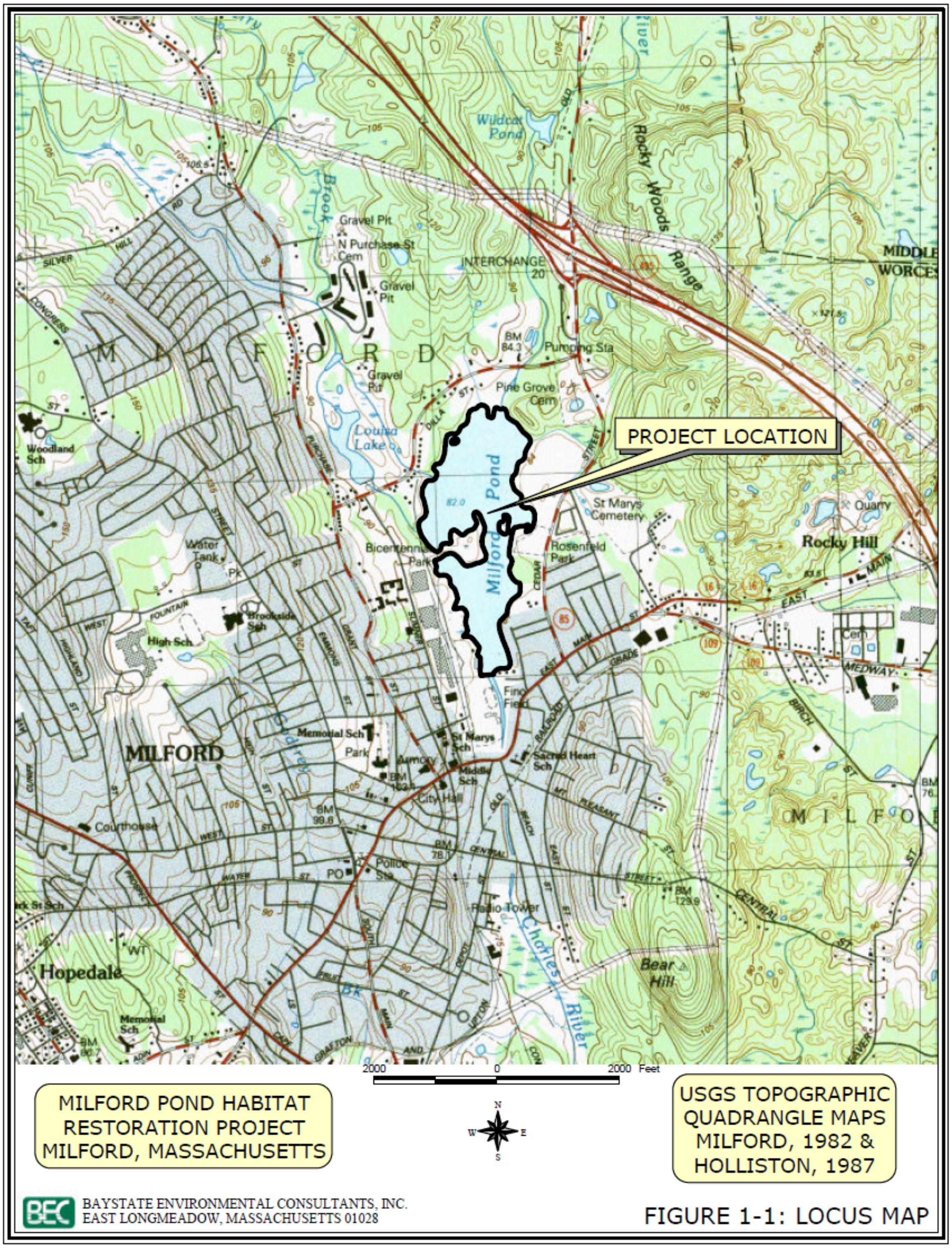

Figure 1-1. Locus Map..

Submerged and floating-leafed aquatic plants occupy most of the pond area. Emergent wetland occurs along the perimeter of Milford Pond, including a 400-foot wide band along the western shoreline south of Clark Island. In its current state, Milford Pond provides wildlife habitat for a variety of aquatic organisms living in emergent wetland and shallow pond habitats. However, the fishery habitat value of Milford Pond is greatly reduced by the shallow depths, dense weeds and the low dissolved oxygen in the water resulting from decaying aquatic vegetation. In time, wetland successional processes will result in the gradual filling of Milford Pond and its conversion to an emergent wetland community. This succession will result in further decreased areas of open water habitat, and continued loss of fish habitat. In addition, the gradual succession of Milford Pond will impact the habitat for four State-listed endangered and threatened bird species: Common Moorhen (*Gallinula chloropus*), Least Bittern (*Ixobrychus exilis*), Pied-billed Grebe (*Podilymbus podiceps*) and King Rail (*Rallus elegans*), (Massachusetts Natural Heritage and Endangered Species Program). The Pied-billed Grebe, specifically, requires open water for feeding as well as emergent marsh for nesting.

In the 1940's and 1950's, Milford Pond was a fisheries resource for local sportsmen who caught "horn pout" (brown bullheads), largemouth bass, and bluegill sunfish. As of 1989, these species were still present in Milford Pond. Nevertheless, the density of the emergent vegetation has contributed to the decline of warm-water fishery in Milford Pond. The low flow through the majority of the pond, as well as thick ice and snow in winter contributes to annual winter fish kills, and summer fish kills occur due to the decomposition of organic matter creating anoxic conditions.

Although the emergent vegetation in the pond has contributed to the decline of the warm-water fishery, it does provide a valuable resource by serving as habitat for the four State-listed birds noted above (Massachusetts Natural Heritage and Endangered Species Program (MA NHESP)).

B. Project Authority

This Environmental Assessment was prepared under the authority of Section 206 of the Water Resources Development Act of 1996, as amended, 33 U.S.C. § 2330. Section 206 provides programmatic authority for the U.S. Army Corps of Engineers (USACE) to carry out aquatic ecosystem restoration projects that improve environmental quality, are in the public interest, and are cost effective. The town of Milford, Massachusetts is the non-Federal sponsor of this project. This Environmental Assessment (EA) addresses the environmental consequences of the proposed dredging and wetland restoration at Milford Pond in accordance with the National Environmental Policy Act of 1969 (NEPA).

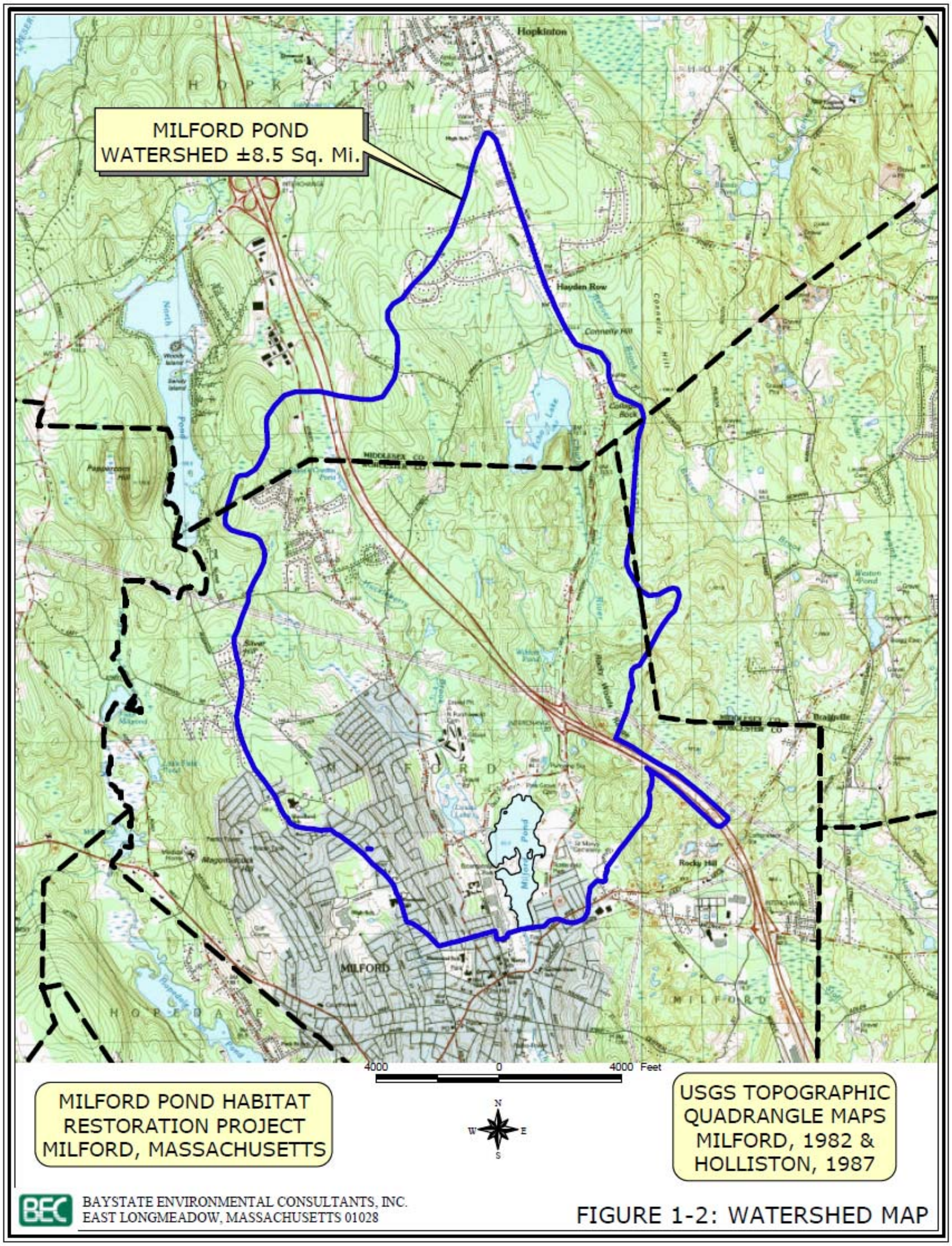

Figure 1-2. Milford Pond Watershed.

II. Project Description

A. Selected Plan

The proposed plan involves dredging approximately 250,000 cubic yards of organic rich sediment from the southern portion of the pond to a depth of 12 feet (the maximum estimated depth of the photic zone) and using the dredged sediment to restore emergent and forested wetland in the northern portion of the impounded area (Figures 2.1 and 2.2). Dredging is proposed to extend from the outlet dam northerly, to a point slightly north of Clark Island encompassing an area of approximately 18 acres. The existing emergent vegetation areas along the westerly boundary of the dredge limits are proposed to remain unaltered except for the area immediately surrounding the town swimming pool in the southeasterly corner of the pond. The proposed project creates diversity among open water, aquatic weed beds, floating vegetated islands, and emergent, shrub, and forested wetland. The plan also avoids impacts to the town's water supply (Clark Island Well Fields) and critical habitat for State-listed bird species that inhabit the pond and surrounding wetlands. Dredging will remove a portion of the accumulated, nutrient-rich sediments in the open-water area, thereby inhibiting excessive plant growth. The wetland restoration portion of the project will help to address phosphorous related water quality problems in Milford Pond, in addition to enhancing fish and wildlife value.

In the proposed plan, sediments will be removed from the southern portion of the pond using a hydraulic dredge or mechanical dredge and hydraulic pipeline. The dredged sediment slurry will be pumped to the northern end of the pond, where a retaining structure will be placed along the perimeter of the wetland restoration area to retain the dredged sediments. Dredged sediment would be pumped into the area behind the containment structure allowing the sediment to accumulate to approximately the height of the surrounding marsh. The area would hold approximately 250,000 cubic yards of material dredged from the southern portion of the pond. The final surface of the filled area is anticipated to encompass approximately 30 acres and will be shaped and revegetated to support a combination of emergent, shrub, and forested wetland habitats. In addition, the hydrology of the newly constructed wetland will be suitable for the reestablishment of Atlantic white cedar (*Chamaecyparis thyoides*) to Milford Pond, a species that was historically present in the pond prior to the construction of the dam at the outflow.

A buffer zone consisting of an approximately 100 to 400 foot wide strip of open water will remain between the existing cattail-dominated wetland habitat and the proposed dredging limits. In addition, provisions to prevent the disturbance of the floating vegetated islands that are outside the limits of the dredge areas and disposal areas will be incorporated into the Plans and Specifications.

Figure 2.1 Milford Pond and Proposed Areas of Dredging and Restoration.

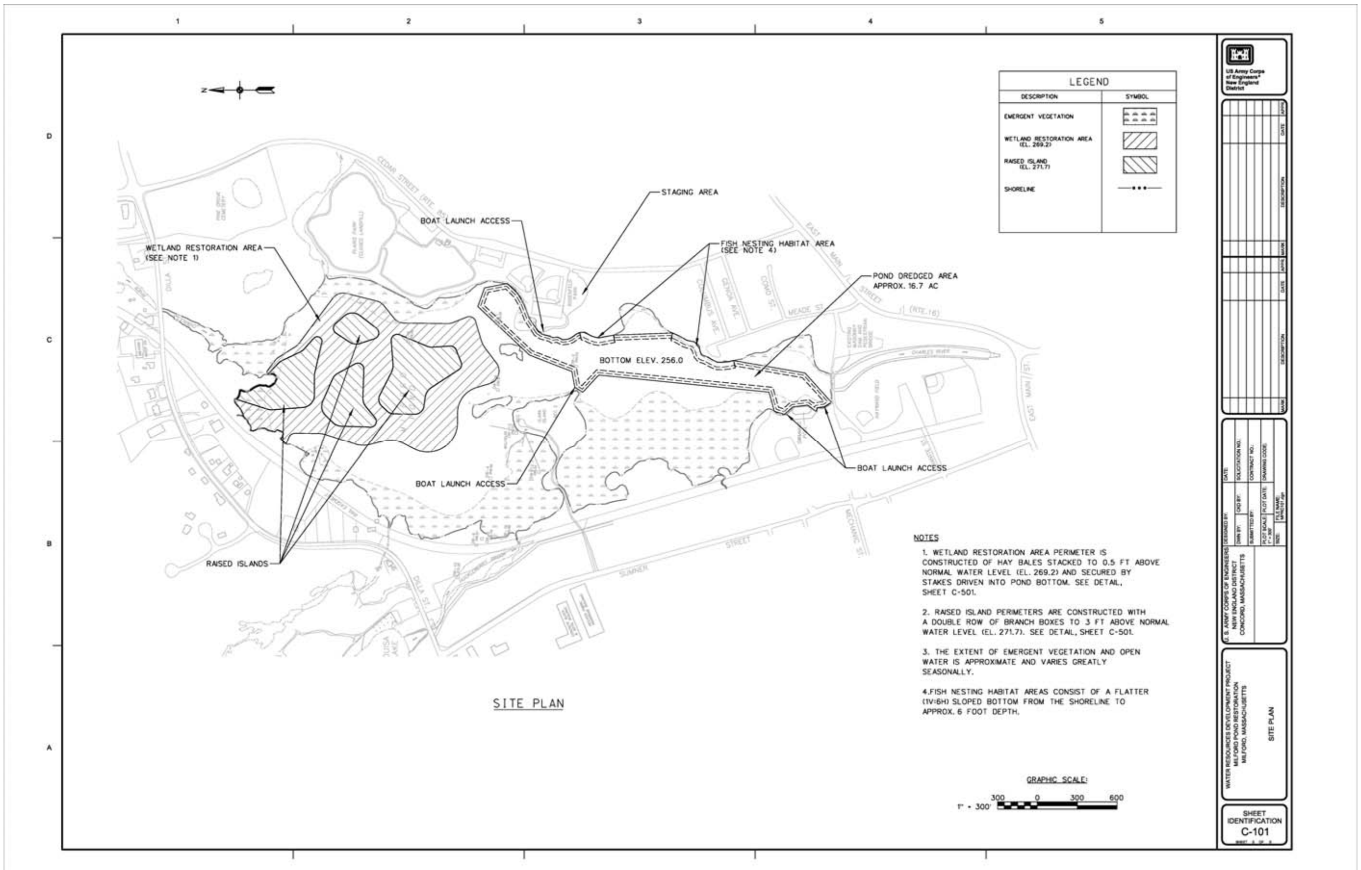

Figure 2.2. Detailed View of Proposed Wetland Restoration Area.

III. Alternatives

Alternatives evaluated in this Environmental Assessment (EA) for the habitat restoration of the Milford Pond ecosystem ranged from dredging to removal of the dam:

1. No Action

2. Full dredging of the entire 120± acre pond, with upland disposal North of Dilla Street

3. Dredging 45± acres, with upland disposal North of Dilla Street

4. Dredging 20± acres, with upland disposal North of Dilla Street

5. Dam removal

6. Dam removal with dredging of 45± acres with upland disposal North of Dilla Street.

7. Dredging 18+ acres with beneficial use of dredged sediments (creation of 30 acres of emergent wetland habitat)

These alternatives will be discussed below.

A. Alternative 1 - No Action

The No Action Alternative (“without project condition”) is required to be evaluated as prescribed by NEPA and the Council on Environmental Quality (CEQ) NEPA regulations. The No Action Alternative serves as a baseline against which the Proposed Action and alternatives can be evaluated. Evaluation of the No Action Alternative involves assessing the environmental effects that would result if the proposed action did not take place. The “No Action” alternative describes the most likely future condition that could be expected if no alternative is selected for implementation.

If no action is taken, the current conditions at Milford Pond will continue to be degraded and worsen. Sediments would continue to be deposited in the pond via runoff from the urban and wooded watershed introducing additional nutrients that create eutrophication and impair water quality in the pond. Areas of extremely dense emergent and floating leafed vegetation would continue to rapidly convert open water areas to choked aquatic habitat and increasing emergent marshland, a process that if left unimpeded will eventually transform virtually the entire pond to wet meadow and swamp. Eventually the area would convert to an emergent marsh with the loss of the open water habitat. During the process, there would be a continuation of the degraded water quality and aesthetically poor conditions. This transformation will drastically reduce or eliminate warm water fisheries habitat, and also degrade the functions and values of the remaining emergent wetland which currently supports nesting habitat for avian waterfowl, including State protected rare bird species, which are equally dependent upon the open water habitat for feeding habitat.

Although the succession to an emergent marsh would present an alternate ecosystem with a change in habitat and species composition, the loss of the open water habitat would negatively affect not only the existing fisheries, but also the avian wetland and waterfowl species that inhabit the area. As noted previously, these include several State protected rare species that require a balance of emergent vegetation adjacent to areas of open water for their habitat (i.e. King Rail, Pied Billed Grebe, Least Bittern, and Common Moorhen; see Incremental Analysis from 2005 Environmental Assessment) for further discussion). With the loss of open water, their habitat would be significantly reduced and/or eliminated. Since the value of restoring the wetland and open water habitat would be preferable in this location due to its potential to support a diverse ecosystem, (which includes fish, wetland species, and waterfowl), this alternative was not selected.

B. Alternative 2 - Complete Dredging of Pond Basin with Upland Disposal North of Dilla Street

This alternative would involve the full-scale dredging of the entire 120± acre pond basin using hydraulic equipment. Under this alternative, the proposed dredging program would dredge the entire pond to a depth of 12 feet, the maximum estimated depth of the photic zone (Figure 6-1). A full-scale dredging program would result in the restoration of open water habitat throughout the entire 120-acre pond basin. The immediate margins of the northern and western portions of the pond, as well as some cove areas would be preserved to avoid wetland habitat and preserve some of the littoral zone vegetation. Clark Island Well Field would not be included within the area of dredging to avoid any direct impact to the well field.

This alternative would deepen the lake about 1-10 feet over about 95% of its surface area and would require the removal of about 1,000,000± cubic yards of organic sediments. An initial weed-harvesting program would be necessary immediately before dredging to allow efficient operation of the dredge.

This alternative would restore the maximum areas of open water and preserve some of the emergent vegetation areas within some of the coves, improving aquatic fin fish habitat by restoring water depth to the shallower portions of the pond. It would also substantially reduce the existing aquatic macrophyte densities and probably the density of their regrowth. The regrowth of aquatic macrophytes at a lesser density within the shoreline littoral zone is expected to occur which will restore beneficial warm water fishery habitat, providing an aquatic weed bed with substantially less density than currently occurs. Under this scenario, the total aquatic weed beds remaining may be somewhat less than optimal. In addition this alternative would remove the dense aquatic and emergent vegetation that has grown at the outflows of the storm drains that discharge into the pond, where it provides an additional water quality benefit by filtering the incoming storm water. However this alternative would not involve dredging in the immediate vicinity of the Clark Island Well Fields and therefore would protect the wells from the infiltration of surface water.

Since this alternative would remove the greatest amount of organic material from the pond it would have the greatest potential for an adverse impact in the areas north of well fields where there is presumed induced recharge from the overlying waters creating the potential for surface water infiltration into the aquifer. Also, this dredging alternative has the greatest potential for adverse impact on waterfowl habitat, including protected State-listed species, which are dependent upon the dense emergent vegetation and shallow aquatic weed beds for nesting and foraging habitat.

This dredging alternative, as well as the partial dredging alternatives discussed below, would require the use of a 20± acre Town-owned parcel for processing of the dredged materials. The site is located north of the pond, north of Dilla St. (See Figure 6-1). Due to space limitations, all of the dredging alternatives would utilize mechanical dewatering using belt filter press technology to manage the hydraulically dredged material. The hydraulic dredging process would pump the organic sediments in a slurry state to storage tanks at the mechanical dewatering site. Mechanical mixers would maintain the sediments in suspension in the tanks. The slurry would then be pumped from the tanks to several trailer-mounted mechanical dewatering units located nearby. After removing the solids, clean water would be returned to the pond. The sediment volume in the peaty sediments of Milford Pond would be decreased by about one-third by this process.

The project would use about 10 acres of the 20±-acre disposal site, avoiding wetlands and providing necessary setbacks to control erosion and sedimentation. For the full pond dredging program, this site would not be able to contain the entire volume of sediments to be dredged from the pond and the Town would need to seek alternate placement or beneficial reuse of the material during the dredging program in order to minimize the storage area required. Sediments will be hydraulically dredged from the pond and transported by dredge pipeline to the sediment dewatering and disposal site. The dredge pipeline would extend from the pond to the site by being placed within the Huckleberry Brook channel and underneath Dilla Street in the existing 5'x3'± box culvert. Temporary easements would be required from three (3) private landowners in order to install, operate, and remove the dredge pipeline between the pond and Dilla Street. Excess water from the dewatering process would utilize the Huckleberry Brook channel to return to Milford Pond.

The sediment-processing site would be restored by seeding the dredged sediments with a grass and wildflower seed mix to provide site stability. Gradually, shrub and sapling growth would develop within this area transforming into a woodland community over several decades. These impacts are short-term over the life of the project and long-term effects are considered insignificant as full restoration of these areas is proposed.

This alternative would be expected to result in reductions of macrophyte growth due to the deepening of the pond and the removal of much of the nutrient rich organic sediments. This would be expected to result in water quality improvements including increased dissolved oxygen concentrations in the water column due to the reduction of the amount of decaying dead vegetation deposited on the bottom of the pond, as well as nutrient recycling resulting from the decaying plant vegetation (that would tend to maintain eutrophic conditions in the pond). In addition, aesthetic improvements would be expected with this alternative by reduction and/or elimination of the odors associated with the anaerobic decomposition of pond vegetation and eutrophic conditions. However after re-examination of the quantities of material that would be removed in this alternative, it became evident that a much larger disposal area would be necessary to accommodate all of it. Therefore due to the problems associated with the capacity of the disposal area, the loss of the marsh habitat necessary for the four state listed water birds, as well as the potential negative effects on the Clark Island Well field, this alternative was not selected.

In summary, the positive effects on finfish aquatic habitat are offset by the following negative aspects associated with the dredging of the entire pond:

1. Removal of some desirable aquatic weed bed habitat in the littoral zone;
2. Removal of emergent marsh vegetation that provides habitat for waterfowl and mammals;
3. Removal of emergent marsh vegetation that provides habitat for protected species of waterfowl (king rail, common moorhen, the pied-billed grebe, and the least bittern);
4. Displacement of existing wildlife communities and creation of an ecosystem with less overall habitat diversity; and
5. Potential adverse impacts to the local water supply (Clark Island Well Field) due to removal of protective peat layers that currently filters the induced infiltration that partially support the water supply of the aquifer.
6. Inability of the disposal area to accommodate the total amount of dredged material.

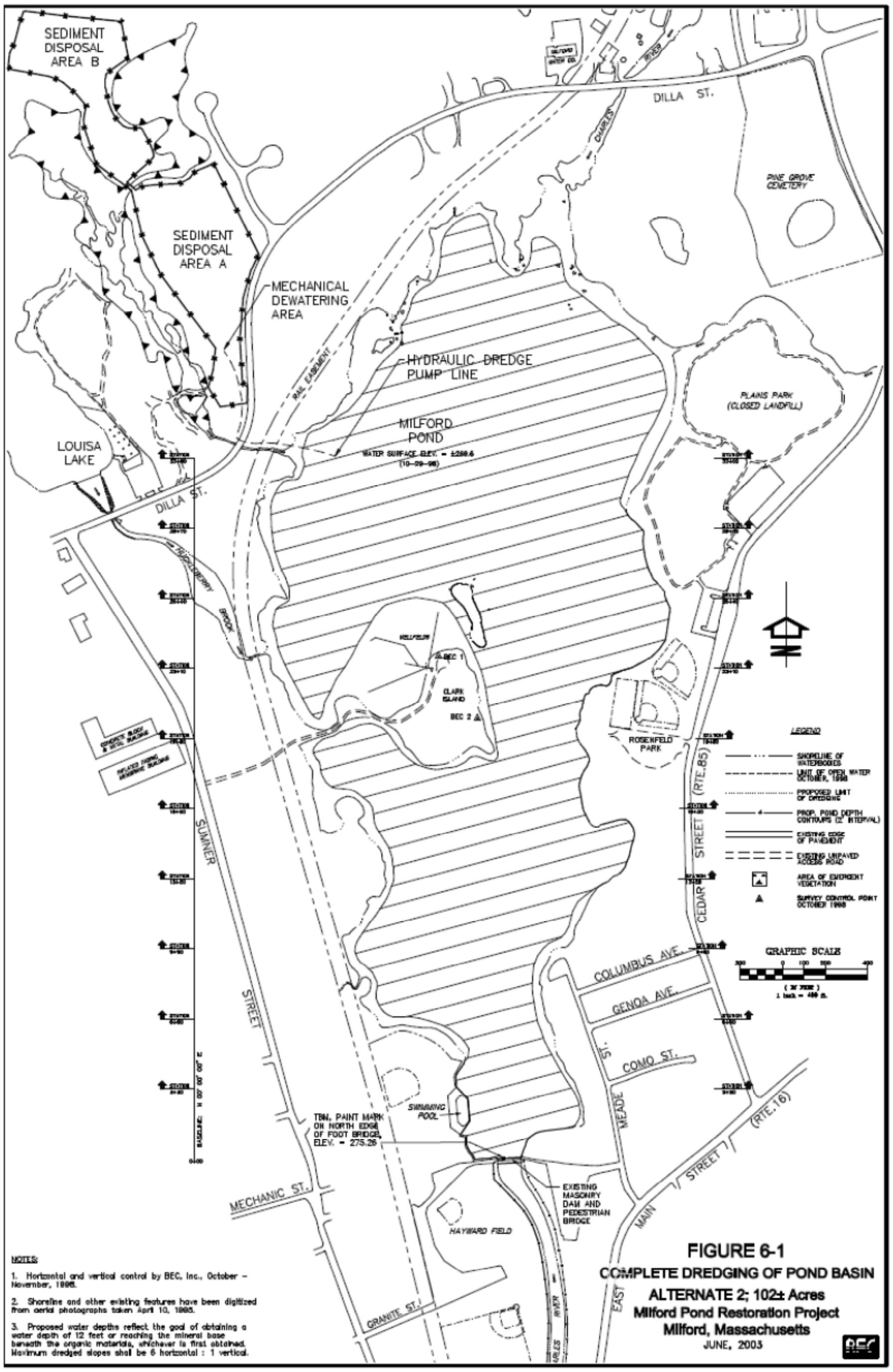

Figure 6-1. Alternative 2, Complete Dredging of the Pond.

C. (Alternatives 3 & 4) Partial Dredging

These alternatives would dredge only a 45 and 20 acre portion of the pond as opposed to the entire pond as would occur in Alternative 2. The pond would still be dredged to either 12 feet or to the mineral base beneath the organic sediments, whichever is obtained first. The areas to be dredged would be towards the southern and eastern portions of the pond, avoiding the Clark Island Well Field and the emergent wetlands on the western side of the pond. Two plans were considered under the partial dredging concept:

1. A 45-acre section extending from the dam northward past Clark Island; and
2. A 21-acre section extending from the dam northward to Clark Island.

Both of these project areas would avoid dredging the cattail-dominated marsh south and west of Clark Island in order to avoid conflicts with rare waterfowl species nesting habitat. These two scenarios also share some of the same attributes. They both would increase pond depths and decrease aquatic macrophyte growth within a portion of the pond, providing and enhancing deep, open water habitat necessary for promoting the residence of certain fish species in Milford Pond. Deep water allows for forage, over-wintering, and resting of fish such as yellow perch, brown bullhead, chain pickerel, black crappie, largemouth bass, and bluegill sunfish. The remaining shallow, weedy environment currently found in Milford Pond is also an element of the required habitat for these species, providing cover. A balance of both deep, open water and shallow, weedy areas provides more optimal habitat for these fish species, as well as supporting other wildlife, such as wading and dabbling birds and aquatic mammals (e.g., muskrat).

Environmental impacts associated with the partial dredging program could include:

1. Removal of some desirable aquatic weed bed habitat in the littoral zone; and
2. Potential adverse impacts to the local water supply (Clark Island Well Field) due to removal of protective peat layers that currently filter the induced recharge that partially supports the water supply of the aquifer.

While the removal of existing organic sediments would alter the benthic habitat; partial dredging only impacts a fraction of the 120±-acre waterbody. Overall, habitat diversity within Milford Pond will be improved as some shallow pond and emergent wetland habitat will be converted to open water habitat, while a portion will be preserved in its present state. Existing wildlife communities will be preserved, while new communities will develop in restored sections of the pond. The four State-listed species identified by MA NHESP include king rail, common moorhen, least bittern, and pied-billed grebe, all of which nest in the dense cover habitat found in emergent wetland areas, such as that preserved in the western portion of Milford Pond. Seasonal dredging to prevent disturbance during nesting periods will further protect priority habitats for these species.

Relative to the Clark Island Well Field, the vertical and horizontal limits of the partial dredging program were determined, in part, under consideration of the Clark Island Well Field. Ground Water Associated (1987), and as confirmed by the current study (Marin, 2002), showed that a groundwater-divide forms near the small island (east of

Clark Island) during periods when the Clark Island wells are pumped. An area located north of Clark Island is within the zone of influence of the wells. Previous subsurface investigations showed that the sand and gravel aquifer that is pumped by the Clark Island wells is overlain by a layer of peat or possibly layers of peat and clay. The overlying peat layer provides a hydraulic barrier to a certain extent and provides an environment favorable for natural attenuation of pollutants. Only one of the partial dredging scenarios would impact a relatively small area west of the groundwater divide.

Both of the partial dredging programs would provide enhanced habitat improvement benefits with minimal environmental impacts and a lower cost. These alternatives would also provide the restoration of some of the historical recreational uses and aesthetic values, although to a lesser extent than previously existed, or as provided by the full pond-dredging alternative.

Similar to the full pond-dredging alternative, these partial dredging alternatives would require the use of a 20± acre Town-owned parcel for processing of the dredged materials. This site is located on the north side of the pond, north of Dilla St. (Refer to Figure 5-1). Although this site can potentially contain the entire volume of sediments to be dredged from the pond, it could require an average depth of 18 feet for the 45 acre dredging alternative and about half that for the 21 acre dredging alternative. In addition, due to irregular topography, heights of the sediment would vary. Additionally, the Town is expected to seek beneficial reuse of the material during the 4 year dredging program, which will minimize the storage area required. Other dredging programs with the same types of similar peaty dredged sediments have had little difficulty in finding users for the material. Upon completion of the project, the disposal site would be re-vegetated with native vegetation. However, if there is no reuse of the dredged sediments, it is likely that a large area of dredged material (possibly 18 feet high or more) would remain at the disposal area.

The alternative to dredge 45 acres was the previously selected plan in the 2005 Final Detailed Project Report and Environmental Assessment for the Aquatic Habitat Restoration of Milford Pond, Milford, Massachusetts. However, due to the limited capacity and uncertainty of the disposal area north of Dilla Street to be able to accommodate the total volume of dredged material, this alternative was no longer considered feasible.

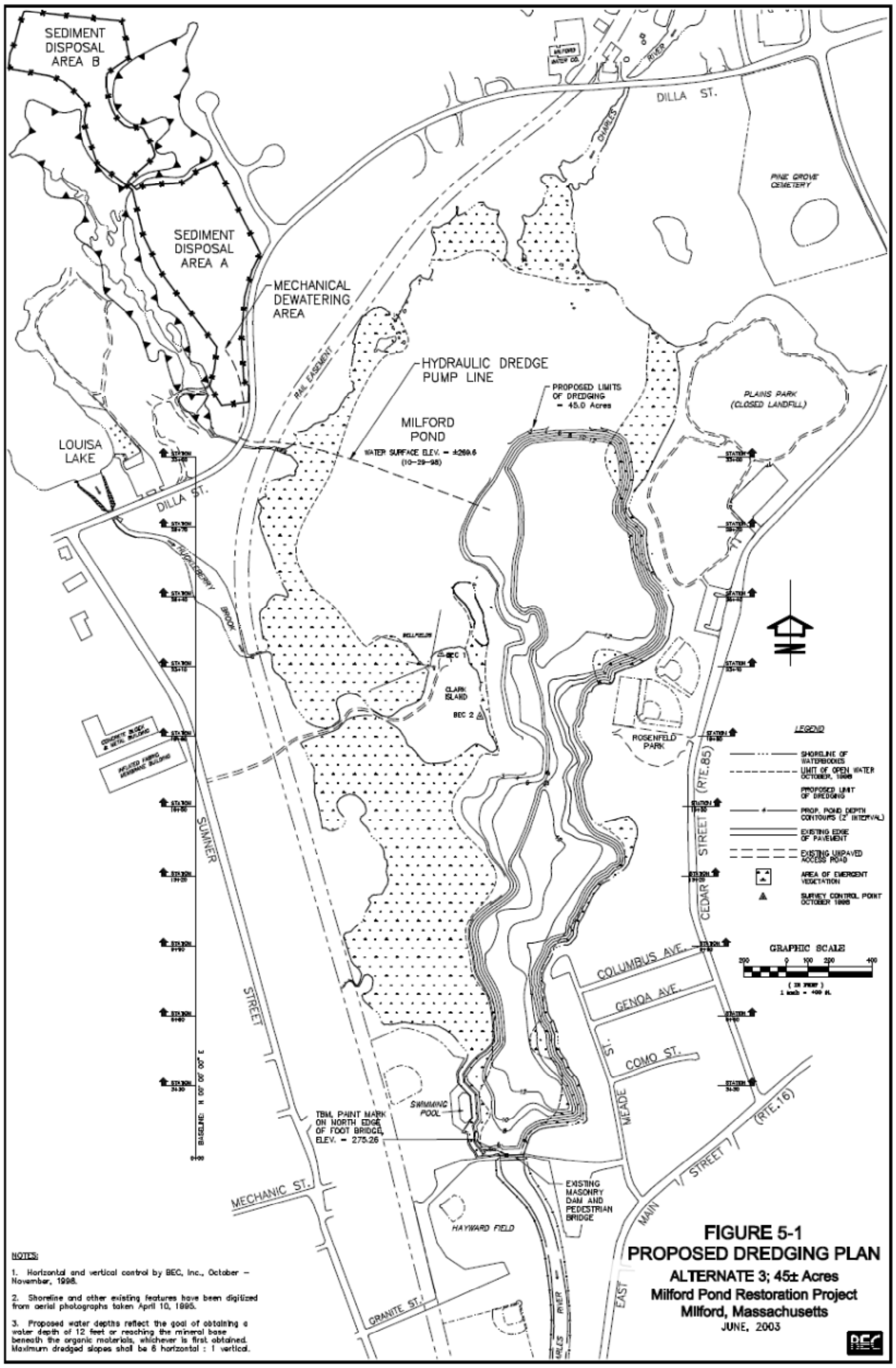

Figure 5-1. Alternative 3, Dredging 45 acres.

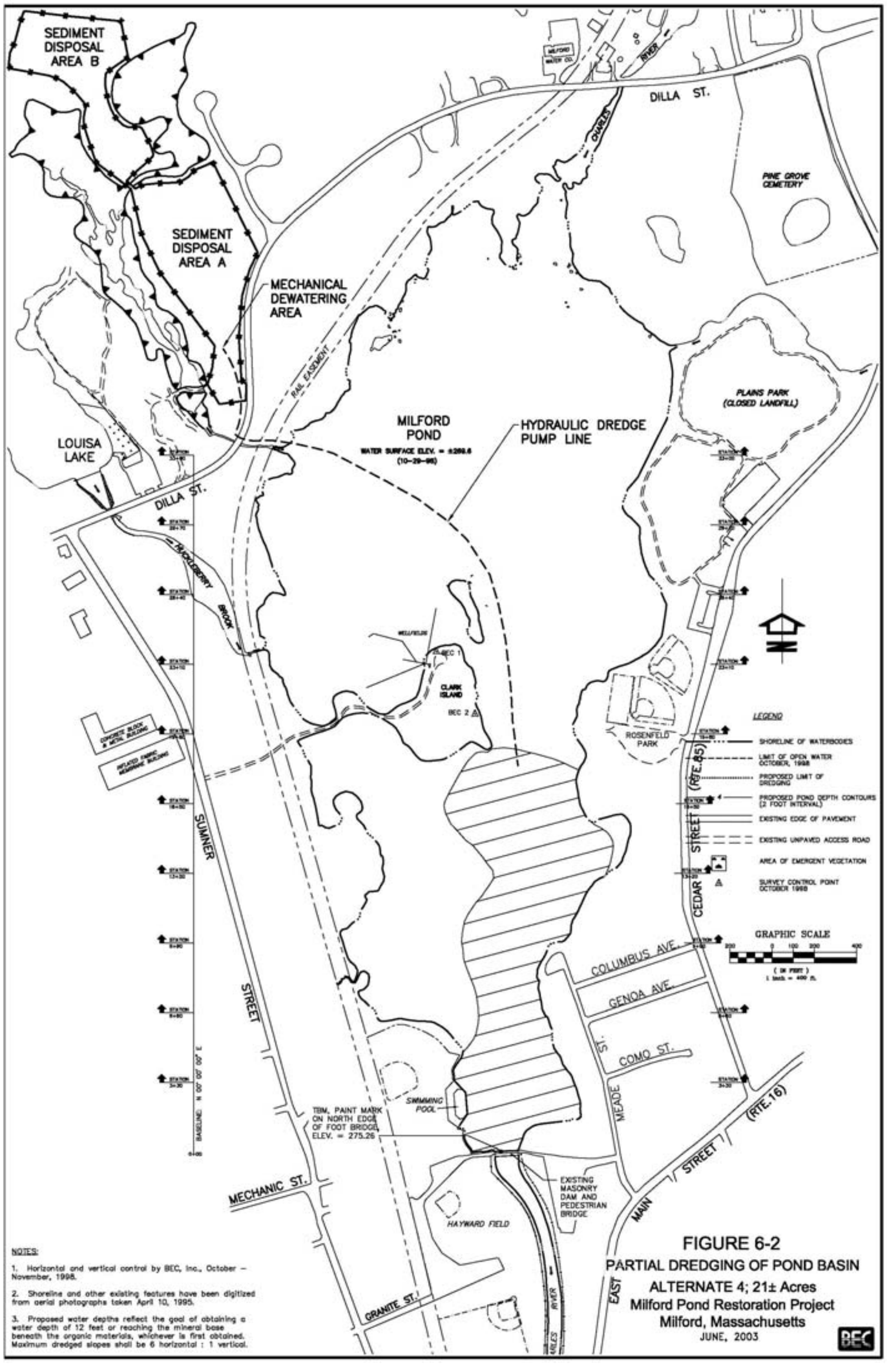

Figure 6-2. Alternative 4, Dredging 21 Acres.

D. Alternative 5 - Dam Removal

This alternative entails removing the dam that currently impounds Milford Pond, thus allowing the pond to drain returning the area to wetland. The Charles River would be allowed to return to its natural course and flow freely through the wetland and on to Boston Harbor. An emergent marshland habitat would dominate the system (most likely extending from the existing cattail dominated marsh in the southwest quadrant of the original pond basin), developing on deep organic sediments that have filled in the pond. Stream flows for the Charles River, Huckleberry Brook, and storm water inputs would cut into the sediments to establish new stream channels, which would emerge and develop over several years until relatively stable channels emerged. This alternative would drastically alter the hydraulic properties of the aquifer located beneath Milford Pond, from which the Milford Water Company extracts drinking water. In addition, the existing sediment would form a raised terrace that would eventually become revegetated with either wetland or upland vegetation depending on the final hydrologic regime. It should be noted, that with this alternative, the hydrology would be expected in some areas to return to what it was historically. Therefore, portions of the pond may be suitable for the restoration of Atlantic white cedar. However, it would not be expected to be restored to its historic conditions due to the amount of sediment that has accumulated over the years.

One the objectives of dam removal would be to provide fish passage to the pond, restoring a riverine fisheries habitat to that portion of the Charles River. Although Atlantic salmon no longer migrate into the Charles River, the lower Charles River does support several anadromous and catadromous species including American Shad, American Eel, Blueback Herring and Alewife. The Charles River has 20 dams along its length of which the Milford Pond dam is the most upgradient. While the lower five dams are equipped with fish ladders, there remain 14 dams downstream of the Milford Pond dam that block anadromous and catadromous fish passage north to this reach. Therefore, removal of this dam would not provide benefit for anadromous fish in the Charles River until fish passage facilities are completed at the 14 downstream dams. However it would provide some connectivity allowing the passage of resident migratory species, (potamodromous species) such as white sucker to locations upstream or downstream of the dam. In addition it could possibly allow catadromous American eels to access Milford Pond, since they could potentially pass some of the lower dams due to their ability to climb over and/or around some dams along wetted surfaces. However during the most recent fish sampling eels were not found in Milford Pond. It should be noted that the existing dam is located on a pre-existing natural rock ledge several feet high which previously allowed the development of a cedar swamp with accumulation of deep organic peat. Therefore, fish migration would not necessarily be improved by removal of the dam. However, a fish ladder could be considered at a future date for any of the alternatives once viable fish passage is provided at the downstream dam sites.

Natural environmental processes would be allowed to function with dam removal, but the ability of the exposed pond bottom to revert to the condition that existed prior to original dam construction over 60 years ago is unlikely without additional management and control of invasive species. Originally, the area was a swamp with Atlantic White Cedars (*Chamaecyparis thyoides*). White cedars of reduced abundance and stature may persist in the northeast corner of Milford Pond (IEP/CDM, 1986), and therefore there is the potential for these trees to become reestablished in the pond. However, without active invasive species control, the exposed pond bottom will most likely be rapidly colonized by invasive wetland species including purple loosestrife, and Phragmites, which would interfere with the re-establishment of these trees.

In addition (as noted previously), allowing the pond to drain may have a substantial impact on the hydraulic properties of the aquifer beneath Milford Pond, from which the Milford Water Company extracts drinking water. The Milford Water Company operates wells that are located on Clark Island in the center of Milford Pond. Based on data from an 11 day pumping test of the Clark Island Well Field, Groundwater Associates (1987) concluded that the Clark Island Well Field receives the majority of its recharge from leakage through the overlying peat layer that separates Milford Pond from the aquifer, and from upgradient sources to the north and northwest. This suggests that the draining of Milford Pond would result in the loss of a major source of recharge to the aquifer. Already, this well field suffers in production under periods of severe drought when the pond levels are naturally lowered. The Clark Island Well Field produces more than half of the total groundwater source of drinking water to the area and between 13% and 36% of the total daily water demand. Currently, the Milford Water Company is actively seeking additional water supplies to meet existing and anticipated water demands. The loss of this well field would not be a feasible alternative.

This alternative also poses impacts to the rare species habitat within the pond basin. The four State-listed species identified by MA NHESP (king rail, common moorhen, least bittern, and pied-billed grebe) all nest in the dense cover habitat found in emergent marshy wetland areas, such as in the western portion of Milford Pond. The lowered hydrology would effectively convert this habitat to an area undesirable to these species.

The removal of the dam also poses potential for erosion and sedimentation unless significant measures are taken to avoid such impacts. The lowering of the water level will cause the stream flow from various sources to cut channels into the accumulated soft, highly erodable, surficial sediments. Stream flows for the Charles River, Huckleberry Brook, and storm water inputs would cut into the sediments to establish new stream channels, which would emerge and develop over several years until relatively stable channels were established. Avoidance of this condition would likely require pre-dredging of preferred flow pathways for each of the inlets to the pond basin, sized to an appropriate dimension to provide relative stability. Bioengineering of the new stream banks might also be required in addition to intensive seeding/planting of the newly exposed sediments. In addition, the implementation of this alternative would likely not be desired by the town residents, who through the Milford Pond Restoration Committee have established goals for pond restoration, as opposed to river restoration.

Due to the potential adverse effects to the well field and rare species habitat as well as minimal benefits to fish passage (due to the existing natural bedrock barrier), this alternative was not selected.

In summary, the alternatives considering the removal of the existing dam would allow the area to drain and revert entirely to a swamp, with a narrow remaining shallow channel for the Charles River. An emergent marshland habitat would dominate the system (most likely extending from the existing cattail dominated marsh in the southwest quadrant of the original pond basin), developing on deep organic sediments that have filled in the pond. In addition there would be the potential for the Atlantic white cedar to become re-established in the pond with effective management/control of invasive species. Stream flows for the Charles River, Huckleberry Brook, and storm water inputs would cut into the sediments to establish new stream channels, which would emerge and develop over several years until relatively stable channels emerged. This alternative would drastically alter the hydraulic properties of the aquifer located beneath Milford Pond, from which the Milford Water Company extracts drinking water. In addition, significant alteration of wetland resources, loss of rare species habitat for wading birds and waterfowl, and potential invasive wetland plant dominance in newly exposed marsh habitat, are among environmental challenges associated with this alternative. In addition, although there is the potential for the restoration of the historic Atlantic white cedar, there would be reduction of the existing warmwater fisheries habitat as well as the potential loss of the rare bird species habitat.

Due to the potential adverse effects to the well field and rare species habitat as well as minimal benefits to fish passage (due to the existing natural bedrock barrier), this alternative was not selected.

E. Alternative 6 - Dam Removal with Partial Dredging

This alternative involves removal of the dam while dredging approximately 45± acres of the Milford Pond area. The 45± acre partial dredging alternative was paired with the dam removal since this was the preferred dredging alternative size selected by the pond restoration committee, and provides a good representation of the types of issues associated with combining dam removal with dredging.

This alternative would have the effect of allowing the river to flow freely while still creating areas of deeper water fisheries habitat. The dredging would be performed in the same location as for the 45±-acre dredging without dam removal alternative. The benefits of this alternative would, in part, be the same as those resulting from the partial dredging alternative, including the restoration of deep, open water, warm water fisheries habitat while maintaining emergent wetland environments. However, the shallow aquatic weed beds would be largely eliminated, except to the extent that they redeveloped within the newly dredged pond basin. As discussed in Alternative 5, dam removal would not open the river for migratory fish passage due to numerous downstream obstructions, as well as the obstruction of the natural bedrock barrier on which the existing dam was built.

While providing some new deep-water habitat, this alternative would have most of the same deficits as observed in Alternative 5. There would be likely adverse impact to the public water supply from Clark Island Well Field and the rare waterfowl species habitat. In addition, the benefit to anadromous fisheries is uncertain given the significant fish migration barriers downstream. Therefore, this alternative was not selected.

F. Alternative 7. Dredging 18 Acres of the Pond with Wetland Creation (Preferred Alternative)

The proposed plan involves dredging the southern portion of the pond to a depth of 12 feet (Figure 2) and using the dredged organic-rich sediment to restore emergent and forested wetland in the northern portion of the impounded area. The proposed project creates a more balanced diversity among open water, aquatic weed beds, floating vegetated islands, and emergent, shrub, and forested wetland. The plan also avoids impacts to the town’s water supply (Clark Island Well Fields) and critical habitat for State-listed bird species that inhabit the pond and surrounding wetlands. Dredging will remove a portion of the accumulated, nutrient-rich sediments in the open-water area, thereby inhibiting excessive plant growth. Sediments will be removed from the southern portion of the pond using a hydraulic pipeline dredge. The dredged sediment slurry will be pumped to the northern end of the pond, where a retaining structure will be placed along the perimeter of the wetland restoration area to retain the dredged sediments. The final surface of the filled area will be shaped and re-vegetated to support a combination of emergent, shrub, and forested wetland habitats. A buffer zone will remain between the existing cattail-dominated wetland habitat and the proposed dredging limits. In addition, provisions to prevent the disturbance of the floating vegetated islands will be incorporated into the Plans and Specifications. Dredging will be accomplished during one full season starting in March or April and ending in December with some preliminary work during the previous fall.

The dredged sediment would be used to convert approximately30 acres of open water/aquatic bed wetland in the northern end of the pond to emergent wetland, more typical of the historic wetland type that previously supported Atlantic white cedar. A sediment containment structure would be placed along the perimeter of the wetland restoration area to retain the dredged sediments. Dredged sediment would be pumped into the area behind the containment structure allowing the sediment to accumulate to the height of the surrounding marsh. The area would hold approximately 250,000 cubic yards of material dredged from the southern portion of the pond. The wetland would be planted with emergent marsh vegetation (e.g. cattails) or shrubs and trees including the Atlantic white cedar. Removal of the sediment and restoration of the wetland may help to reduce phosphorus related water quality problems in Milford Pond in addition to enhancing fish and wildlife value.

The emergent vegetation in the restored wetland is also expected to increase the amount of nesting habitat and cover for the four state listed species of water birds all of which prefer to nest in emergent marsh.

G. Summary

Table 1.1 summarizes each the beneficial and adverse impacts of each alternative. Also included are the costs of each alternative and the area of impact.

Page Intentionally Blank

Table 1.1. Alternatives Summary

Alternative	Affected Acreage	Benefits	Adverse Impacts
No Action	0 acres	• Protection of Clark Island Well Fields • Expansion of emergent wetland habitat	• Loss of fisheries • Loss of open water habitat • Loss of recreational resource • Odors
Complete Dredge	120 acres dredged + 14 acres sediment processing and disposal	• Restoration of open water habitat to maximum extent possible • Improvement in aquatic fin fish habitat • Restoration in recreational resource to maximum extent possible • Reduction of odors	• Greatest potential for adverse impact on Clark Island Well Fields • Removal of emergent wetland habitat for mammals and waterfowl, including rare species • Removal of some desirable aquatic weed bed habitat in the littoral zone • Displacement of existing wildlife communities • Reduction in overall habitat diversity • Full use of developed and undeveloped portions of Town-owned land for dredged material disposal
Partial Dredge – 45 acre	45 acres dredged + 14 acres sediment processing and disposal	• Preservation of rare waterfowl species nesting habitat • Restoration of open water habitat • Improvement in habitat diversity with most desirable balance of emergent wetland, aquatic weed bed and open water • Preservation of existing wildlife communities • Restoration in recreational resource • Improvement in aquatic fin fish habitat • Reduction of odors	• Removal of some desirable aquatic weed bed habitat in the littoral zone • Potential for adverse impact on Clark Island Well Fields • Partial use of Town-owned land for dredged material disposal
Partial Dredge – 21 acre	21 acres dredged + 14 acres sediment processing and disposal	• Preservation of rare waterfowl species nesting habitat • Restoration of open water habitat • Marginal improvement in habitat diversity • Preservation of existing wildlife communities • Partial restoration in recreational resource	• Removal of some desirable aquatic weed bed habitat in the littoral zone • Potential for adverse impact on Clark Island Well Fields • Partial use of Town-owned land for dredged material disposal

Page Intentionally Blank

Alternative	Affected Acreage	Benefits	Adverse Impacts	
		• Improvement in aquatic fin fish habitat • Reduction of odors		
Dam Removal	5 acres dredged + 14 acres sediment processing and disposal	• Restoration of natural riverine habitat • Low potential to improve fish passage	• Opportunity for colonization by invasive wetland species • Loss of major source of recharge to Clark Island Well Field • Loss of emergent wetland habitat for rare waterfowl • Erosion and sedimentation • No improvement in recreational resource; undesired by Town of Milford	
Dam Removal with Partial Dredge	45 acres dredged + 14 acres sediment processing and disposal	• Restoration of natural riverine habitat • Low potential to improve fish passage • Restoration of open water habitat	• Opportunity for colonization by invasive wetland species • Loss of major source of recharge to Clark Island Well Field • Loss of emergent wetland habitat for rare waterfowl • Erosion and sedimentation • Little improvement in recreational resource; undesired by Town of Milford • Partial use of Town-owned land for dredged material disposal	
Dredging 18 Acres of the Pond with Wetland Creation (Preferred Alternative)	18 acres dredged +30 acres of wetland creation	• Preservation of rare waterfowl species nesting habitat • Restoration of open water habitat • Improvement in habitat diversity with moredesirable combination of emergent wetland, aquatic weed bed and open water • Preservation of existing wildlife communities • Restoration in recreational resource • Improvement in aquatic fin fish habitat • Reduction of odors • Creation of 30 acres of wetland/marsh habitat suitable for waterfowl species nesting habitat • Potential Restoration of historical cedar swamp habitat capable of supporting Atlantic white cedar.	• Removal of some desirable aquatic weed bed habitat in the littoral zone which could result in loss of larval/juvenile fish nursery/feeding areas • Opportunity for colonization by invasive wetland species	

Page Intentionally Blank

IV. Affected Environment

A. General

Milford Pond is a linear-shaped waterbody oriented on a north-south axis near the headwaters of the Charles River. In its current state, it exists as a man made pond, formed by the impoundment of the Charles River by a dam at its downstream end, approximately 1500 feet upstream of Main Street in Milford. The pond has a shoreline length of 16,609± ft. and an average depth of less than two feet throughout most of its area. It has an estimated total lake volume of 162± acre-feet. The pond is bordered by numerous parks and urban residential areas. The overall Milford Pond watershed size is 5,440± acres (8.5 square miles), with a watershed to lake ratio of 44:1. It extends beyond the municipal boundaries of the Town of Milford into the Towns of Hopkinton to the north and Holliston to the east. Table 7-1 presents the characteristics of Milford Pond.

The dam structure, owned by the Town of Milford, is an earthen embankment dam with a cast-in-place concrete primary spillway located near the central portions of the dam which was built in approximately 1938. The spillway is a gravity section founded on earth. Steel sheeting cutoff wall, presumably driven to bedrock, is imbedded in the bottom of the concrete section. The crest of the spillway is approximately four feet higher than the downstream channel. Flashboards, which are normally in place, raise the normal water surface approximately 1 foot" above the spillway's crest. This intermediate-sized dam is approximately 200 feet in length with a reported structural height of 8 feet. This dam, therefore, provides for a maximum storage potential of approximately400-acre feet. Access to the dam is provided via a concrete pedestrian bridge, which is restricted from vehicular traffic. Although the dam maintains the water level of the existing impoundment, a shallower natural impoundment was historically present due to a bedrock ledge located under the existing dam. The former impoundment provided habitat for Atlantic white cedar and was classified as a cedar swamp, with the former name of Milford Pond being Cedar Swamp Pond. The water surface elevation of the current pond is approximately 8 feet higher than that of the historic impoundment created by the bedrock ledge. The historic impoundment had depths of approximately 3-4 feet. Therefore, the maximum depth of the pond after the construction of the dam was approximately 11-12 feet deep.

B - Terrestrial Environment

B.1. Geology /Soils

The Town of Milford is located in Worcester County, which is in the central upland region of Massachusetts; also known as the Worcester Plateau. The rugged terrain that characterizes this area is dominated by ridgetops that have a uniform elevation of about 1,100 feet. The surficial geology and soils within this region have been strongly influenced by glacial activity during the Pleistocene era. Soil parent materials consist of glacial till and glacial outwash derived from crystalline rocks, geologically recent alluvial deposits, and, in wet areas, thick deposits of decomposed organic matter. Glacial till consists of unstratified, unsorted clay, silt, sand, and boulders. It is dominated by sand or loam, but with variable amounts of gravel, stones and

Table 1.2. Milford Pond Characteristics

Parameter	Description
Lake Type	Impoundment of Charles River and former pond/wetland complex
Lake Area	120 acres
Watershed Area	5440 acres
Watershed : Lake	44 : 1
Lake Volume	209,000 m^3 (170 acre feet).
Average Depth	< 2 feet
Shore Length	16,609 feet
Shoreline Irregularity	2.04 (ratio of actual shoreline length to shoreline of hypothetical circular lake of same area [8,124 feet])
Major Tributaries	Charles River, Huckleberry Brook, Ivy Brook, and Deer Brook. Other waterbodies found within the Milford Pond watershed include Louisa Lake, Echo Lake, and Wildcat pond.
Outflow Stream	Charles River
Geology	Glacial Till Soils
Groundwater Influence	Underlain by aquifer utilized by Milford Water Company. Water exchange separated by peat layer.
Sediment Type	Peat deposits underlain by sand.
Trophic Status	Eutrophic
Chlorophyll (a)	Range 0-12 mg/m^3
Total N	Range 0.17 to 2.3 mg/l (nitrate + TKN)
Total P	Range <0.01 to 0.20 mg/l
Productivity	Primarily phosphorous limited.
Secchi Disk Transparency	4 to 6 feet

boulders, and has a friable to very firm consistency. Glacial outwash consists of sorted, stratified gravel, sand and silt deposited by glacial melt waters. The recent materials deposited by stream overflow are on flood plains of streams and consist of gravel, sand, silt and clay in various combinations (USDA, 1998).

The bedrock within the Milford Pond drainage basin is the Milford Granite (Carr, 1979). Milford Pond and surrounding areas are underlain by sand and gravel deposits. Regional surficial materials include till or bedrock and floodplain alluvium, in addition to sand and gravel deposits (Figure 7-2). In addition, the area which was initially proposed as the dredged material disposal site located to the north of the pond contains a mix of terrain with topography rising in an easterly direction:

- A riparian wetland on the westerly side associated with the former primary channel for Huckleberry Brook prior to its diversion to Louisa Lake;
- A shrub/wooded wetland on the northeastern portion of the site, draining to the riparian wetlands via an narrow intermittent stream; and

- Outwash uplands within the developed portions of the site, which have been partially mined as sand & gravel deposits; and
- Glacial till soils (Canton soil series) in wooded uplands on the easterly side of the site.

.

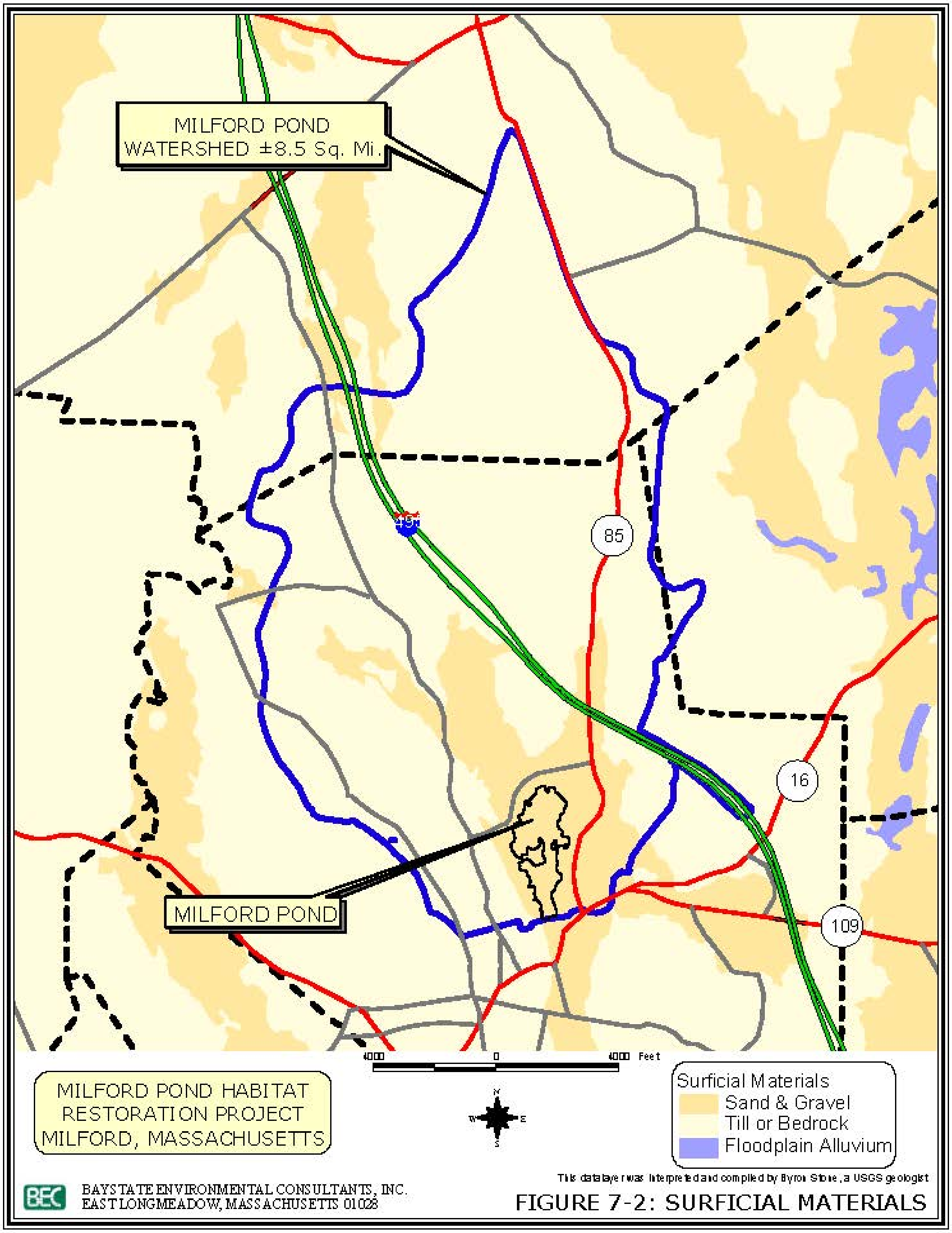

Figure 7-2. Surficial Materials.

Slabs of quarried granite, as well as exposed bedrock are evident on the east side of the parcel.

Weston and Sampson (1991 and 1994), IEP (1984), Groundwater Associates (1987), and Whitman and Howard (1991) present interpretations of the subsurface characteristics near the Clark Island Well Field and the Milford Landfill. There are general similarities in the characteristics and subsurface profiles presented by the four consulting firms. In general, the depth to bedrock ranges from 18 to 70 feet, with a minimum depth beneath the small island located east of Clark's Island. All reports indicate that there is a sand and gravel aquifer underlying Milford Pond and surrounding area, and that there are layers of peat and/or clay overlying the aquifer. Previous studies consistently report that the thickness of the peat layer generally increases from west to east. West of Clark's Island, layers of peat, fine sand, silt and clay exist at a total thickness of approximately 10 feet. East of Clark's Island, these layers expand to a thickness of approximately 20 to 25 feet. Some of the previous studies indicate that there are distinct layers of peat overlying clay near the small island located east of Clark's Island, while other studies do not confirm the presence of a clay layer. Clark Island and the small island east of it are composed of a north-south trending till ridge.

B.2. Vegetation

The vegetative communities surrounding Milford Pond are comprised of several small fragmented communities amidst the developed shoreline:

1. Wooded uplands with red maple, red and white oak, white pine and gray birch;
2. Wooded and shrub wetlands with red maple gray birch, alder, and dogwood;
3. Cattail dominated marsh within the pond basin, primarily within the southwestern portions of the pond; and
4. The floating leaved and submerged aquatic vegetation within the pond.

The wooded and scrub-shrub emergent wetland types may be found along the perimeter of Milford Pond and along the Lower Huckleberry Brook and Charles River corridors. The fringing pond wetlands exhibit a classic wetland successional mosaic, in which sediment and organic material accumulation contributes to reductions in open water habitats and speeds the process of wetland succession. As a part of this process, sediment accumulation along the shoreline fringes allows emergent wetland species to expand into open water areas. The vegetation found in these wetlands includes buttonbush, speckled alder, red maple, dogwood, elderberry, and highbush blueberry.

Within the 120± acre Milford Pond basin, the vegetative zones are roughly divided as follows:

- 25% emergent wetland growth
- 70% dense aquatic weed beds
- 5% open water with relatively high density of aquatic weeds.

Emergent wetlands occur along the perimeter of Milford Pond and in a 400-foot wide band along the western shoreline, south of Clark Island. These areas are dominated by primarily broad-leaved and narrow-leaved cattail, swamp loosestrife, tussock sedge, soft rush, water smartweed, arrow arum, and pickerel weed. Some patches of invasive species may be found in this wetland type. Purple loosestrife may be found scattered throughout these areas, while a large patch of *Phragmites* may be found along the eastern shoreline near the former landfill.

The lacustrine limnetic open water habitats occupy the majority of the vegetative assemblages, including dense mats of floating aquatic vegetation and accumulated organic materials resulting in the formation of free-floating peat islands. The floating leaved vegetation found in Milford Pond includes white water lily, yellow pond lily, watershield, and duckweed. These species range in density of growth and may occupy from 60-100% of the pond surface in certain areas. Submerged aquatic plants may also be found growing throughout Milford Pond. The primary species that comprise the open water submersed plant community include Eurasian water milfoil, bladderwort, spatterdock, large leaf pondweed, and bush pondweed. The density of growth of these species typically ranges from 80-100% of the pond area.

Within the proposed dredged material disposal site, there is a mix of vegetative assemblages. On the western side of the parcel, there is a wooded and shrub wetland with dominant species including a red maple, sweet pepper bush, speckled alder and gray birch. A narrow wetland swale also drains a small shrub wetland on the eastern portion of the site to combine flows with the westerly wetland. The remaining non-developed portions of the site is wooded uplands dominated by red oak, black birch, gray birch, sugar maple, white pine, and black cherry. The canopy height is approximately 70-80' with 75% canopy closure. Tree sizes range from 5-18" DBH. The understory is relatively sparse (15-20%). Ground cover species include bracken fern, sweet fern, and sheep laurel. Within the wooded uplands there are numerous boulders and rock slabs associated with past quarrying activities in the region. Topography rises abruptly from west to east with the boulder-strewn, wooded upland forest associated with the undeveloped portions of the parcel.

B. 3. - Wildlife

The wildlife habitat areas in the Milford Pond and dredged material disposal areas reflect the different vegetative assemblages. The wooded uplands and wetlands provide habitat for various songbirds, arboreal and ground dwelling mammals, and various reptiles and amphibians. The emergent wetland areas are extremely productive ecosystems that provide habitat for a variety of aquatic wildlife species, including wading and dabbling birds, as well as the four protected waterfowl species. The topography, soil structure, and plant community composition and structure provides important wildlife habitat functions such as food, shelter, and migratory and breeding areas for wildlife, as well as overwintering areas for mammals and reptiles.

Generally in more developed areas adjacent to the pond, terrestrial wildlife species include those that can exist in close proximity to areas of human population. These include smaller mammals such as gray squirrel, muskrat, beaver, cottontail rabbit, woodchuck, skunk and raccoon. In the areas of less human population such as the wooded upland at the northern end of the pond and the narrow fringing wooded wetland and riparian wetland associated with the Charles River and Huckleberry Brook inlets, mammalian species can include (in addition to the above) white tailed deer, as well as red fox, gray fox, fisher, bobcat and coyote all known to inhabit these areas of the state. In addition, beavers inhabit much of the Commonwealth of Massachusetts, including areas of the Charles River and its watershed.

It should be noted that there is also substantial habitat degradation associated with human activities, including the residential and industrial development, the former landfill, parkland, and local roadways. Such effects of habitat degradation include:

- Evidence of erosion or sedimentation problems within the watershed;
- Storm water discharge from urban watershed with associated nutrients and various associated contaminants;
- Substantial invasion of exotic plants (e.g. milfoil, purple loosestrife, *Phragmites*);
- Disturbance from roads or highways (e.g., fragmentation, historical fill in waterbodies, lack of vegetated riparian areas).

All of these factors contribute directly or indirectly to the actual habitat conditions observed within and surrounding the ponds.

Notable wildlife habitat areas adjacent to the Pond include the following:

- Wooded upland at the northern end of the pond, associated with the cemetery and between the Charles River and Huckleberry Brook inlets;
- The narrow fringing wooded wetland and riparian wetland associated with the Charles River and Huckleberry Brook inlets; and
- The fringing emergent marsh on the west sides of the pond, north and south of Clark Island.

The aquatic vegetation is also a separate habitat area for Milford Pond, the vegetation forming the base of the food web as well as providing structural habitat in the form of cover and escape habitat for fish and invertebrates.

The persistent emergent marshes associated on the west side of Milford Pond provide nesting and foraging sites for the many wetland dependant birds including various wading and dabbling waterfowl, as well as other aquatic dependent birds. Emergent marsh habitat types occupy 41.5± acres of the nearly 100-acre wetland complex. The majority of this emergent marsh habitat type, 37± acres, is located along the entire western pond margin, from the Charles River inlet to the dammed outlet. A 3.5± acre shrub-dominant emergent marsh is located on the eastern pond margin in close proximity to the closed landfill. Two additional areas of emergent marsh, totaling less than an acre, are located to the North and South of Rosenfeld Park.

Cattail (*Typha sp.*) is the predominant species in these emergent marshes, with the largest section located on the southwest shore of the pond (south of Clark Island), as well as a smaller section on the northwest shore (north of Clark Island). This type of emergent marsh habitat is prime habitat for the four state listed bird species and will be discussed further in Sections IV.D and IV.E of this EA.

Wildlife observed up in the marsh areas included red winged blackbird, white egret, mallard duck, Canada goose, and great blue heron. It was also noted to be suitable habitat for small mammals including the muskrat and amphibians/reptiles such as bullfrog, green frog, eastern garter snake, snapper turtle, and eastern painted turtle. The shoreline habitat also supports many of these same species, as well as habitat for belted kingfisher. The wooded upland habitats surrounding the pond, including the formerly proposed dredged material disposal site, support such cosmopolitan species as eastern chipmunk, eastern gray squirrel, eastern cotton tail, little brown bat, European starling, gray catbird, hairy woodpecker, northern flicker, eastern kingbird, mocking bird, American crow, blue jay, black-capped chickadee and many other species.

In addition, a recent survey conducted in the pond (GZA, 2014, Appendix H, noted the presence of numerous muskrat trails through the emergent cattail marsh, confirming the presence of this species in Milford Pond.

C. Aquatic Environment

C. 1 – Hydrology

Milford Pond is formed by a man-made impoundment of the Charles River, with additional inflows from Huckleberry Brook, Louisa Lake, an intermittent stream and 17 storm water outfalls. Huckleberry Brook and Louisa Lake flow into the western side of the pond, while the Charles River flows from north to south. The Charles River begins as a spring on the southerly slope of Honey Hill in Hopkinton, flowing into Echo Lake (approximately 1 mile downstream), which has been referred to as the source of the Charles River (DEP, 2006). It then flows southerly for approximately 2 miles to the inflow of Milford Pond. From the discharge of Milford Pond it meanders in a general northeasterly direction for approximately 80 miles to its mouth in Boston Harbor.

The Milford Pond watershed (referred to as the Greater Milford Pond watershed) is approximately 8.5 square miles (5,440 acres) in size and is comprised of seven individual sub watersheds as delineated by MassGIS. These seven sub watersheds include the Upper Huckleberry Brook, Louisa Lake, Lower Huckleberry Brook, Milford Pond, Upper Charles, Lower Charles, and Echo Lake sub watersheds. The Greater Milford Pond watershed consists of area in the towns of Milford, Hopkinton and Holliston. The direct watershed of Milford Pond has an area of about 82 acres and is roughly bordered by

Route 495, Route 16 (East Main Street), and Congress Street.

The Greater Milford Pond watershed is characterized by approximately 55% forested area, 26% residential area, and 7% total commercial, industrial and urban areas. In contrast, the local region around Milford Pond is characterized by approximately 27% forested area, 31% residential area, and 17% total commercial, industrial and urban areas. The greater percentages of residential and commercial/industrial area immediately surrounding Milford Pond illustrates that there is concentrated development in this area. The relatively higher percentages of developed area in the localized region are associated with relatively higher percentages of impervious area.

IEP/CDM (1986) analyzed surface and groundwater inflows and direct precipitation in relation to outlet discharge, evaporation, storage change, and Clark Island Well Field withdrawal volumes to develop a hydrologic budget for Milford Pond.

The water budget equation for Milford Pond is:

Surface Inflows + Groundwater Inflows + Direct Precipitation = Outlet Discharge + Evaporation + Storage Change + Clark Island Well Field Withdrawal

Table 7-2 presents the best available estimates of inflow and outflow from available data sources as reported by IEP/CDM (1986). In general, the major contributions of surface water inflows to Milford Pond include flow from Upper Huckleberry Brook via Lower Huckleberry Brook and Louisa Lake, and the Charles River.

Table 7-2. Annual Hydrologic Budget for Milford Pond (IEP/CDM, 1986)

Source	Volume (Million Gallons)	Percent of Total
Inflow		
Surface Inflows	2474	62.0 %
Groundwater Inflow	1392	35.2%
Direct Precipitation	118	2.8%
Total Inflow	**3963**	**100.0%**
Outflow		
Evaporation	71	1.8%
Outlet	3657	92.3%
Clark Island Well Field Withdrawals	189	4.8%
Unaccounted for	47	1.2%
Total Outflow	**3963**	**100.0%**

IEP/CDM (1986) calculated that the majority of water outflow from Milford Pond (92%) occurs via the dam outflow, which discharges to the continuation of the Charles River. The remaining 8% of total water outflow results from withdrawals by the Milford Water Company at the Clark Island Well Field (5%), loss via evaporation (2%), and 1% due to other outflow paths such as groundwater seepage. Vertical groundwater flow is limited due to the hydrologic barrier created by the thick peat mat that underlies Milford Pond.

IEP/CDM (1986) calculated a residence time of 0.013 years, corresponding to a turnover ratio of 75 times/year. They estimated that in an average year with 44.2 inches of rainfall, Milford Pond has an average annual residence time of 0.0117 years, resulting in a flushing rate of 85 times per year. They reported that their results are inconsistent with those of the Carr (1979) study, which reported a turnover rate of 41 times per year. Monthly figures, presented by IEP/CDM (1986), showed wide ranges of variability over the course of the year with shorter residence times and faster flushing rates in spring and longer residence times and slower flushing rates exhibited in summer and fall.

In the recent study of Louisa Lake overflow withdrawals, Metcalf and Eddy (2001) estimated the total inflow using the area-ratio transform method. Following this approach, BEC obtained historical streamflow records from the USGS site on the Quinsigamond River at North Grafton (USGS Station 01110000). The Quinsigamond River is within the Blackstone River Basin, located in Worcester County. The watershed area at the station is 25.6 mi^2 (16384 ac). USGS statistics for the station include mean daily flows from 1939 to 2000. The area-ratio transfer method yielded a total annual inflow to Milford Pond of approximately 3151 million gallons (MG) and the volume of the pond (as estimated by BEC, 2000) is 55.4 MG. Under existing conditions, the residence time of Milford Pond is 0.018 years (7 days) and the flushing rate is estimated at 57 times per year. This result is within the range of previously reported flushing rates for Milford Pond.

Physical, biological and chemical processes in a waterbody are impacted by hydraulic residence time of a waterbody. There is some variation in the definitions of “short” (fast flushing system) and “long” (slow flushing system) residence time. In general, waterbodies with residence times on the order of days or weeks are considered to have relatively short residence times, while waterbodies with residence times on the order of months or years are considered to have relatively long residence times. Table 7-3 includes some of the criteria found in the literature. With a flushing rate of 57 times per year, Milford Pond is considered a fast flushing system.

Table 7-3. Residence Time Literature Values

Classification	**Residence time**	**Equivalent Flushing Rate (#/year)**	**Source**
Short Residence Time	<10 days (0.027 yrs)	>37	EPA (1998)
	< 365 days (1 yr)	>1	Chin (2000)
Long Residence Time	>120 days (0.33 yrs)	<3	EPA (1998)
	>365 days (1 yr)	<1	Chin (2000)

C.2. - Water Quality

The Massachusetts Department of Environmental Protection has designated the Charles River from its source to Dilla Street as Class A, and from Dilla Street to the

Milford Wastewater Treatment Plant as Class B (which includes the waters of Milford Pond), according to the Massachusetts Surface Water Quality Standards (314 CMR 4.0, December, 2013). These standards designate the most sensitive uses for which the surface waters of the Commonwealth shall be enhanced, maintained and protected; prescribe minimum water quality criteria required to sustain the designated uses; and include provisions for the prohibition of discharges (MA DEP 1996). These regulations undergo public review every three years. The three classes assigned to inland surface water (*i.e.*, freshwater) are described below. It should be noted that these classifications represent a goal to which the water quality should attain, and do not necessarily indicate that the standards are being met.

Class A *– These waters are designated as a source of public water supply. To the extent compatible with this use they shall be an excellent habitat for fish, other aquatic life* and *wildlife*, and *suitable for primary* and *secondary contact recreation. These waters shall have excellent aesthetic value. These waters are designated for protection as Outstanding Resource Waters (ORW's) under 314 CMR 4.04(3).*

Class B *– These waters are designated as a habitat for fish, other aquatic life*, and *wildlife,* and *for primary* and *secondary contact recreation. Where designated they shall be suitable as a source of water supply with appropriate treatment. They shall be suitable for irrigation* and *other agricultural uses* and *for compatible industrial cooling* and *process uses. These waters shall have consistently good aesthetic value.*

Class C *– These waters are designated as a habitat for fish, other aquatic life* and *wildlife*, and *for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking* and *for compatible industrial cooling* and *process uses. These waters shall have good aesthetic value.*

The 1997/1998 *Charles River Water Quality Assessment Report*, published by the Massachusetts Department of Environmental Protection (MADEP), classifies the various reaches of the Charles River based upon Surface Water Quality Standards (SWQS). The Charles River, from its headwaters to its outlet in Boston Harbor, is consistent with its National Goal Uses of "fishable and swimmable waters". As noted above, the Charles River is classified as a Class A (Public Water Supply) waterbody from the outlet of Echo Lake in Hopkinton to Dilla Street in Milford. Dilla Street, located directly north of Milford Pond, marks the southern boundary of the Class A designation of the Charles. Below Dilla Street, the Charles River is designated a Class B waterbody. Therefore, Milford Pond would be considered a Class B waterbody. Eutrophic conditions, shallow depths, and dense macrophyte growth limit the potential of this waterbody. The water quality and subsequent wildlife habitat and recreational values of Milford Pond are highly dependent upon the quality of its contributing waters. The major contributing waters to Milford Pond consist of inflows from the Charles River, Louisa Lake, and Huckleberry Brook. The overall quality of these contributing waters is acceptable and generally consistent with Class B waters (i.e.: fishable/swimmable). However, episodic low dissolved oxygen and high levels of phosphorous and nitrogenous compounds frequently degrade overall water quality. The input of nutrient-rich waters exacerbates the eutrophic conditions found in Milford Pond.

In addition, according to the 2002 -2006 Charles River Watershed Water Quality Assessment Report (DEP, 2008), Milford Pond is considered to be impaired for two use criteria, including aquatic life and fish consumption. The aquatic life impairment is due to low dissolved oxygen and the infestation of non-native aquatic macrophytes; and the fish consumption impairment is due to elevated mercury in fish tissues with the suspected source being atmospheric deposition. In addition, although the designated uses of the pond for primary and secondary contact and aesthetics were not assessed in the pond (for the period of the 2002-2006 assessment), they are identified as being in "Alert Status" due to Secchi disk depth ranges (a measure of water clarity) between and 0.65 and 1 meter, which is less than the swimming guidance of 1.2 meters (DEP, 2008).

IEP/CDM (1986) evaluated the water quality and trophic status of Milford Pond using data they collected and data collected by Carr (1979). Both studies include water quality data from Louisa Lake, Charles River, and Huckleberry Brook and the Milford Pond outlet, as presented in Table 7-4. IEP/CDM (1986) determined that Milford Pond was eutrophic based on measured nutrient, chlorophyll-a, and dissolved oxygen levels. This conclusion is consistent with the results of the Carr (1979) report and the recent field observations conducted by BEC in 2000. Table 7-4 includes data collected by BEC on September 20 and October 16, 2002 from the Charles River inflow and the Louisa Lake outflow (see Figure 7-3). In general, the data fall within the ranges presented by IEP/CDM (1986) and Carr (1979). Chlorophyll-a, turbidity and iron levels in the Charles River inflow are slightly higher and the conductivity reading is much higher than previously reported levels. The conductivity reading is also higher than previous levels for the Louisa Lake outflow. These levels exceed the range of 50 to 500 μmhos/cm found in most natural waters.

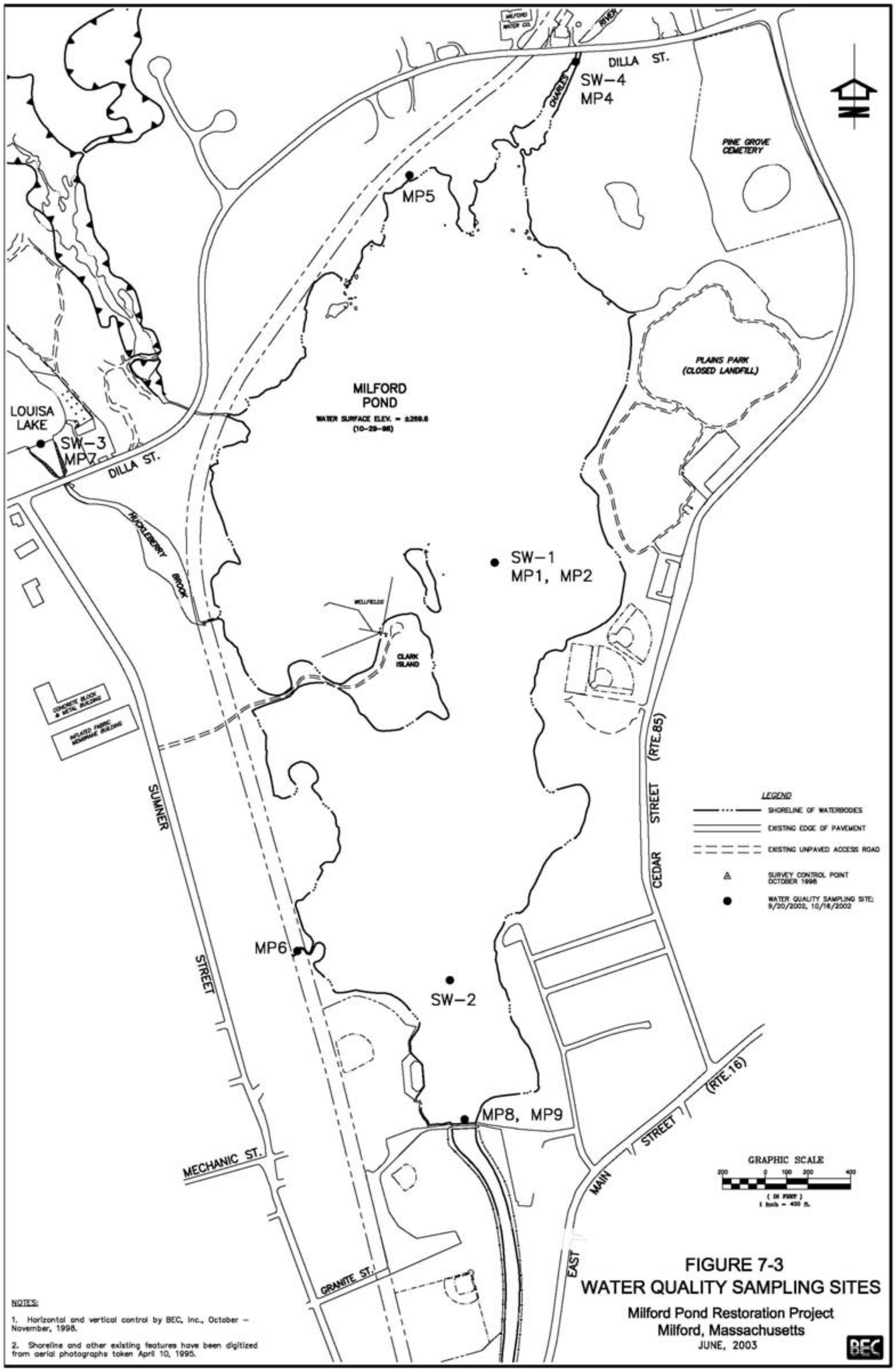

Figure 7-3. Milford Pond Water Quality Sampling Sites, June 2003.

The most common limiting nutrient for plant growth in freshwater aquatic ecosystems is phosphorous. Increased phosphorous levels caused by human activities are a common cause of cultural eutrophication. Phosphorous levels greater than 0.02 mg/l indicate eutrophic conditions. Recorded phosphorous levels as listed in Table 7-4 ranged from 0.01-0.05 mg/l at inlet stations, while total phosphorous levels at the outflow averaged 0.04 mg/l. In addition to phosphorous levels, nitrogenous compounds, including ammonia, nitrate, and Kjeldahl-nitrogen, influence aquatic community productivity.

Table 7-4. Milford Pond Inlet/Outlet Water Quality

Sampling Station	Investigator		Chl-a (mg/m^3)	TP (mg/L)	TKN (mg/L)	Ammonia Nitrogen (mg/L)	Nitrate Nitrogen (mg/L)	Iron (mg/L)
Charles River Inflow	IEP/CDM	R[1]	-	0.02-0.03	0.40-0.71	<0.02-0.05	0.02-0.09	0.23-1.54
		M[2]	12	0.02	0.51	0.04	0.06	0.86
	Carr	R	-	0.01-0.05	0.05-1.2	0.05-0.27	0.08-0.95	0.06-0.44
		M	-	0.02	0.47	0.14	0.35	0.24
	BEC[3] (SW-4; MP4)		47; ND	0.05; 0.02	0.66; 0.3	0.10; 0.15	ND; 0.16	1.9; 0.97
Huckleberry Brook	IEP/CDM	R	-	<0.01-0.04	0.16-0.39	<0.02-0.06	0.01-0.09	0.74-1.10
		M	4.8	0.02	0.30	0.05	0.06	0.93
	Carr	R	-	0.01-0.05	0.20-1.3	0.01-0.39	0.02-1.0	0.10-1.8
		M	-	0.03	0.58	0.16	0.40	0.62
Louisa Lake Outflow	IEP/CDM	R	-	-	0.34-0.58	<0.02-0.14	<0.01-0.17	0.41-0.52
		M	-	0.03	0.46	0.08	0.09	0.46
	Carr	R	-	0.02-0.04	0.25-1.3	0.10-0.50	0.05-0.74	0.09-1.16
		M	-	0.03	0.75	0.26	0.26	0.42
	BEC[3] (SW-3; MP7)		12; ND	0.01; 0.01	0.40; 0.34	20; 0.11	ND[4]; 0.12	0.63; 0.35
Milford Pond Outflow	IEP/CDM	R	-	0.02-0.04	0.63-1.38	0.03-0.65	0.01-0.19	0.36-1.15
		M	0	0.03	0.89	0.30	0.08	0.86
	Carr	R	-	0.01-0.20	0.31-1.2	0.05-0.60	0.05-0.80	0.10-1.04
		M	-	0.04	0.68	0.19	0.29	0.41
Dilla St. (MP5)	BEC[7]		ND	0.03	0.36	ND	2.4	0.38
Sumner St. (MP6)	BEC[7]		ND	0.05	0.5	0.24	1.6	0.14

Table 7-4 continued.

Sampling Station	Investigator		pH	SS[5] (mg/L)	DS[6] (mg/L)	Turbidity (NTU)	Conductivity (μmhos/cm)	True Color (c.u.)	Apparent Color (c.u.)
Charles River Inflow	IEP/CDM	R[1]	4.6-6.0	2-15	68-249	0.5-3.5	81-290	40-55	55-150
		M[2]	5.7	6	154	2.3	194	50	90
	Carr	R	4.1-6.6	-	-	0-18	-	-	19-90
		M	5.7	-	-	5	-	-	54
	BEC[3] (SW-4; MP4)		6.7; 6.1	9.8; ND	-	4.5; 3.5	902; 1079	-	-
Huckleberry Brook	IEP/CDM	R	6.0-7.0	2-13	63-106	1.6-4.0	65-138	40-88	40-104
		M	6.6	6	88	2.5	111	56	66
	Carr	R	5.5-7.0	-	-	0.28	-	-	3-118
		M	6.2	-	-	7	-	-	64
Louisa Lake Outflow	IEP/CDM	R	6.1-6.7	5-9	80-103	1.3-1.9	113-131	40-45	55-56
		M	6.4	7	92	1.6	122	42	56
	Carr	R	5.6-6.9	-	-	0-20	-	-	0-80
		M	6.3	-	-	8	-	-	45
	BEC[3] (SW-3; MP7)		6.6; 6.4	ND; ND	-	1.8; 1.7	410; 639	-	-
Milford Pond Outflow	IEP/CDM	R	5.4-7.2	2-13	79-244	2.9-6.0	122-350	40-52	35-200
		M	6.4	9	153	4.5	237	44	102
	Carr	R	5.6-7.8	-	-	0-13	-	-	0-55
		M	6.5	-	-	3	-	-	30
Dilla St. (MP5)	BEC[7]		6.6	37	-	1.2	2604	-	-
Sumner St. (MP6)	BEC[7]		6.5	9.9	-	6.4	342	-	-

[1] R = Range
[2] M = Mean
[3]single samples collected September 20, 2002; October 16, 2002.
[4]ND = not detected – indicates the constituent was not present in quantities above the Method Detection Limit (MDL)
[5] SS = Suspended Solids
[6] DS = Dissolved Solids
[7]single samples collected October 16, 2002.

Nitrogenous compounds were recorded at various inlet and outlet sampling stations. Measurements of all three parameters indicate higher levels recorded at the Milford Pond outlet than at any of the three inlet sampling locations. Measurements indicate that ammonia nitrogen levels often exceed 0.20 ppm, suggesting anaerobic ammonification of the pond. The pond is acting as a source of organic nitrogen caused by overgrowth of macrophytic plant communities. Ammonia levels measured in the Louisa Lake outflow on September 20, 2002 are extremely high, however the value measured in October of 2002 was lower. This suggests that the high value of September is either due to a sampling or laboratory error, or possibly to the presence of Canadian geese that were observed near the sampling location.

On October 16, 2002, additional samples were collected from storm water outfalls located off of Dilla Street and Sumner Street (see Table 7-4). There are no previous data at these locations, but the levels may be compared to those observed at the other inlet sampling stations (Charles River inflow, Louisa Lake outflow, Huckleberry Brook). At the Dilla Street outfall, suspended solids and conductivity are elevated. Nitrate nitrogen is slightly elevated at both locations and is higher than the levels observed in the Milford Pond outflow.

Tables 7-5 and 7-6 present the results of dry and wet weather water quality sampling conducted by BEC on September 20, 2002 and October 16, 2002, respectively, within Milford Pond itself. The locations from which the samples were collected in September included a mid-pond location just northeast of the Rosenfeld Park Boat Launch and a lower pond location approximately 700 feet north of the dam. In October, the samples were collected at the same mid-pond location as in September, but the lower pond samples were collected right at the dam rather than slightly north of it (see Figure 7-3). At each location within the pond, one surface sample was collected and another was taken at the pond bottom. In September, surface phosphorous levels are just high enough to confirm eutrophic conditions in the pond, while the deeper levels are much higher. This is a strong indication that phosphorous is being released from the bottom sediments under anoxic conditions. The phosphorous levels recorded in October are lower and more uniform than those measured in September, except for the deep lower pond sample. This is indicative of mixing occurring prior to or during the sampling time. The ammonia levels confirm the inlet and outlet measurements that indicate the possibility of anaerobic ammonification occurring in the pond.

Table 7-5. Milford Pond Water Quality (9/20/2002)

		Mid pond surface (SW-1A)	Mid pond depth (SW-1B)	Lower pond surface (SW-2A)	Lower pond depth (SW-2B)
PARAMETER					
Turbidity	**(NTU)**	10	15	3.2	9.8
Total Alkalinity	**(mg $CaCO_3$/L)**	47	46	23	20
Total Suspended Solids	**(mg/L)**	ND	72	ND	230
Ammonia Nitrogen	**(mg/L)**	0.767	0.690	0.171	ND
Nitrite Nitrogen	**(mg/L)**	ND	ND	ND	ND
Nitrate Nitrogen	**(mg/L)**	ND	ND	ND	ND
Total Kjeldahl Nitrogen	**(mg/L)**	1.2	3.7	0.61	6.4
Total Phosphorous	**(mg/L)**	0.02	0.29	0.02	0.48
Orthophosphate Phosphorous	**(mg/L)**	ND	ND	ND	ND
Chlorophyll-A	**(mg/m^3)**	13.0	48.5	21.0	95.8
Total Iron	**(mg/L)**	2.4	5.4	1.9	9.0

Table 7-6. Milford Pond Water Quality (10/16/2002)

		Mid pond surface (MP1)	Mid pond depth (MP2)	Lower pond surface (MP8)	Lower pond depth (MP9)
PARAMETER					
Turbidity	**(NTU)**	9	7	1.2	14
Total Alkalinity	**(mg $CaCO_3$/L)**	43	36	16	16
Total Suspended Solids	**(mg/L)**	ND	ND	ND	62
Ammonia Nitrogen	**(mg/L)**	0.822	0.551	ND	ND
Nitrite Nitrogen	**(mg/L)**	ND	ND	ND	ND
Nitrate Nitrogen	**(mg/L)**	ND	ND	0.1	ND
Total Kjeldahl Nitrogen	**(mg/L)**	1.2	0.92	0.32	1.6
Total Phosphorous	**(mg/L)**	0.01	0.01	0.01	0.12
Orthophosphate Phosphorous	**(mg/L)**	ND	ND	ND	ND
Chlorophyll-A	**(mg/m^3)**	ND	ND	ND	ND
Total Iron	**(mg/L)**	2	1.6	0.49	2.4

IEP/CDM (1986) used measured chlorophyll-a to estimate algal biomass within the water column. This measure would only reflect phytoplankton biomass and not hyper abundance of aquatic plants. Notwithstanding, chlorophyll-a concentrations of 12.0 mg/m^3 measured at the Charles River inlet indicated eutrophic conditions. IEP/CDM (1986) observed somewhat lower, but still relatively high chlorophyll-a concentrations at the Huckleberry Brook inflow and the Milford Pond outflow. As shown in Tables 7-5 and 7-6, chlorophyll-a measurements taken by BEC in September and October of 2002 ranged from none detected to 95.8 mg/m^3, confirming eutrophic conditions.

IEP/CDM (1986) measured dissolved oxygen levels at pond inlets and the Milford Pond outlet to determine oxygen consumption within the pond. Dissolved oxygen levels ranged from a low of 24.5% recorded at the outlet sampling station in August 1984 to super-saturation levels of 120% recorded at inlet sampling stations in early May 1984. Dissolved oxygen levels at the outlet averaged 62.7% saturation. Dissolved oxygen levels measured by BEC in 2002 within Milford Pond ranged from 15% saturation at the mid pond bottom (SW-1) to 83% saturation at the water surface near the dam (MP8; Figure 7-3). Dissolved oxygen profiles showed a marked decrease with depth during the September sampling event. In October, the DO levels were more uniform throughout the water column, as shown in Figure 7-4. The saturation levels are within the acceptable range for biological activity, but below the optimal level of greater than 70% saturation. Depleted oxygen saturations in Milford Pond are most likely the result of increased biological activity, resulting in vegetative decomposition by aerobic bacteria, which utilize large amounts of oxygen within the water column. Due to the shallow condition of the pond, typical thermal stratification and hypolimnetic oxygen depletion is limited to a small portion of the pond on the east side opposite Clark’s Island. However, oxygen depletion remains problematic throughout the pond. Oxygen depletion can readily occur when dense surface aggregations of aquatic weed growth inhibit vertical mixing. The highly organic sediments have a large respiratory consumption of oxygen and even mild density or thermal stratification can result in a shallow oxygen profile. In addition, the lack of offsetting photosynthetic oxygen generation during nighttime leads to a dissolved oxygen deficit in poorly mixed waters. Levels measured within Milford Pond are within the acceptable range for biological activity, but below the optimal level of greater than 70% saturation. After fall turnover, the DO levels become more uniform throughout the water column. Depleted oxygen saturations in Milford Pond are most likely the result of increased biological activity, resulting from vegetative decomposition by aerobic bacteria, which utilize large amounts of oxygen within the water column. Analysis of dissolved oxygen levels further supports classification of Milford Pond as a eutrophic waterbody. The dissolved oxygen data are tabulated in Appendix G.

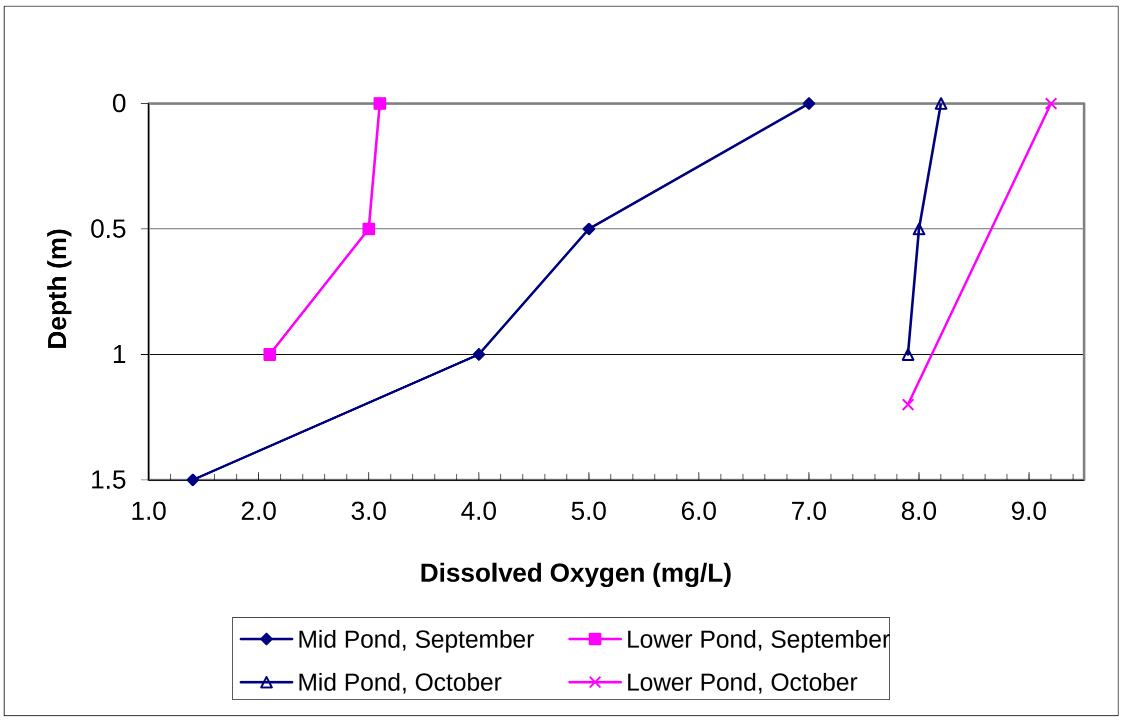

Figure 7-4. Milford Pond Dissolved Oxygen Profiles (2002)

Additional parameters provide insight into the water quality of Milford Pond and its tributaries. Physical parameters measured for the IEP/CDM (1986) study included pH, color, turbidity, suspended and dissolved solid concentrations, and electrical conductivity. Mean pH levels ranged from 5.7-6.6 with the lowest pH levels recorded at the Charles River inflow. The pH levels measured within Milford Pond by BEC in 2002 fell within this range, as shown in Table 7-7, except at the lower pond location in October (MP8, MP9; See Figure 7-3). Milford Pond is more acidic than most waterbodies, which have a pH range from 6.5-8.5. Waters entering Milford Pond are highly colored, with high turbidity levels caused by the presence of dissolved or particulate matter resulting from algal populations and decomposition of organic matter. These levels do not have a major impact upon water quality, but may lead to decreased photic zones, which limit macrophytic plant growth. Analysis of suspended and dissolved solids revealed that levels were highest at the outflow, but averages did not exceed 200 mg/l. The total suspended solids levels measured within the pond by BEC in 2002 were undetected in the surface samples but were as high as 230 mg/L in the bottom samples (Table 7-5), possibly due to disturbance of bottom sediments. Electrical conductivity ranges of pond water reported by IEP/CDM (1986) fell well within natural water ranges of 50 to 500 μS/cm. However, those measured in 2002 exceeded 500 μS/cm at the mid pond location.

Table 7-7. Milford Pond Water Quality Results

Location	Specific Conductivity (μS/cm)	Temperature (°C)	pH	Secchi Disk Depth (ft)	Water Depth (ft)
Mid Pond (9/20/02)				2.6	4.3
Surface	518	20.0	6.17		
Middle	518	19.7	6.14		
Bottom	525	19.1	6.17		
Lower Pond (9/20/02)				3.1	3.3
Surface	427	20.7	6.15		
Middle	426	18.9			
Bottom	425	18.9	6.12		
Mid Pond (10/16/02)				3.6	4.6
Surface	510	11.1	6.44		
Middle	507	11.1			
Bottom	502	11.1	6.56		
Lower Pond (10/16/02)					
Surface	382	12.9	6.87		
Middle	405	11.6	6.97		

C. 3 - Sediment Chemistry

In general, deep organic sediments are the dominant substrate in Milford Pond. These sediments have accumulated over time as a result of the impoundment of the Charles River. Prior to dam creation in 1938, a small waterfall, at the base of the present-day pond, served as a grade control for the Charles River. This waterfall created a topographical gradient, which resulted in the formation of a marsh and the gradual accumulation of upstream sediments. When the dam was built in 1938, Milford Pond formed over deep peaty soils with high organic contents resulting from historical wetland formation. Since this time cultural sedimentation caused by inflow from tributary streams and runoff from the surrounding watershed has led to the formation of an organic sediment substrate overlying these peat soils.

BEC (2000) and IEP/CDM (1986) have investigated the physical and chemical characteristics of Milford Pond sediments. As part of the CSA and QRA for the Milford Landfill, Weston and Sampson (1994, 1997) collected sediment samples from Milford Pond in 1991 and 1995. The three samples were collected from sites along the eastern edge of Milford Pond near the Milford Landfill (Figure 7-5) and were analyzed for VOCs and metals. The IEP/CDM (1986) sediment-sampling program was conducted in December 1984, and consisted of three composite sampling cores collected at different locations throughout the pond. Sediment samples were analyzed for nutrients, heavy metals, PCB's, and physical parameters. Four samples of unconsolidated organic Milford Pond sediments were obtained by BEC on January 11, 1999 for physical and chemical analyses. The physical properties, including size distribution, percent solids, percent volatile solids, and moisture content, were measured. Chemical analyses included nutrients, metals, TCLP metals, PAHs, PCBs and VOCs. An additional fifteen (15) core samples were obtained between May 29 and 30, 2002 from locations within the potential Milford Pond dredge limits (See Figure 7- 5 and Appendix E). The following discussion focuses on the BEC (2002) investigation. Results of the physical and chemical analyses of the IEP/CDM (1996), Weston and Sampson (1994), and BEC (2000) are included for comparative purposes.

Table 7-8 summarizes the maximum, minimum, and mean values of the sediment quality parameters for which there was detection for the 15 samples collected in 2002. In general, the sediment samples were found to be highly organic, with total volatile solids ranging from 52 to 80%, with the exception of two samples located near the center of the pond in the vicinity of Rosenfeld Park and the Clark Island Well Field. These samples had total volatile solids of 12 and 23% and had the highest percent total solids and lowest percent total organic carbon (TOC), as compared to the other samples. According to the U.S. Department of Agriculture (USDA) Classification System, Sample COE-8 is a loam, COE-9 is a loamy sand, and COE-10 is a sandy loam. The remaining samples are classified as silty loam, according to the USDA Classification System. It should be noted that these classifications are based on the mineral portion of the samples only.

Table 7-8. 2002 Sediment Analysis Summary

	Minimum	Maximum	Mean
Solids, Total (%)	8.6	29	12
Solids, Total Volatile (%)	12	80	58
Total Organic Carbon (%)	6.45	30.8	18.7
Metals			
Arsenic, Total (mg/kg)	0.92	3.9	2.1
Barium, Total (mg/kg)	27	86	60
Cadmium, Total (mg/kg)	ND	1.5	0.35
Chromium, Total (mg/kg)	1.3	5.6	2.9
Lead, Total (mg/kg)	1.2	52	12
Mercury, Total (mg/kg)	0.02	0.11	0.05
PAH			
Perylene (ug/kg)	ND	2200	864
EPH			
C19-C36 Aliphatics (mg/kg)	13	165	90
C11-C22 Aromatics (mg/kg)	24.7	282	141

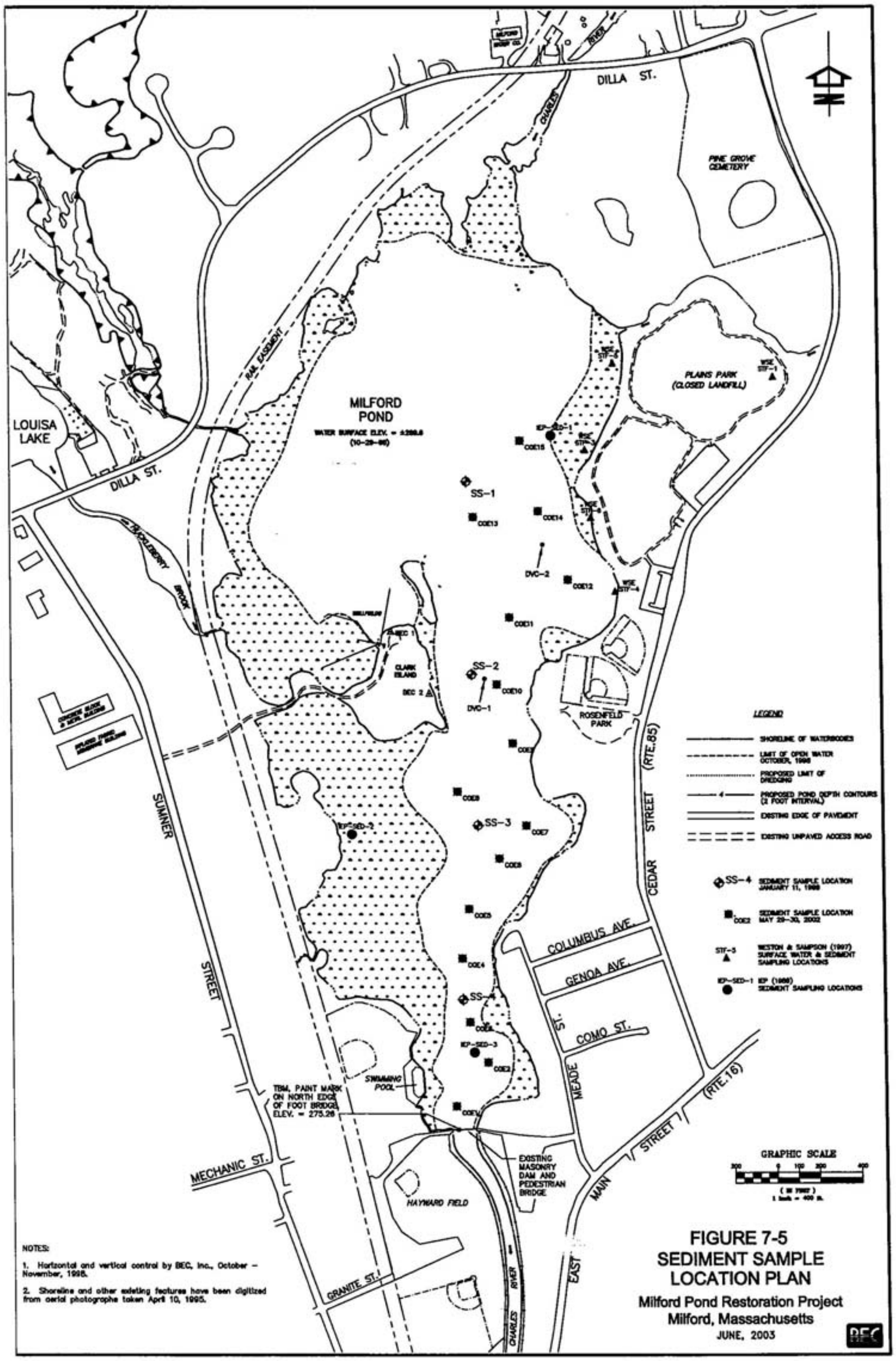

Figure 7-5 Milford Pond Sediment Sample Location Plan, 2003.

C. 3.a. Polynuclear Aromatic Hydrocarbons

Most of the polynuclear aromatic hydrocarbons (PAHs) tested for were not detected in the majority of the May 2002 samples and thus are not included in Table 7-8. In general, PAHs are products of incomplete combustion. Inefficient combustion of solid and liquid fuels such as coal, wood, kerosene, and fuel oil can lead to PAH formation. Common sources of PAHs include diesel and gasoline engines; service stations, coke ovens, and tar plants; heaters, boilers, and furnaces; municipal and hazardous wastes; cigarette smoke, wood stoves, and barbecues; and iron and steel foundries. Toxicological studies have identified several PAHs as carcinogenic. None of the PAHs detected in the May 2002 samples were in concentrations above the Massachusetts Contingency Plan (MCP) S-1 or S-2 standards (for GW-1). Samples COE-1 and COE-2, located at the southern end of the pond, near the dam, and sample COE-9, near Rosenfeld Park and the boat launch, contained a greater variety of PAHs. At the northern end of the pond, COE-12 and COE-13 likewise contained a higher diversity of PAHs. The total PAH values for the samples ranged from below detection limits (COE-10) to a high of 7.8 mg/kg (COE-1).

Each of the samples, with the exception of COE-10 (due west of Rosenfeld Park), contained detectable quantities (0.13-7.2 mg/kg) of the PAH perylene as the primary PAH. Perylene is commonly used as a fluorescent dye and in paints. Anthropogenic sources of perylene include Fuel Oil 5, diesel fuel, and used engine oil, in addition to its use in the manufacture of organic semiconductors. This compound exhibits high photostability and thermal stability and chemical inertness. It is relatively resistive of biodegradation in soils. Perylene is not classifiable as to its carcinogenicity in humans, and there is no MCP standard for perylene. Perylene is also noted to be one of the few PAHs to occur naturallyin the environment. This PAH has been identified in natural sediments in pond/lake bottoms. The presence of perylene in sediments may be due to the assimilation of plant material into bottom sediments, and may be considered as an indicator of plant pigments, such as chlorophyll a, in sediments.

C.3.b. - Metals

Contaminant concentrations were low for most metals in comparison to non-urban soil concentrations for Massachusetts (DEP, Final Interim policy WSC/ORS-95-141). The only metals that were found in levels exceeding the MADEP’s Background concentrations for non-urban soils concentrations in the May 2002 sample round were barium and selenium. Selenium was only detected in sample COE-9, near Rosenfeld Park, at a concentration of 1.2 mg/kg. Barium was found in the majority of samples in levels exceeding the MA DEP Background Soil concentrations, but was still significantly below the MCP S-1 standard. For the May 2002 sample set, TCLP testing was only completed if there was a theoretical possibility of TCLP criteria being exceeded for a certain metal, based on the total metals analysis. No TCLP testing was required.

In considering the concentrations of contaminants in the sediments from Milford Pond, in addition to the MA DEP Background Soil concentrations noted above, the

Massachusetts Contingency Plan (MCP) at 310 CMR 40.000 was used to determine whether or not these sediments were suitable for their placement in the designated containment area, based upon the potential health risks associated with human exposure to these sediments.

The Massachusetts Contingency Plan was developed for the purposes of regulating hazardous materials and/or oil spills or discharges and provides regulations for their cleanup and disposal in order to protect public health. The MCP Subpart A: General Provisions Section 40.0002 – Purpose, paragraph 1a, states that the purposes of the Massachusetts Contingency Plan are, without limitation, to: (a) provide for the protection of health, safety, public welfare and the environment by establishing requirements and procedures for the following: 1. the prevention and control of activities which may cause, contribute to, or exacerbate a release or threat of release of oil and/or hazardous material". In addition the purposes include provisions for the reporting, assessment of extent of the contamination, evaluation of cleanup alternatives, and the implementation of cleanup actions. It also provides for several other purposes which are listed in the full text of that section of the document.

As part of the plan, the MCP has developed chemical-specific numerical cleanup standards that are designed to provide a simple means to determine whether remediation is necessary at a site and when no further remedial response action is needed. These include Method 1, Method 2 and Method 3 Standards which range from site specific risk characterization (Method 3) to Promulgated standards (Method 1) that provides an option that is simple to use and results in predictable outcomes. In addition a hybrid methodology (Method 2) allows limited modification of the Method 1 Standards based upon site-specific information. All three Methods address the potential risk of harm to health, public welfare and the environment. Risk to safety is considered separately.

The MCP Method 1 Standards represent levels of oil or hazardous materials at which no further remedial response actions would be required based upon the risk of harm posed by these chemicals. The standards are protective of public health, public welfare, and the environment (i.e., represent a condition of "no significant risk"), given the exposures assumed, and are measurable.

These MCP numerical standards are further categorized to include concentrations of contaminants in either groundwater or soil. Numerical Standards have been derived for three categories of soil that were designed to address a broad range of potential human exposures (Categories S-1, S-2 and S-3). The applicability of a particular soil category depends upon both the accessibility of the soil (measured primarily by depth) and the human activities that take place (or may take place) at the surface. Within a soil category there are further sub-categories identified by groundwater type: the soil standards within these subcategories have been modified by the potential for a contaminant to leach and degrade the site groundwater.

The soil categories range from S1 to S3 and are defined as follows:

Soil Category S-1: Concentrations based on sensitive uses of the property and accessible soil, either currently or in the foreseeable future. Additional criteria are established for the protection of groundwater, based on the leaching potential of the contaminated soil. The MCP S-1 soil standards (310 CMR 40.0975(6)(a)) apply to soil associated with unrestricted use. Activities commonly associated with the S-1 soil category include residential use, parks, playgrounds and schoolyards. The criteria that define the S-1 soil category are found at 310 CMR 40.0933. The S-1 soil standards consider incidental ingestion of the soil, dermal contact with the soil and ingestion of produce grown in the soil.

Soil Category S-2: Concentrations based on property uses associated with moderate exposure and accessible soil, either currently or in the foreseeable future. Additional criteria are established for the protection of groundwater, based on the leaching potential of the contaminated soil. The MCP S-2 soil standards (310 CMR 40.0975(6)(b)) apply to soil associated with moderate exposure, including infrequent (or light) use by children. Activities commonly associated with the S-2 soil category include retail use and landscaped areas. The criteria that define the S-2 soil category are found at 310 CMR 40.0933. The S-2 soil standards consider incidental ingestion of the soil and dermal contact with the soil.

Soil Category S-3: Concentrations based on restricted access and property with limited potential for exposure, either currently or in the foreseeable future. Additional criteria are established for the protection of groundwater, based on the leaching potential of the contaminated soil. The S-3 soil standards consider incidental ingestion of the soil and dermal contact with the soil.

C. 3. d. - Milford Pond PCB Analysis

Polychlorinated Biphenyls (PCBs) and pesticides were not detected in the laboratory analysis. An Extractable petroleum hydrocarbon (EPH) test was also completed for the May 2002 sediment samples, according to MA DEP methods. Sample COE-1, located just north of the dam, was the only sample to have detectable levels of EPH in the C9 – C18 aliphatics range. The concentration in this sample was well below the S-1/GW1 standards of the Massachusetts Contingency Plan (MCP) at 310 CMR 40.000.

C. 3. e. - Aliphatic and Aromatic Hydrocarbons

All of the samples saw detectable levels in the C19 – C36 aliphatics range and the C11 – C22 aromatics range. Samples COE-2, COE-3, and COE-11 had levels of C11 – C22 aromatics that exceeded the S-1/GW1 standards of the MCP at 310 CMR 40.000 in 3 of 15 samples (by up to 40%). Samples COE-2 and COE-3 are located at the southern end of the pond, and sample COE-11 is located to the northwest of Rosenfeld Park. While additional sampling at the dredged material disposal site may be required as part of the Water Quality Certificate application for the dredging program, the levels observed are not likely to prevent the proposed dredging program for Milford Pond or limit disposal of the sediments.

Sediment sample COE-13 was the only sample which contained detectable quantities of a volatile organic compound (VOC) as detected in the 8260 scan. This sample contained low concentrations of p-Isopropyltoluene (p-Cymene), which may be associated with bactericides and insecticides, or natural plant oil. The concentrations detected were significantly below the reportable quantities and there is no MCP standard for this compound. Since this was the only VOC detected for the entire sample set, this value may be indicative of a sampling or laboratory error.

Table 7-9. Results from Previous Analyses of Sediment Characteristics

Parameter	Range observed by IEP/CDM (collected in 1984)	Range observed by Weston and Sampson (collected in 1991)	Range observed by BEC (collected in 1999)
% Volatile Solids	12.2 – 61.1	-	58 – 80
Total P	-	-	170 – 590
TKN	-	-	11,000 – 21,000
% Moisture	56 - 82	-	90 – 92
Metals			
Arsenic	4.7 - 16	0.5 – 2.8	1.2 – 5.8
Barium	-	10 - 63	-
Cadmium	<3.9 - <13	ND	0.36 – 4.7
Calcium	-	-	6,100 – 13,000
Chromium	5.8 - 13	3 – 12.9	3.1 – 8.4
Copper	12 - 33	2 – 16.3	6.1 – 23
Lead	5.4 - 466	11.8 – 107	24 – 91
Iron	-	30 – 16,800	-
Magnesium	-	-	640 – 1,200
Manganese	-	1 - 133	-
Mercury	<0.31 - <0.77	ND – 0.18	ND – 0.4
Nickel	<3.9 - <13	-	2.6 – 12
Potassium	0 - 5	-	ND
Selenium	-	ND – 0.72	-
Silver	-	ND - 2	-
Zinc	86 - 254	2 - 155	44 – 260
PCBs/Pesticides			ND
alpha - HCH	-	ND - 56	-
4,4-DDD	-	ND - 450	-
4,4’-DDE	-	ND - 160	-
Detected PAHs			
Benzo (ae) pyrene	-	-	ND – 1,700
Benzo (b) flouranthene	-	ND - 148	ND – 1,400
Benzo (k) flouranthene	-	-	ND – 1,500
Benzo (a) anthracene	-	ND – 1,000	-
Perylene	-	-	3,200 – 7,200
Volatile Organics			ND
Benzene		ND - 13	-
1,1, Dichloroethane	ND - 11.1 *	-	-
Methylene Chloride	ND - 31 *	-	-

Note: Metals and nutrients are expressed in mg/kg PAHs, VOCs, and PCBs/Pesticides in μg/kg ND=None Detected * Two of the samples did not have detectable levels of the contaminant. The upper range value was observed in the sample collected near the edge of the Milford Landfill

Results of the BEC 2002 sediment investigation are comparable with the previous studies as shown in Table 7-9. The 2002 sediment samples were not analyzed for nutrients, but the 1999 samples showed TP concentrations ranging from 170 to 590 mg/kg and TKN concentrations ranging from 11,000 to 21,000 mg/kg. The nutrient concentrations (phosphorous and nitrogen) in the soft sediments are high and are reflective of the eutrophic conditions of Milford Pond. The elevated levels of TP and TKN in the shallow sediment provide an excellent substrate for aquatic plant growth in Milford Pond.

Of the metals that were not tested in the 2002 samples, cadmium, mercury, and zinc were observed to have concentrations that were higher than the MA DEP's background concentrations for non-urban soils in one of the 1999 samples. This sample was located in the southern end of the pond.

Low concentrations of the PAHs benzo (ae) pyrene, benzo (b) fluoranthene, and benzo (k) fluoranthene were detected in one of the 1999 samples. The first two of these contaminants were found in concentrations, which slightly exceed the Method 1 S-1 and S-2 Standards of the Massachusetts Contingency Plan (MCP) at 310 CMR 40.000.

C. 3.f 2009 Sediment Sampling

In April of 2009, another series of sediment samples were collected from Milford Pond (Appendix F). Field sampling occurred at Milford Pond between April 7 and April 15, 2009. Sediment cores were collected to project depth (-12 feet) from 32 locations within Milford Pond, Milford, MA (Figure 1). The sediment from these cores was described and sampled for physical and chemical analysis in support of permitting efforts.

The sediment sample locations were separated into three groups: A-Series (Figure 2), B-Series (Figure 3), and C-Series (Figure 4). The C-Series cores were collected first (April 7) with the purpose of physically characterizing the sediments of the pond, to collect geotechnical data from substrata, and to provide samples for analysis that would assist in the design of the dewatering process (Table 1). The A-Series cores were collected second (April 8–9), following the collection of the C-Series (Table 2). The A-Series cores were collected for physical and chemical analysis of the substrata. The B-Series cores were collected last (April 10, 13-15); these cores were collected to provide a large volume of sample for laboratory dewatering tests (Table 3). The observations made from the C-series core descriptions were used to determine the locations of the B-Series cores. Water was also collected from the pond using a 12-volt pump and garden hose.

The Series A, B and C samples were analyzed for geotechnical properties including grain size, hydrometer, moisture and solids content, bulk density, specific gravity, Atterburg limits, organic matter content, fiber content of peat and USCS Classification. The results of these analyses can be found in Appendix F along with the sampling report. In addition further analyses were conducted on the Series A samples to include total metals, PAHs, PCB congeners, EPH (extractable petroleum hydrocarbons), and TOC (total organic carbon). Results of the chemistry analyses will be discussed below (with the exception of the TOCs).

C.3. g. - Chemistry Results (2009)

1. PAHs

A total of 22 sediment samples were analyzed for the parameters noted above from the series A samples. Included in the analyses were composites of several of the samples, as well as many individual non-composited samples. In addition, some of the samples were split according to depth, with the upper layers analyzed separately from the lower layer. Table 8.0 provides a list of the samples that were analyzed and the compositing scheme.

Generally, most of the results of the PAH analysis of the Milford Pond samples indicate concentrations below the detection limits. In addition, in those samples where one or more specific PAHs were detected, the concentrations generally did not exceed the Massachusetts Contingency Plan, 310 CMR 40 S1 Soil and Groundwater Standards. An exception was sample, MPA 21, collected from the southern end of the pond near the dam (see sample location map, Figure 8 and Appendix F). This sample had concentrations of Flouranthene of 1.52 mg/kg, exceeding the S1 standard of 1.00 mg/kg by 52 mg/kg and a concentration of Pyrene of 1.34 mg/kg, exceeding the S1 standard of 1.00 mg/kg by 34mg/kg. However these concentrations were well below the S2 standards of 3.00 mg/kg for both Flouranthene and Pyrene respectively. The highest concentrations of PAH's were detected in the samples collected either from the most northern section of the pond (samples MPA-1 through MPA-7) or the most southern section of the pond (samples MPA-17 through MPA 21). The PAH results measured from all the Milford Pond samples are presented in Table 8.1 below as well as in Appendix F.

Figure 8.0 Basemap of Milford Pond and USACE specified sampling locations. Figure illustrates sample locations for the A-Series Cores.

Table 8.0. Summary Table of Milford Pond Samples and Compositing Scheme for Samples Collected in 2009.

Sample ID	Physical Analysis	Chemical Analysis
MPA-1,2,3 Composite A	X	X
MPA-4,5 Composite B	X	X
MPA-6 C Sample	X	X
MPA-7,9 Composite D	X	
MPA-7 0-5.90 ft	X	X
MPA-8 0-2.20 ft	X	
MPA-82.20-5.10 ft	X	X
MPA-8 5.10-7.10 ft	X	X
MPA-9 0-4.80 ft	X	
MPA-9 4.80-7.75 ft	X	X
MPA-10 6.0-8.70 ft	X	X
MPA-10,11 Composite F	X	X
MPA-12 0-9.30 ft	X	X
MPA-13,15 Composite H	X	X
MPA-14 0-9.30 ft	X	X
MPA-16 0-6.30 ft	X	X
MPA-17 0-9.30 ft	X	X
MPA-18 0-7.0 ft	X	X
MPA-19 0-8.25 ft	X	X
MPA-20 0-9.70 ft	X	X
MPA-21 0-4.40 ft	X	X
MPA-21 4.40-9.50 ft	X	

Table 8.1. Summary of PAH Results from Milford Pond Samples (2009).

Constituent	MPA 12 0-9.3'	MPA 13+15 COMP H	MPA 14 0-9.3'	MPA 16 0-6.3'	MPA 17 0-9.3'	MPA 18 0-7'	MPA 19 0-8.25'	MPA 20	MPA 21 0-4.4'
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Naphthalene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.068(U)
Acenaphthylene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.0836
Acenaphthene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.068(U)
Fluorene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.0741
Phenanthrene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.144	0.12(U)	0.0766(U)	0.116	0.66
Anthracene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.0914
Fluoranthene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.483	0.167	0.0766(U)	0.297	1.52
Pyrene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.392	0.132	0.0766(U)	0.253	1.34
Benz(a)anthracene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.225	0.12(U)	0.0766(U)	0.103	0.657
Chrysene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.208	0.12(U)	0.0766(U)	0.131	0.635
Benzo(b)fluoranthene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.293	0.12(U)	0.0766(U)	0.177	0.691
Benzo(k)fluoranthene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.119	0.12(U)	0.0766(U)	0.0648(U)	0.446
Benzo(a)pyrene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.147	0.12(U)	0.0766(U)	0.0648(U)	0.405
Indeno(1,2,3-cd)Pyrene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.163	0.12(U)	0.0766(U)	0.0659	0.474
Dibenz(a,h)anthracene	0.0809(U)	0.0913(U)	0.0951	0.0902(U)	0.0713(U)	0.12(U)	0.0766(U)	0.0648(U)	0.133
Benzo(ghi)perylene	0.0809(U)	0.0913(U)	0.084(U)	0.0902(U)	0.139	0.12(U)	0.0766(U)	0.0684	0.398

U - The unit was analyzed for, but not detected above the laboratory reporting limits

Constituent	MPA 1,2,3 COMP A	MPA 4,5 COMP B	MPA 6	MPA 7 0-5.9'	MPA 8 2.2-5.1'/MPA 8 5.1-7.1'	MPA 9 4.8-7.75'	MPA 10+11 COMP F	MPA 10 6-8.7'
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Naphthalene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Acenaphthylene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Acenaphthene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Fluorene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Phenanthrene	0.094(U)	0.0765(U)	0.0782	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Anthracene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Fluoranthene	0.119	0.164	0.251	0.0924	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Pyrene	0.094(U)	0.138	0.196	0.0791	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Benz(a)anthracene	0.094(U)	0.0765(U)	0.0822	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Chrysene	0.094(U)	0.0765(U)	0.0821	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Benzo(b)fluoranthene	0.094(U)	0.0982	0.126	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Benzo(k)fluoranthene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Benzo(a)pyrene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Indeno(1,2,3-cd)Pyrene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Dibenz(a,h)anthracene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)
Benzo(ghi)perylene	0.094(U)	0.0765(U)	0.0774(U)	0.0777(U)	0.0146(U)	0.0118(U)	0.0797(U)	0.0102(U)

U - The unit was analyzed for, but not detected above the laboratory reporting limits

Table 8.1 Continued. Summary of PAH Results from Milford Pond Samples (2009).

2. PCBs

Analysis of PCB congeners from the 2009 Milford Pond samples indicated concentrations below the detection limits for all of the samples and all of the congeners with the exception of Sample MPA-16 0-6.3 feet, where a concentration of 0.0216 mg/kg was detected for congener PCB 105; and for sample MPA 21 0-4.4 feet, where a concentration of 0.0102 mg/kg was detected for PCB 28. The MCP S1 Standard for PCBs is 0.2 mg/kg and the S2 Standard is 0.3 mg/kg. Although both of the concentrations of individual congeners detected from the samples are below MCP S1 standard of 2.00 mg/kg, when totaling the detection limits of the congeners that were not detected as well as the individual concentrations of congeners that were detected, the estimated concentration of PCBs in sample MPA-16 0-6.3 feet is 0.22004 mg/kg and the estimated concentration of PCBs in sample MPA 21 0-4.4 feet is 0.1598 mg/kg. Although the estimated concentration for sample MPA 21 0-4.4 feet is less than the MCP S1 Standard, the estimated concentration of PCBs in sample MPA- 16 0-6.3 feet slightly exceeds the S1standard by 0.02 mg/kg (1.0%). However it is well below the S2 Standard of 3.0 mg/kg. As noted previously, the MCP S2 Standards consider the potential for moderate human exposure, of which the sediment re-use/wetland creation area would presumably be classified. It should be noted however that these estimated concentrations are extremely conservative, based on the assumption that the concentrations of the undetected congeners were at or only slightly less than the actual detection limits. However, most likely they were considerably less than the detection limits, or not detected at all, which would reduce the estimated total concentrations to below the MCP S1 Standards. It should also be noted that both of these samples were collected from the southern section of the pond, which also showed increased concentrations of PAHs. A summary of the PCB results are presented in Table 8.2 below.

Table 8.2 Summary of PCB Results from Milford Pond Samples (2009).

Constituent	MPA 1,2,3 COMP A	MPA 4,5 COMP B	MPA 6	MPA 7 0-5.9'	MPA 8 2.2-5.1'/MPA 8 5.1-7.1'	MPA 9 4.8-7.75'	MPA 10+11 COMP F	MPA 10 6-8.7'
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PCB 8	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 18	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 28	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 44	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 49	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 52	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 66	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 87	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 101	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 105	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 118	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 128	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 138	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 153	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 170	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 180	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 183	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 184	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 187	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 195	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 206	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)
PCB 209	0.0094(U)	0.00765(U)	0.0077(U)	0.00777(U)	0.00146(U)	0.00118(U)	0.00797(U)	0.00102(U)

U - The unit was analyzed for, but not detected above the laboratory reporting limits

Constituent	MPA 12 0-9.3'	MPA 13+15 COMP H	MPA 14 0-9.3'	MPA 16 0-6.3'	MPA 17 0-9.3'	MPA 18 0-7'	MPA 19 0-8.25'	MPA 20	MPA 21 0-4.4'
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
PCB 8	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 18	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 28	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0102
PCB 44	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 49	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 52	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 66	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 87	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 101	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 105	0.00809(U)	0.0091(U)	0.0084(U)	0.0216	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 118	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 128	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 138	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 153	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 170	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 180	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 183	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 184	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 187	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 195	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 206	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)
PCB 209	0.00809(U)	0.0091(U)	0.0084(U)	0.00902(U)	0.00713(U)	0.012(U)	0.00766(U)	0.00648(U)	0.0068(U)

U - The unit was analyzed for, but not detected above the laboratory reporting limits

3. Extractable Petroleum Hydrocarbons (EPH)

Results of the EPH analyses from the Milford Pond sediment samples collected in 2009 are presented in Table 8.3 below. None of the C9-C18 Aliphatics were detected in any of the samples. However, concentrations of the C19-C36 Aliphatics and C11- C22 Aromatics were detected from many of the samples. For the C19-C36 Aliphatics, these concentrations were below the S1and GW1 Massachusetts Contingency Plan concentration of 3000 mg/kg. The detected concentrations of the C11-C22 Aromatics were also below the MCP S1 GW1 standard of 1000 mg/kg. Therefore these low concentrations in the sediments should not prevent it from being placed in the wetland restoration area for its intended use of re-establishing wetland habitat.

Table 8.3. EPH Concentrations from Milford Pond Sediment Samples Collected in 2009 (mg/kg).

Location	C9-C18 Aliphatics	C19-C36 Aliphatics	C11-C22 Aromatics	C11-C22 Aromatics, Adjusted
MPA 1,2,3 COMP A	66.8(U)	109	95.2	95.2
MPA 4,5 COMP B	56(U)	65.5	114	110
MPA 6	57(U)	57(U)	57(U)	57(U)
MPA 7 0-5.9'	56.5(U)	58.5	64	64
MPA 8 2.2-5.1'/MPA 8 5.1-7.1'	11.1(U)	11.1(U)	11.1(U)	11.1(U)
MPA 9 4.8-7.75'	8.54(U)	8.54(U)	8.54(U)	8.54(U)
MPA 10+11 COMP F	57.5(U)	65.7	76.9	76.9
MPA 10 6-8.7'	7.86(U)	7.86(U)	7.86(U)	7.86(U)
MPA 12 0-9.3'	59.5(U)	176	230	230
MPA 13+15 COMP H	66(U)	106	281	272
MPA 14 0-9.3'	60.6(U)	65.4	87.6	87.6
MPA 16 0-6.3'	68.4(U)	68.4(U)	172	172
MPA 17 0-9.3'	54.2(U)	54.2(U)	54.2(U)	54.2(U)
MPA 18 0-7'	87(U)	128	260	252
MPA 19 0-8.25'	59(U)	149	220	220
MPA 20	47.6(U)	47.6(U)	66.1	66.1
MPA 21 0-4.4'	49(U)	68.7	138	138

. Metals

Metals that were analyzed from the Milford Pond sediment samples included Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, and Zinc. The results of the trace metals analyses are presented in Table 8.4 below. Although there were detectable concentrations of each of the metals in all of the samples (with the exception of Mercury which was detected in only four sediment samples) these concentrations were all below the MA Contingency Plan S1 standards for each of these metals. It should be noted that copper was detected in all of the samples in concentrations ranging from 3.95 mg/kg in Sample MPA-10, to 20 mg/kg in Sample MPA 21. Although there are no standards for Copper listed in the MA Contingency Plan, the concentration ranges measured from the 2009 samples are similar to the concentrations measured from the earlier sediment samplings of the pond mentioned previously (see Table 7-9 above).

Table 8.4. Concentrations of Metals Detected from Milford Pond Sediment Samples Collected in 2009.

Location	Arsenic, Total	Cadmium, Total	Chromium, Total	Copper, Total	Lead, Total	Mercury, Total	Nickel, Total	Zinc, Total
MPA 1,2,3 COMP SAMPLE A	1.84	0.46	4.33	8.98	10.4	0.112(U)	4	32.9
MPA 4,5 COMP SAMPLE B	2.18	0.585	4.45	8.69	21.2	0.093(U)	4.71	70.9
MPA 6	1.92	0.38	4.86	8.77	16.9	0.092(U)	4.35	44
MPA 7 0-5.9'	17.7	0.756	12.1	15.4	13	0.098(U)	11	45.8
MPA 8 2.2-5.1'/MPA 8 5.1-7.1'	4.22	0.182	10.1	10.9	2.79	0.02(U)	9.43	38.4
MPA 9 4.8-7.75'	3.23	0.096	9.92	9.03	2.79	0.014(U)	8.7	30
MPA 10+11 COMP F	4.44	0.682	6.66	11	3.52	0.097(U)	6.35	36.4
MPA 10 6-8.7'	0.79	0.028	4.1	3.95	1.57	0.014(U)	3.4	14.5
MPA 12 0-9.3'	2.49	0.335	5.8	9.91	9.13	0.096(U)	5.25	32.1
MPA 13+15 COMP H	2.96	2.72	4.81	9.54	23.3	0.117	13.5	118
MPA 14 0-9.3'	1.81	0.248	3.69	7.5	3.12	0.095(U)	3.61	17.3
MPA 16 0-6.3'	1.58	0.445	3.64	6.62	6.23	0.108(U)	3.53	20.9
MPA 17 0-9.3'	3.81	2.45	6.24	13.9	48.5	0.159	10.4	158
MPA 18 0-7'	3.87	1.38	4.99	14.7	23.6	0.148(U)	8.35	78.9
MPA 19 0-8.25'	1.82	0.775	4.28	8.31	6.97	0.106(U)	4.3	221
MPA 20	3.06	1	7.07	13.2	35.5	0.127	7.42	85.7
MPA 21 0-4.4'	6.34	2.8	7.48	20	109	0.236	11.7	206

U - The unit was analyzed for, but not detected above the laboratory reporting limits.

D - Biological Resources

Milford Pond has a relatively typical biotic community for a shallow, eutrophic, temperate-zone lake. Data on aquatic habitat was obtained from *the DEIR for Utilization of Louise Lake Overflow for Public Water Supply* (Metcalf & Eddy, 2000), the *D/F Study for Milford Pond* (IEP/CDM, 1986), *Options for the Reclamation of Cedar Swamp Pond* (Carr, 1979), a *Report on the Proposed Restoration Project for Milford Pond* (BEC, 2000), and recent field investigations.

D. 1. - Wetlands and Aquatic Vegetation

Aquatic macrophyte growth in Milford Pond is extremely dense due to the deep organic soils that underlie Milford Pond. These nutrient-rich sediments provide a fertile substrate for aquatic macrophyte growth. These plants are, therefore, neither phosphorous, nor nitrogen limited. In Milford Pond, seasonal light limitations and competition for available growing space are the only limiting factors for macrophyte growth.

On September 22, 1998, Baystate Environmental Consultants (BEC) scientists conducted a survey of Milford Pond resulting in the creation of a map of aquatic vegetation for this waterbody (See Figure 7.6 and Table 7-10). The aquatic macrophytes found in Milford Pond consist of emergents, submergents, floating-leafed, and free floating plant species. A total of ten submergent or floating-leafed species were identified as part of this investigation. The remainder consisted of peripheral emergent herbaceous species and some shrubs and trees. Submergent and floating-leafed plant species were found throughout the pond area and occupy density ranges from 60-100% of the pond area. Floating-leafed plants found in Milford Pond include white water lily, yellow pond lily, and watershield, while the free-floating component was limited to duckweed. Submergent species found within Milford Pond include bladderwort, Eurasian water milfoil, mermaid weed, water starwort, spatterdock, bush and large leaf pondweeds. Species such as Eurasian milfoil have the potential to become invasive and cause nuisance conditions in northeastern ponds and lakes. Such is the case at Milford Pond.

Table 7-10. Aquatic Vegetation

Common Name	Scientific Name
Swamp Loosestrife	*Decodon verticillatus*
Water Smartweed	*Polygonum punctatum*
White Water Lily	*Nymphaea odorata*
Yellow Pond Lily	*Nuphar variegatum*
Bladderwort	*Utricularia vulgaris*
Water Shield	*Brasenia schreberi*
Eurasian Water Milfoil	*Myriophyllum heterophyllum*
Large Leaf Pond Weed	*Potamogeton amplifolius*
Arrow Arum	*Peltandra virginica*
Pickerelweed	*Pontederia cordata*
Red Maple	*Acer rubrum*
Buttonbush	*Cephalanthus occidentalis*
Mermaid Weed	*Prosperinaca palustris*
Purple Loosestrife	*Lythrum salicaria*
Water Starwort	*Callitriche sp.*
Bush Pond Weed	*Naja flexilis*
Giant Bulrush	*Scirpus validus*
Three Square Sedge	*Scirpus americanus*
Arrowhead	*Sagittaria latifolia*
Broad-Leaf Cattail	*Typha latifolia*

Narrow-Leaf Cattail	*Typha angustifolia*
Marsh St. John's Wort	*Triadenum virginicum*
Clearweed	*Pilea pumila*
Speckled Alder	*Alnus rugosa*
Duckweed	*Lemna minor*
Common Reed	*Phragmites communis*
Jewelweed	*Impatiens canadensis*
Tussock Sedge	*Carex stricta*
Green-Headed Coneflower	*Rudbeckia laciniata*
Bittersweet Nightshade	*Solanum dulcamara*

Another more recent Aquatic Vegetation Survey was conducted in October of 2013 by Lycott Environmental Laboratories primarily for the purpose of determining the presence of invasive species (Appendix I). The results indicated that a single invasive species, variable milfoil (*Myriophyllum heterophyllum*) dominates the vegetation community of Milford Pond. The report notes that this species was observed throughout the water body in varying densities (sparse to dense) with dense beds common throughout the pond. In addition, in areas with low water levels or large mats of filamentous algae, new terrestrial growth of *M. heterphyllum* was observed. Other invasive species that were observed in the pond included purple loostrife *(Lythrum salicaria*) which is common on the shoreline and on the islands, Oriental bittersweet (*Celastrus orbiculatus*), which was noted in an isolated upland occurrence in an area along the southeastern shore of the pond, and Japanese knotweed (*Fallopia Japonica*) which was also observed in isolated upland occurrences along the eastern side of the pond adjacent to Rosenfield Park. In addition, two stands of common reed (*Phragmites australis*) were observed, one along the southwest side of the pond, and the other along the northeast side of the pond. Although the primary objective of the survey was to identify and locate invasive species, the report noted that there were several *Typha*-dominated marshes (mentioned previously). A vegetation map showing the locations and distribution of these species is shown in Figure 9, as well as Appendix I where it is included with the complete report noted above.

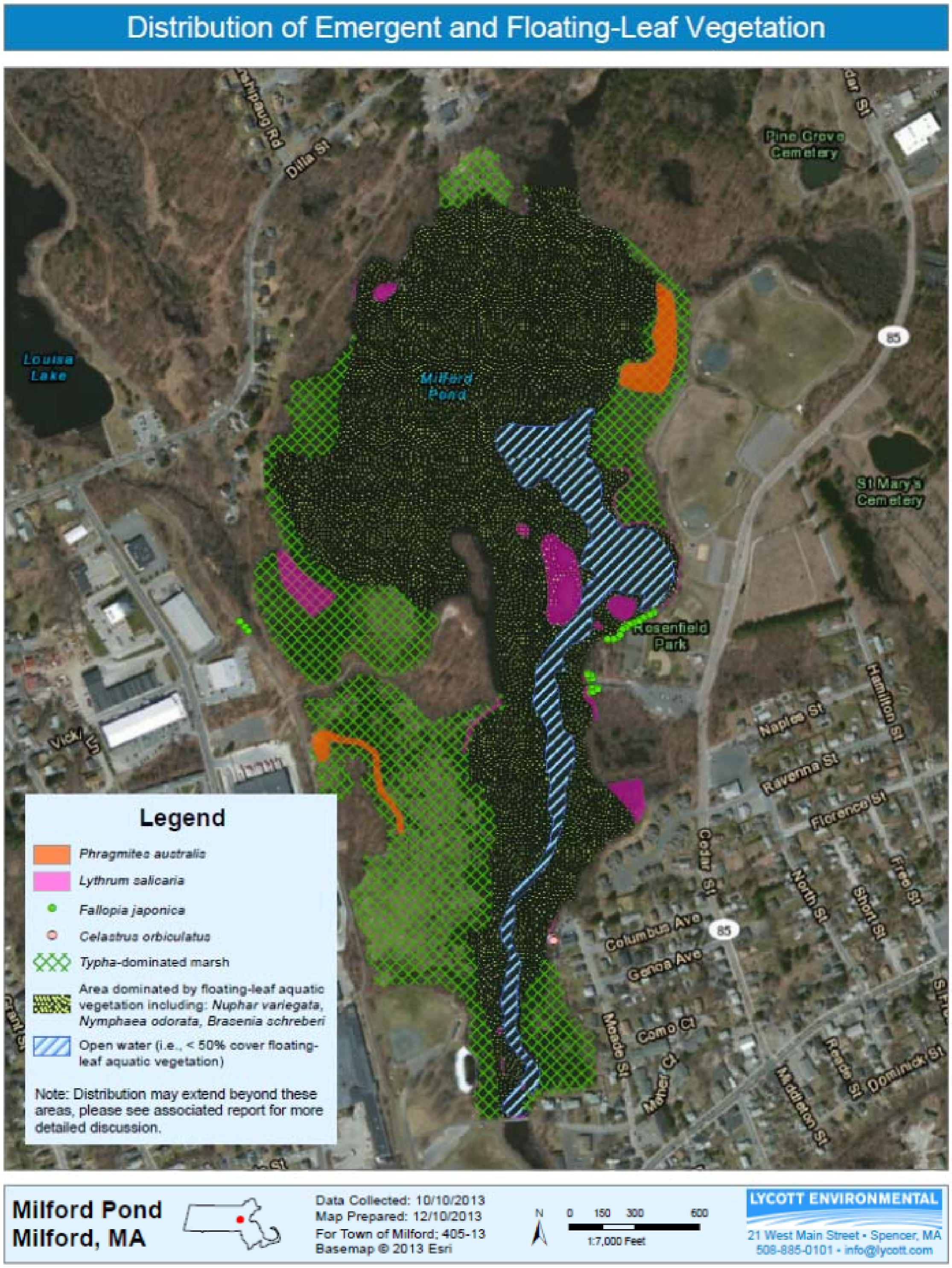

Figure 9.0 Distribution of Aquatic Vegetation in Milford Pond in December, 2013.

According to the National Wetlands Inventory (NWI) map, the greater Milford Pond wetland complex may be divided into two major wetland types: lacustrine limnetic open water (L1OW) and palustrine scrub-shrub emergent wetland (PSS1/EM). Lacustrine limnetic open water habitats occupy the majority of the wetland and will be the primary focus of the Milford Pond Restoration Project, while palustrine scrub-shrub emergent wetland types may be found along the perimeter of Milford Pond and will be preserved as habitat for a variety of wildlife species. These wetlands exhibit a classic wetland successional mosaic, in which sediment and organic material accumulation contributes to reductions in open water habitats and speeds the process of wetland succession. As a part of this process, sediment accumulation along the shoreline fringes allows emergent wetland species to expand into open water areas, while dense mats of floating aquatic vegetation accumulate organic materials resulting in the formation of free-floating peat islands. These processes have resulted in a reduction in open water habitat. In Milford Pond, only small pockets of open water habitat remain due to the rapid accumulation of sediment caused by runoff from the surrounding watershed. In addititon, the lacustrine limnetic can be further classified to include aquatic bed that includes rooted vascular or floating vascular aquatic vegetation. Large areas of this sub-class are located along the edges of the pond between the open water and the palustrine scrub-shrub located along the shoreline.

Lacustrine limnetic open water wetlands may be characterized as wetland systems situated in a dammed river channel, greater than 20 acres in size, and lacking vegetative cover in the form of trees, shrubs, or persistent emergents. These wetlands extend upward from the littoral boundary and include all deepwater habitats. This wetland type is exhibiting classic wetland successional processes, which have been sped up by development in the surrounding watershed. The continued proliferation of floating leaf and submersed macrophyte species will eventually eliminate any open water habitat from Milford Pond. At present, some open water habitat is available; however shallow water and dense aquatic macrophyte growth limit the value of this habitat.

Palustrine scrub-shrub and emergent wetlands may be characterized as small (less than 20 acres) non-tidal wetlands dominated by emergent broad-leaved deciduous scrub-shrub vegetation. These areas occur along the perimeter of Milford Pond and in a 400-foot wide band along the western shoreline. Emergent wetland areas are extremely productive ecosystems that provide habitat for a variety of aquatic and terrestrial wildlife species.

The primary emergent marshland habitat type important to the aquatic birds of interest present at Milford Pond is characterized as Palustrine Emergent Marsh (PEM), as per Cowardin et al., 1979. More specifically, the PEM habitat areas present within the Milford Pond basin that are dominated by dense stands of common cattail (*Typha latifolia*) and narrow-leaved cattail (*Typha angustifolia*) are the most desirable habitat type. Other PEM habitat types at Milford Pond, such as those containing waterwillow (*Decodon verticillatus*; Swamp loosestrife) as the dominant vegetation, are not as significant to the aquatic birds of interest as those dominated by cattail species. The other vegetation habitat type observed at Milford Pond is characterized as Palustrine

Scrub/Shrub (PSS) habitat. The PSS habitat areas present within the Milford Pond basin are typically dominated by Buttonbush (*Cephalanthus occidentalis*) or Speckled Alder (*Alnus incana*), with a sparse understory herbaceous strata typically of Water-willow. The PSS habitat is significantly less common than the PEM communities.

Regulated resource areas found within Milford Pond include Land Under Water (LUW), Bordering Vegetated Wetland (BVW), Bordering Land Subject to Flooding (BLSF), and Bank resource areas. Analysis of FEMA maps indicates that Milford Pond falls entirely within the 100-year floodplain of the Charles River. Land Under Water (LUW) is defined as the land beneath any creek, river, stream, pond, or lake, which may be composed of organic muck or peat, fine sediments, rocks, or bedrock. This resource area encompasses all land located below the low annual water level of Milford Pond. Areas classified as LUW dominate the majority of Milford Pond including the large band of emergent vegetation located along the western portions of Milford Pond. LUW also is included within the channel of Huckleberry Brook within the Town-owned land to be used as a sediment disposal area under the dredging alternatives.

Bordering Vegetated Wetland, defined as freshwater wetlands, which border on creeks, rivers, streams, lakes, or ponds, with hydric soils, which support a predominance of wetland indicator plants, occupy only a small area of Milford Pond. These areas are located at the inlet of Lower Huckleberry Brook and along the eastern shoreline adjacent to the capped landfill. There are also substantial areas of BVW within the Town-owned land to be used for sediment disposal (mostly on the western side), although all such disposal will be located on uplands, outside of the wetlands. Bordering Land Subject to Flooding (BLSF) is defined as an area of low, flat topography that is subject to flooding from a rise in a bordering waterway or waterbody. This resource area is found within the 100-year floodplain of the Charles River and extends from the Bank or BVW around the perimeter of the pond. Bank resource areas are defined as the portion of the land surface, which normally abuts and confines a water body. This resource area occurs between a water body and BVW and adjacent floodplain, or in the absence of these, between a waterbody and an upland. Bank resources areas are located around the perimeter of much of the pond and provide a short transition zone between LUW and the BVW or upland.

D. 2. Benthic Environment

A study of benthic macro invertebrates was conducted as part of the D/F Study performed by IEP/CDM (1986). Samples were taken at four sampling stations on May 9, 1984 and December 4, 1984. These sampling stations were located upstream of the Charles River, Huckleberry Brook, and Louisa Lake inflows and at the Milford Pond outflow. Macro invertebrate communities found upstream of the Charles River and Huckleberry Brook inflows exhibited a good diversity of pollution intolerant, facultative, and pollution tolerant forms. Species found in these sampling locations include blackflies, stoneflies, mayflies, midge larvae, *Asellus*, and *Hyalella*. The presence of these species indicates well-oxygenated unpolluted water. Macro invertebrate communities recorded near the Louisa Lake inflow and the Milford Pond outflow exhibited a fair diversity of pollutant-tolerant and facultative forms. Species found in this area include *Asellus*, *Hyalella*, midge larvae, and mollusks. The presence of these species with the absence of pollution intolerant species is indicative of degraded water quality and benthic habitat. Table 7-11 summarizes the benthic analyses.

Table 7-11. Benthic Analyses

Station	May 9, 1984	December 4, 1984
1	Good diversity of pollution-intolerant and facultative forms. Blackfly larvae (very abundant), *Hyalella* (frequent), stonefly nymphs (common), *Asellus* (common), midge larvae (common), mayflies (frequent).	Good diversity of pollution-tolerant and facultative forms. *Asellus* (abundant), midge larvae (frequent), *Hyalella* (frequent), mayfly nymphs (common), cranefly larvae (rare), stonefly nymphs (rare), mollusks (common), alderfly nymphs (rare).
2	Fair diversity of pollution tolerant and facultative forms. *Asellus* (abundant), blackfly larvae (common) non-biting midge larvae (common), mayfly larvae *Siphonurus* (rare), caddisfly case remnants.	Fair diversity of facultative forms. Midge larvae (abundant), mayfly nymphs (common), *Asellus* (common), *Hyalella* (common).
3	Fair diversity of pollution tolerant forms. *Asellus* (common), *Hyalella* (common), midge larvae (very abundant), filamentous algae present.	Fair diversity of pollution-tolerant and facultative forms. Midge larvae (common), *Hyalella* (common), mollusks (common), water beetles (rare), cranefly larvae (rare).
4	No sample obtained.	Fair diversity of pollution-tolerant and facultative forms. *Asellus* (abundant), *Hyalella* (common), midge larvae (common), non-biting midge larvae (rare), mollusks (rare).

Note: Conducted by IEP biologists in 1984. Station 1=Charles River Inlet, Station 2=Huckleberry Brook Inlet, Station 3=Louisa Lake Inlet, 4=Charles River Outlet

IV. D. 3. - Fisheries

Data on fisheries resources was obtained from the *Final EIR for Utilization of Louisa Lake Overflow for Public Water Supply* (Metcalf & Eddy, December 2001, EOEA #11394) and from ACOE. The EIR utilized fisheries data obtained from a Massachusetts Department of Environmental Protection fish toxin monitoring study conducted in 1989. This fish toxin monitoring study utilized gill net and electro shocking sampling techniques. The ACOE fish survey was performed in September of 2002. Table 7-12 presents the available data from these two efforts.

Table 7-12. Fisheries Data

	1989	2002		
Species	**Number**	**Number**	**Average Length (cm)**	**Average Weight (g)**
Brown Bullhead	4	1	30.2	392.5
Black Crappie	3	1	5.5	2
Bluegill	2	22	8.5	56.1
Chain Pickerel	1	11	24.8	130.7
Golden Shiner	--	9	12.3	18.3
Largemouth Bass	3	7	16.1	258.4
Pumpkin Seed	--	4	6.4	6.7
Yellow Perch	8	2	26.7	229

Yellow perch, brown bullhead, chain pickerel, black crappie, largemouth bass, and bluegill sunfish were captured during both sampling events. These species are commonly found in ponds and lakes throughout the northeast and are typical of shallow, still waters such as Milford Pond. Ambush feeders such as chain pickerel and largemouth bass thrive in weedy environments such as Milford Pond due to the presence of ample cover vegetation. However, the rapid deterioration of open water habitats could threaten to limit habitat for their prey base. Bluegill sunfish are a key food resource for piscivorous fish, but typically occupy a habitat niche requiring open water and aquatic macrophyte cover. Additionally, decomposition of aquatic vegetation has resulted in low dissolved oxygen levels during summer months. Low dissolved oxygen levels have the potential to result in fish kills.

Since the impoundment of the Charles River and subsequent creation of Milford Pond in 1938, local sportsmen for recreational fishing have utilized Milford Pond. In recent years, the suitability of Milford Pond for recreational fishing has been compromised due to cultural eutrophication and uncontrolled weed growth. Comment letters on the ENF provide anecdotal evidence of the recreational fishing history of Milford Pond. In the 1940's and 1950's, Milford Pond was a fisheries resource for local sportsmen who caught "horn pout" (brown bullheads), largemouth bass, and bluegill sunfish. The dredging of Milford Pond will result in a decrease in aquatic macrophyte communities and the restoration of deep-water habitat for fisheries. The restoration program will help to restore an ecological balance to this eutrophic system.

E. - Threatened and Endangered Species

The Massachusetts Natural Heritage and Endangered Species Program (MA NHESP; MA Division of Fisheries & Wildlife) identified the occurrence of four State-listed species in the vicinity of the project area, as documented in letters dated April 12, 2002 and January 5, 2005 (see Appendix B), and more recently a letter dated August 23, 2011 (see Appendix D). These species include the pied-billed grebe, least bittern, king rail, and common moorhen.

These State-listed species all nest in freshwater marshes with emergent vegetation communities including cattails. Massachusetts is the northern extent of the king rail's range, while the other three species have wide ranges in the east. Although their ranges are extensive, these birds are limited by paucity of nesting habitat. These species are not strong fliers, and rely on swimming or camouflage to escape predators. Although cattails and other emergent vegetation are important to the habitat of these birds, these species also utilize open water for flying or feeding. The pied-billed grebe, specifically, requires open water to build up speed for flight, while the least bittern feeds at the edges of open water, and the common moorhen feeds by wading or diving in open water.

In December of 2013, an aquatic bird habitat study was conducted by GZA GeoEnvironmental, Inc. The results of this survey noted that there is extensive emergent marshland habitat associated with Milford Pond, with the largest contiguous section located south of Clark's Island, on the west side of the pond (Appendix H). This wetland habitat is the preferred breeding habitat for several species of aquatic birds, including the state listed species noted above. The report noted that the following marshland-associated, aquatic bird species (including State-listed rare species) have been recorded at Milford Pond during the breeding season by multiple avian experts over the past 20 years, and this information has been provided to MA Natural Heritage and Endangered Species Program (NHESP). Based upon these records, the known species include:

American Bittern *(Botaurus lentiginosus)* E = State Endangered
Least Bittern *(Ixobrychus exilis)* E = State Endangered
Pied-billed Grebe *(Podilymbus podiceps)* E = State Endangered
King Rail *(Rallus elegans)* T = State Threatened
Common Moorhen *(Gallinula chloropus)* SC = State Special Concern species.
Sora Rail *(Porzana carolina)* Scarce breeder, but not State Listed
Marsh Wren *(Cistothorus palustris)* Possible breeder (not State Listed)
Virginia Rail *(Rallus limicola)* Common breeder (not State Listed)

In addition the survey found that there were two important emergent marshland aquatic bird habitat areas potentially supportive of the State-listed waterfowl species. Both important habitats were PEM emergent marshland habitat, located on the west side of the pond in proximity to Clark's Island (W5 and W9). These two habitat areas encompass the largest expanses of PEM emergent marshland habitat present within the Milford Pond basin. Both of these wetlands contained the typical dense stands of Common Cattail and Narrow-leaved Cattail. The area designated W5 is located south of Clark Island along the western shore of the pond, and is the largest area of PEM Cattail dominated marshland, and the area designated as W9 is located north of Clark Island, along the western shore and is a smaller area of Cattail dominated marshland than area W5 (See Figure 9.1 and Appendix H). These areas represent the preferred waterfowl habitat for the four Stated-listed waterfowl species in Milford Pond. These cattail-dominated PEM areas contain numerouss muskrat "runways" that provide open water entrance ways into the protective interior reaches. Approximately 30% of the cattail area is open water, in part as a result of the muskrat activity. Direct evidence of muskrat activity was observed during the mounds located along the eastern area, as well as W9, represents the preferred waterfowl habitat for the margin of W5. The existing, apparently active/healthy, muskrat population present in these larger W5 and W9 marshland areas significantly improves the quality of the habitat for the overall productivity of the State-listed waterfowl. The smaller more limited areas of *Typha* stands (e.g., W2, located near the town swimming pool, and W17, assessment, including active muskrat foraging and observation of muskrat feeding mounds located along the eastern area, as well as W9,

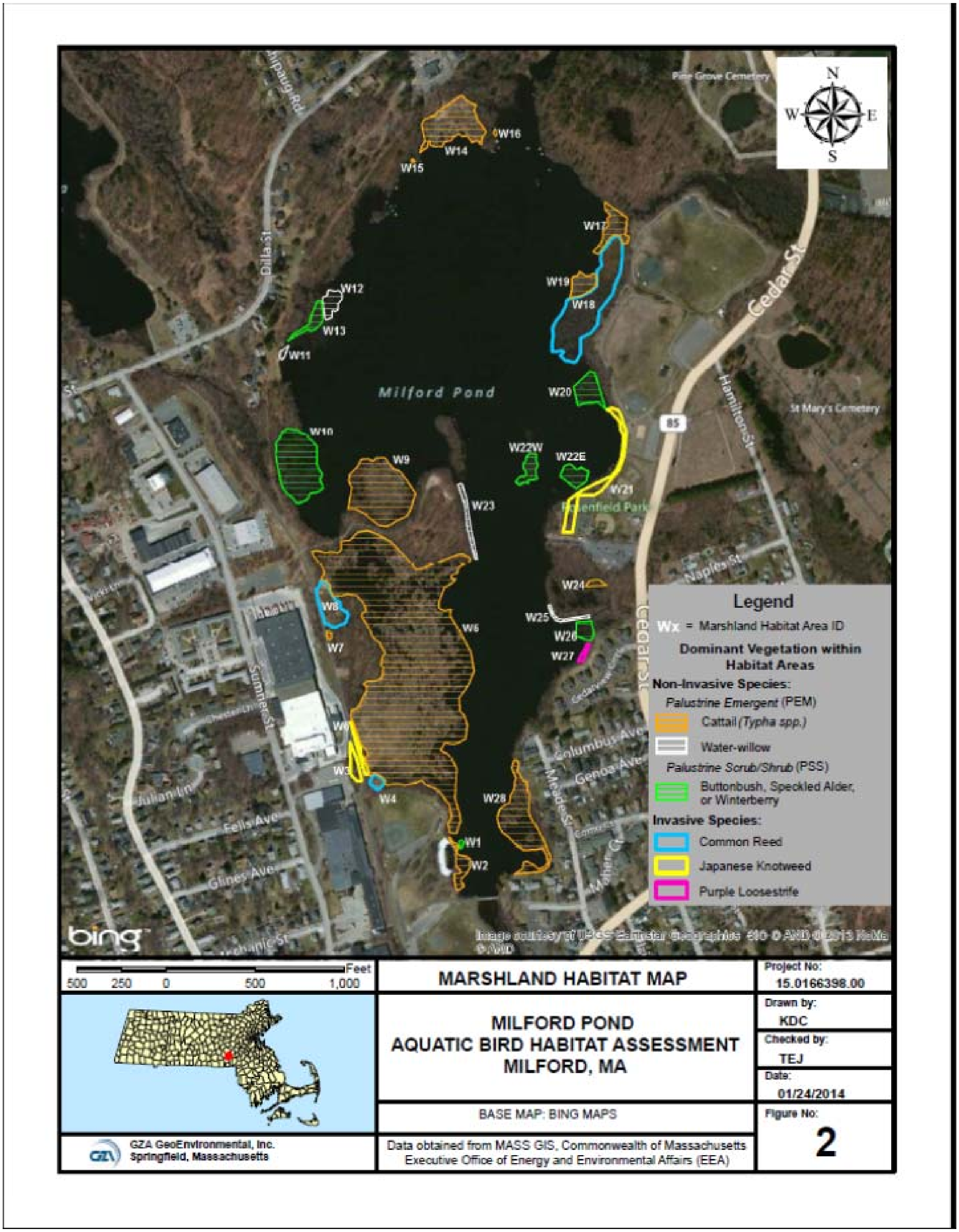

Figure 9.1 Milford Pond Marshland Habitat Map, December 2013.

represents the preferred waterfowl habitat for the margin of W5. The existing, apparently active/healthy, muskrat population present in these larger W5 and W9 marshland areas significantly improves the quality of the habitat for the overall productivity of the State-listed waterfowl. The smaller more limited areas of *Typha* stands (e.g., W2, located near the town swimming pool, and W17, located along the northeast side of the pond), lack the size (contiguous surface area) to provide desirable habitat and protective cover for the aquatic birds, and also lack evidence of an active muskrat population that is an important enhancement of the other, more desirable *Typha* areas.

The proposed dewatering/disposal site is located in open water/aquatic bed habitat to the northwest of Clark Island, just north of area W9. Therefore, the priority habitat for the four listed bird species is not expected to be negatively affected by the deposition of the dredged material. The avoidance of potential impacts to these species will be discussed further in Chapter VII, Actions Taken to Minimize Impacts.

The project area contains no federally-listed or proposed threatened or endangered species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS), according to a letter dated May 13, 2002 from USFWS (copy in Appendix B) and a letter from USFWS dated January 7, 2014 (Appendix D).

F. - Historical and Archaeological Resources

The Town of Milford was originally incorporated in 1780 as a farming community with agricultural land located primarily on the fertile floodplains of the Charles River and on prime agricultural soils located in upland areas. Milford Pond, originally known as Cedar Swamp Pond, was historically a cedar swamp located in the headwaters of the Charles River. The swamp was formed due to the presence of a small waterfall at the swamp’s southerly boundary, which acted as a grade control for the riverbed, forming a topographical barrier which led to the formation of a wooded swamp. As Milford was settled, the lands surrounding the northern portion of the swamp were cleared for farmland, while lands surrounding the southern portion developed into the Town of Milford. Cedar Swamp was considered a valuable community asset by early colonists and was divided into small proprietary allotments, which ensured each individual landowner a small share. Lumber from the large cedar trees found in Cedar Swamp was highly prized for its durability. Sawn logs were used in the construction of log cabins and for charcoal production as well as for cedar shingles. Lumber cut from the towering cedar trees was highly durable and was used for the construction of homes and cedar shingles by early colonists.

Early Milford Pond shoreline development included the construction of an iron foundry on the southwestern shore, a rail line along the western shore, and the placement of a cemetery on the northeastern shore. A town landfill, now known as Plains Park, was developed to the south of the cemetery on the northeastern shore of Milford Pond. An icehouse reportedly operated for a number of years along the southeasterly shoreline of the pond. In time, the cedar swamp was converted into a pond through the cutting of trees and the construction of an impoundment above the small waterfalls along the Charles

River. The present dam, which was constructed circa 1938 partly in response to severe flooding in 1936 and 1938, raised the water level within the swamp and created the shallow pond that exists today. The maximum depth of the pond when it was formed was five feet.

In 1795, a fledgling boot and shoe industry began production in the Town of Milford. As this industry expanded, the town developed into a thriving manufacturing center, world renowned for the manufacture of shoes and boots. The discovery of valuable deposits of structural-grade granite allowed for the development of a small granite quarrying industry within the Town of Milford. The construction of a rail line during the 1850's led to the expansion of both the shoe manufacturing and granite quarrying industries. The development of these industries led to an ever-increasing population base that settled in the downtown area. Industrial development, which required large level areas, access to waterpower and transportation resources, clustered along the banks of the Charles. The resulting land use pattern in the lower portion of the Milford Pond watershed became one of concentrated industrial, transportation, and residential uses in the valleys and sparsely developed uplands.

Early development near the pond included an iron foundry along the southwesterly shore, the construction and operation of a railway along the westerly shore, and a cemetery located northeasterly of the pond. These industries contributed to Milford's development as a sub-regional commercial center. Abutting the easterly shoreline, the Milford landfill operated for several years and has been recently capped and closed and converted to open space available to the town residents as parkland. An icehouse reportedly operated for a number of years along the southeasterly banks of the pond. In the early 1900's, Cedar Swamp Pond was originally created for power generation purposes. By 1938, severe flooding within the downtown area led to the construction of the present dam, owned by the Town of Milford. Dam construction, which was completed in 1938, raised the water within the pond to the present levels.

In the period spanning from the early 1940's through the 1960's, Milford Pond became a focal point for community recreation and use. Local residents used the pond for a variety of recreational activities including swimming, fishing, boating, and ice-skating. In 1962, the Milford Water Company developed the Clark Island Well Field for the provision of potable drinking water to residents of Milford. In the 1940's and 1950's, Milford Pond was utilized by local residents for fishing, boating, swimming and ice-skating. Recent decades have witnessed a decline in water quality and depth (from 5 feet to 2 feet, on average), the proliferation of aquatic weed species, and a significant decrease in the value of the pond's aquatic habitat. The degraded state of the pond has existed since the late 1970s.

The construction of Interstate 495 (I-495) in 1965 and the growth of the automobile industry led to widespread residential growth within the Town of Milford. This growth was centered in the northern and western portions of the town and resulted in the development patterns seen in Milford today.

The Massachusetts Historical Commission (MHC) was contacted in October of 2000 regarding historic and archeological resources within the project area. According to a letter dated December 8, 2000 from MHC, there were two recorded historical sites in the vicinity: the structural foundation remains of the Louisa Lake Ice Company are northwest of Dilla St. adjacent to Louisa Lake, and the Pine Grove Cemetery is at the Cedar and Dilla St. intersection. MHC also stated that due to the favorable environmental setting, unrecorded archeological sites might be present. However, no known sites were in the project area, and all of the proposed project areas are currently highly disturbed sites, unlikely to contain any cultural resources. In February of 2003, MHC was provided with information regarding the proposed dredging operation and dewatering site. The response from MHC indicated that the project as presently proposed is unlikely to affect any significant historic or archaeological resources. Copies of these letters are included in Appendix B.

G. - Socioeconomic Resources and Environmental Justice

The Town of Milford is primarily a residential and industrial community with a population of approximately 27,000 as of the year 2000. There are two major industrial parks in Milford that are home to businesses such as Boston Digital Corporation, EMC, and Photofabrication Engineering, Inc. Major areas of employment in the town include manufacturing at 24%, trade at 25%, and various services at 31%. In 1990, the median household income in Milford was about $38,000, and the unemployment rate in 2001 was 3.6%, which was just under the statewide unemployment rate of 3.7% (DHCD, 2002; Town of Milford, 2002; Commonwealth of Massachusetts, 2001).

Economic development activities in Milford include downtown revitalization efforts through the Downtown Partnership of Milford Inc. and the promotion of development/redevelopment projects through tax incentives within designated "Economic Opportunity Areas" (EOAs) including Bear Hill Industrial Area, Granite Park and the Downtown Area. Cultural resources in the town include the Milford Cultural Center, a variety of restaurants and hotels, and the Town forest and several public lakes including Milford Pond. Town owned conservation land includes Louisa Lake and bordering lands, and the western shore of Milford Pond from Fino Field annex to Clark's Island. Annual community events include the Portuguese Picnic, the Firefighters' Family Day, summer band concerts and the Welcome Santa Parade (DHCD, 2002; Town of Milford, 2002).

Milford is served by Interstate 495, which runs along the eastern boundary of the Town and provides access to I-95 and the Massachusetts Turnpike. State Routes 16, 85, and 140 pass through the Town. Milford Pond is surrounded by Route 85 (Cedar Street), Route 16 (East Main Street), Dilla Street and Sumner Street. Development around the pond consists of residential areas around its southern half, two cemeteries to the northeast, Bicentennial Park and Hayward Field to the west, and the Town Forest to the north. Industries located near the pond include Snap On Tools, on Cedar Street near East Main Street, and Benjamin Moore on Sumner Street.

Executive Order 12898 "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires federal agencies to examine proposed actions to determine whether they will have disproportionately high and adverse human health or environmental effects on minority or low income populations. As of 2000, the Town of Milford had a minority population that was 7.1% of the total population. 6.6% of the housing units within the town are federal or state subsidized housing (DHCD, 2002). An area bordering the western shores of Milford Pond does contain environmental justice populations, according to MassGIS Environmental Justice mapping and the Environmental Justice Policy of the Executive Office of Environmental Affairs ("The Policy"). The Policy defines environmental justice populations as U.S. Census Bureau census block groups that meet one or more of the following criteria:

- The median annual household income is at or below 65 percent of the statewide median income for Massachusetts; or
- 25 percent of the residents are minority; or
- 25 percent of the residents are foreign born, or
- 25 percent of the residents are lacking English language proficiency (EOEA, 2002).

H - Protection of Children

Executive Order 13045 "Protection of Children from Environmental Health Risks and Safety Risks" seeks to protect children from disproportionately incurring environmental health or safety risks that might arise as a result of Army policies, programs, activities and standards. Environmental health risks and safety risks include risks to health and safety attributable to products or substances that a child is likely to come in contact with or ingest. Currently, the excessive vegetative growth surrounding the Town swimming pool located on the southwestern corner of Milford Pond may pose a health and safety risk to children that utilize the pool. Risks associated with the pond itself are limited to those associated with any natural body of water.

In addition to the town swimming pool located on the southwestern corner of the pond, there are several other areas adjacent to Milford Pond that are specifically used by children. These include the Little League fields in Rosenfield Park along the southeastern corner of the pond, and the bicycle trail which is utilized by families with children for walking and bicycling. These areas will be temporarily fenced or similarly controlled during the times of construction to prevent unauthorized access by all members of the community particularly children.

I. - Air Quality

Ambient air quality is protected by Federal and state regulations. The U.S. Environmental Protection Agency (EPA) has developed National Ambient Air Quality Standards (NAAQS) for certain air pollutants, with the NAAQS setting concentration limits that determine the attainment status for each criteria pollutant. The six criteria air pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead.

As of 2008 the entire state of Massachusetts, with the exception of Dukes County, was designated as unclassifiable/attainment for ozone. Prior to this however the entire State of Massachusetts, including Worcester County, was designated as a non-attainment area for ozone. Although as of June 15, 2004, all counties of Eastern Massachusetts were designated by the EPA as moderate non-attainment areas for the 8-hour ozone standard, including Milford, Worcester County, where the project is located (U.S. Environmental Protection Agency, 2005), as of 2008, these areas were re-designated as unclassifiable which is the equivalent of being in attainment.

Under the Federal Clean Air Act and its associated amendments (42 USC 7401 et seq.), the Federal Environmental Protection Agency (EPA) regulates six “criteria” air pollutants:

- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Lead (Pb)
- Carbon monoxide (CO)
- Particulate matter with a diameter of 10 microns or less (PM_{10})
- Ozone (O_3)

Pollutants can be categorized as "local" or "regional". For example, carbon monoxide is a local pollutant because it forms quickly at the source (automobile exhaust) and dissipates rapidly to the atmosphere. Conversely, ozone is a regional pollutant because its formation involves a long chemical process that results is a chemically stable compound that is transported by prevailing winds. Ozone is formed by the reaction of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) in the presence of sunlight. The resulting compound is ozone (O_3), which can negatively affect the respiratory system if present at high concentrations over a prolonged period of time.

The EPA has established health-based National Ambient Air Quality Standards (NAAQS) for these pollutants and the Commonwealth of Massachusetts has in turn adopted its own air standards that mimic the Federal Ambient Air Quality Standards and are administered by the DEP. Based upon comparing the results of monitoring to the NAAQS, areas are categorized as either “attainment” or “non-attainment”. The Town of Milford is in attainment for all the criteria pollutants including ozone, although in the past Milford, as well as the entire Commonwealth of Massachusetts were classified as moderate non-attainment for ozone.

It should be noted that ambient air ozone concentrations are largely controlled by prevailing meteorological conditions (e.g., wind direction, amount of sunlight, and temperature) rather than local emissions. The statewide ozone concentrations are likely influenced by the transport of emissions from densely populated urban areas of the New York metropolitan area as well as industrial stack emissions from Pennsylvania and West Virginia.

Air quality around Milford Pond is dominated by vehicle emissions due to high traffic within the urban residential area. The primary roadway network within the immediate vicinity of Milford Pond includes Dilla Street to the north, Purchase Street to the west, East Main Street (State Highway 16) to the south, and Cedar Street (State Highway 85) to the east. A secondary roadway network that runs throughout the highly developed center of Milford interconnects these main roadways. The secondary roadway network provides access to the various recreational areas and residential neighborhoods that surround Milford Pond. Regionally, the proximity of the site to I-495 is also a factor. Traffic volume data were taken from *the Traffic Impact and Access Study* conducted by VHB. Daily traffic volume counts were conducted along Cedar Street (Route 85) using automatic traffic recorders (ATR). Monitoring was conducted over a 72-hour period in May and June 1999. The 1999 recorded weekday average daily traffic (ADT) on Cedar Street (Route 85) in the vicinity of Milford Pond was 23,100 vehicles. Nearly 2,090 vehicles were recorded per hour during peak evening commuting hours. Weekend measurements were recorded at an ADT of 25,500 vehicles per day with approximately 1,845 vehicles recorded per hour during peak weekend hours.

J. - Farmland Soils

The project site consists of Milford Pond and the proposed sediment disposal site. The soils within the Milford Pond area are subaqueous and do not qualify as prime agricultural soils. The Worcester County Soil Survey (Southern Part, 1998) identifies the soils within the proposed sediment disposal site as “Pits, Gravel” on the western portion, adjacent to the wetlands, and as the Canton Soil Series (8-15% slopes, extremely stony), a sandy, well drained glacial till derived soil, on the western portion. Among the Canton soil series, only the less steep, non-stony soils are considered prime agricultural land. Therefore, the project sites do not include any existing or potentially significant agricultural soils.

K. - Flooding

Flooding in Milford can occur at any time of the year, with major flooding occurring in the fall, winter, and spring seasons. Autumn is a critical season for flood damages due to the potential for hurricanes and their associated torrential rains. The early spring can bring substantial flooding from rainfall and snowmelt. Thunderstorms can bring localized flooding on many of the smaller streams due to intense precipitation, short times of concentration, and highly-developed areas. Major flooding has occurred in the past in the Louisa Lake / Huckleberry Brook areas, both of which outlet into Milford Pond. The 1955 flood was the largest on record for the Charles River and had a recurrence interval just short of 100 years. The average annual rainfall in Milford is approximately 45 inches.

Huckleberry Brook originates in a swampy area in northern Milford. It flows southeasterly through land that is mostly undeveloped but rocky and prone to the generation of large amounts of runoff. The Louisa Lake Flood Control Project was constructed to help alleviate flooding problems in this area. Huckleberry Brook enters Louisa Lake at its northern end, at a diversion structure that keeps baseflow running within the old brook channel and from there into Milford Pond. Heavier flows are directed into Louisa Lake, which provides a flood storage function. Flow from Louisa Lake passes over a low spillway and travels down a channelized stream section before entering Milford Pond.

The Charles River originates at Echo Lake in adjacent Hopkinton. The Charles flows into the northeasterly corner of Milford and is the main feeder stream to Milford Pond. The floodplain of these upper reaches of the Charles River is fairly narrow and undeveloped, with the exception of I-495 and the Route 85 interchange. After exiting Milford Pond, the Charles River enters a series of underground culverts and channelized sections and fully daylights just south of West Central Street. From this location to the Milford-Bellingham town line, the floodplain is relatively wide with light to moderate development.

There are no known formal flood control plans or activities in the Town of Milford. Milford Pond is located within the 100-year flood plain. It has been reported that Milford Pond provides downstream flood control, which seems plausible in light of its relatively large area to watershed ratio. The magnitude of flood attenuation provided by Milford Pond is not known.

V. Environmental Consequences

A. - General

The principal environmental effects sought by the proposed partial dredging program will be beneficial to the waterbody itself and to the surrounding community. The existing loss of water depth within the pond due to sediment infilling and organic accumulation and excessive aquatic and emergent macrophyte growth that has choked the remaining open water and has diminished aquatic habitat values, but not added comparable wetland wildlife habitat value. The objectives of the habitat restoration for the Milford Pond ecosystem are to:

1. Restore areas of open water aquatic habitat with a depth sufficient to discourage dense aquatic weed growth;
2. Enhance total aquatic habitat for fin fish species;
3. Preserve habitat values for waterfowl, including State-listed species; and
4. Restore a balance between open water aquatic habitat, the dense aquatic weed beds, and emergent wetlands; and
5. Avoidance of impacts to the Clark Island Well Fields.

The implementation of a limited dredging program will achieve these balanced goals, yielding increased pond depths, with much of the dredged portions with the bottom below the photic zone. This reduction of the pond bottom within the photic zone will lessen the ongoing excessive aquatic macrophyte infestation, which degrades the aquatic habitat.

The removal of the surficial sediments will also remove an important internal nutrient source that fuels the growth of the rooted aquatic macrophytes. An increase in depth throughout selected areas of the pond will provide open, deeper water habitat essential for improving the diversity of fisheries in the pond. In addition, the beneficial use of the dredged sediments is expected to restore emergent wetland suitable for the reestablishment of the Atlantic white cedar.

The long-term environmental effects of a well-designed dredging program are expected to be positive and consistent with the State and Federal legislation regarding water quality concerns. However, there will be short-term environmental impacts during the construction phase of the project. The following is a discussion of the long-term and short-term anticipated environmental effects associated with the proposed restoration project.

B. Terrestrial Environment

B. 1. Geology / Soils

The impacts of dredging to the local geology and soils are limited to those associated with the partial dredging and the sediment within the pond itself and the placement of the sediments on the sediment storage and processing site. While the organic peat and muck soils will be removed from certain areas of the pond bottom, the remaining pond sediments will not be altered. The limits and depths of the proposed dredging have been established to preserve the existing beneficial geologic peat layer barrier that filters induced recharge to the Milford Water Company Clark Island Well Field. The dredged soils from the bottom of pond in the dredging area will be redeposited over the shallow layers of peat in the pond to the northwest of the Clark Island well field, and are will be revegetated with Atlantic white cedar and other emergent wetland species. Therefore, the soils from the pond will essentially be redistributed from the pond deepening in order to create suitable emergent vegetation/Atlantic white cedar habitat. Much of the material being removed from the pond has accumulated from the storm drain inflows and the upper watershed, and therefore the project is expected to restore the deeper water habitat that has filled in over the last 50 years. Therefore the project is not expected to have any long term negative impacts on the geology and soils in Milford Pond.

B.2. - Vegetation

The proposed dredging of Milford Pond and deposition of the sediments northwest of the Clark Island wellfield is not expected to have any negative effect on upland vegetation communities. It will however affect wetland communities within the pond and adjacent to the shoreline by redistribution of wetland vegetation and cover types. The proposed dredging of Milford Pond and disposal north of Clark Island will convert approximately 30 acres of shallow aquatic bed vegetation to emergent marsh habitat by the deposition of dredged sediments. It is anticipated that the sediments will raise the existing bottom in that location by approximately 1.5 feet, while still providing the necessary soil hydrology for the growth and survival of emergent wetland species including cattail (*Typha sp.*) and Atlantic white cedar (*Chamaecyparis thyoides*).

Although this will reduce some of the dense aquatic bed habitat used as potential spawning and nursery area for warmwater fish species, as well as herptile habitat, it will be replaced with emergent wetland habitat which will still provide some habitat for reptiles and amphibians while creating additional emergent wetland habitat. During the deepening of the pond, a shallow edge along the perimeter will be left intact in order to maintain the existing aquatic bed fisheries habitat currently used for spawning and nursery while increasing the deeper water and open water habitat necessary for overwintering, and foraging. In addition the deepening of the pond will provide additional open water and deepwater fisheries habitat needed for foraging, resting and overwintering. It is expected that it will also provide additional nesting habitat for the four state listed water bird species, while increasing the amount of available open water used by these species for feeding.

B. 3. - Wildlife

The proposed project is not expected to have any long term negative effects on the local terrestrial wildlife. The emergent wetland habitats will be only minimally affected by the dredging (i.e. some smaller areas adjacent to the town swimming pool). The dredging will avoid the priority habitat for the four listed aquatic bird species located to the south of Clark Island. Waterfowl will continue to use the pond during construction, since the habitat will be maintained for the ducks, geese, heron, and kingfisher water birds dependent upon this resource. Hydraulic or mechanical dredging operations disturbance is expected to be very limited for water fowl, with the birds easily avoiding the active area of dredging, and habituating to the presence of the dredge.

In the disposal area (i.e. wetland creation area) some temporary negative effects to the existing aquatic species are expected to occur. As the sediment is deposited, reptiles and amphibians inhabiting this area will be displaced and/or buried. In addition any fish using these areas will be either be displaced or buried. The disposal area will be contained by the placement of a sediment containment structure which will essentially prevent the escape of fish and other small aquatic organisms from the containment area. However as the sediment is pumped to the area, it is expected that most of the motile aquatic organisms will move away from the inflow area to the outer boundaries along the edge of the containment structure. During the time of placement, fish and/or amphibians that become visibly trapped along the inner edges of the containment structure will be manually re-located to the main area of the pond, thereby reducing the overall mortality from the infilling, although those that are not relocated will be buried or suffocated by the infilling sediment. These would primarily be smaller juvenile warmwater fish species that would be foraging in the dense shallow aquatic weed beds associated with the disposal area, as well as smaller amphibian species inhabiting this area. It is expected that these populations will recover within several seasons following the disposal. In addition, the improved deepwater/openwater habitat provided from the pond dredging will offset the loss of the weed choked aquatic bed habitat used for the disposal, and therefore it is expected that the fish population will improve as a result of the dredging. Also, the recreated emergent wetland will provide additional habitat for amphibians and reptiles in the area, offsetting any loss from the filling in of the aquatic bed habitat. In addition, the newly created wetland habitat is expected to provide additional breeding habitat for the four state listed aquatic bird species inhabiting Milford Pond, as well as restoring the Atlantic white cedar swamp habitat.

C. - Aquatic Environment

C. 1. - Hydrology

Removal of approximately 250,000 CY of sediment from the pond is not expected to significantly alter the total volume of the pond or the flushing rates due to the fact that the material will be relocated to another section of the pond, Estimates of the existing annual flushing rate of Milford Pond range from 41 to 85 times per year.

Although the net volume will be relatively unchanged, there will be some reduction to the existing flood storage capacity of the pond, due to the reduction in the total available surface area depth at the disposal area, where several islands will be created above the existing water level elevation, and the entire area of sediment deposition will be raised to the existing water elevation or slightly above it. This slight loss of surface area will result in an increase of 0.2 feet during moderate flood/or rain events, however it will not be changed for the 10 year (or greater) flood event. In addition the banks of the rise steeply along the edges of the pond in the areas abutted by residential property, so the small increase during moderate rain events is not expected to significantly increase overall flood damage risk to the abutting properties.

C. 2. - Water Quality

The hydraulic or mechanical dredging and sediment re-use at Milford Pond will potentially impact short-term water quality in two ways:

1. The operation of a hydraulic or mechanical dredge will disturb sediments in the immediate area of the dredge, locally increasing water turbidity (i.e., typically <100 ft. away), and

2. Return flow to the reservoir from the sediment containment basins and water will have associated turbidity.

In addition, there is some potential for accidental spillage of petroleum-based fuels and lubricants associated with the dredging and processing machinery. Experience with prior hydraulic dredging projects has indicated that these impacts are either insignificant (e.g., turbidity created by cutterheads is typically not detectable greater than 100 feet from the source) or can be easily mitigated (e.g., return flows from containment/settling areas or clarifiers).

A temporary floating silt curtain will be installed downstream of the dredge activity and upstream of the dam and will minimize the amount of turbidity moving downstream. The silt curtain will be installed prior to dredging activity, maintained and cleaned out periodically during the dredge operations, and removed after dredging is completed.

The wetland restoration area (dredge material disposal area), will be contained by a sediment containment structure. These structures will function to contain the sediment within the designated disposal area allowing the suspended solids to settle, while also allowing the water to percolate through them, being filtered in the process. Therefore any excess water from the disposal operation will be settled within the containment area, and filtered through the sediment containment structure prior to flowing back into the pond, and is not expected to negatively affect water quality.

In the long term, water quality will improve due to the removal of nutrient rich bottom sediments that currently release nutrients to the water column and support the growth of aquatic plants. With the lessening of aquatic plant growth, dissolved oxygen depletion due to the decomposition of vegetative matter by aerobic bacteria will decrease. Restoring dissolved oxygen levels and removing the source of nutrients in the sediments will reduce the release of nitrogen and phosphorous to the water column. Also, the creation of emergent wetland habitat will provide an additional buffer area in that section of the pond that can help to intercept silt and nutrient containing runoff from the western section of the watershed, with the nutrient uptake of the emergent vegetation helping to reduce the overall nutrient loading in the pond.

C. 3. Sediment Chemistry

The purpose of the proposed dredging program for Milford Pond is to restore aquatic habitat quality via the removal of accumulated fine, unconsolidated organic and sandy sediments, which have been deposited from brook deltas, storm water outfalls and organic accumulation. The dredging of Milford Pond will remove approximately 250,000 cubic yards of organic sediments from the pond bottom. These sediments will be removed from areas of the pond extending from the outlet dam northerly to a point slightly north of Clark Island. Selected areas with high existing aquatic habitat value associated with their littoral zones and other features will be preserved and not altered by the proposed dredging program. The removal of the organic sediment will decrease the nutrient base within the sediments that currently support dense aquatic weed growth. The removal of these shallow, nutrient rich sediments will help establish a less dense, more beneficial density of aquatic vegetation, thereby increasing aquatic habitat value for fisheries.

The creation of the wetland will convert approximately 30 acres of shallow littoral habitat in the northwest side of the pond to emergent wetland. These relocated sediments will provide the necessary substrate for the recreation of emergent wetland as well as the restoration of Atlantic white cedar to the pond. As noted previously, most contaminants in these sediments are below the S1 Standards for the Massachusetts Contingency Plan, and those few that are not below the S1 Standards are below the S2 Standards, indicating that these are generally suitable for disposal in areas where there is expectation of moderate human exposure, including infrequent use by children. Once this area is re-vegetated, it is expected to function as emergent wetland, and be relatively inaccessible to human activity except by boat or hikers or bird watchers using specialized walking equipment. Therefore it is assumed that there is a low risk of human exposure to any of the contaminants that may be found in the sediments dredged from the Milford Pond and deposited in the recreated wetland area.

D. - Biological Resources

D.1. Vegetation

Dredging will remove the aquatic vegetation and a significant quantity of the nutrient-rich organic sediments that support aquatic macrophyte growth throughout a portion of Milford Pond. Approximately 18$\pm$ acres of the pond will be affected, a majority of which has 80 – 100% vegetative coverage.

The dredging program will benefit the ecosystem habitat by:

- Removing the existing dense aquatic weed bed, thereby stemming a significant long-term risk to the health of the pond;
- Increasing light penetration and supporting lower growing aquatic plants;
- Increasing vegetative diversity;
- Increasing diversity of structural habitat related to aquatic macrophytes; and
- Decreasing nocturnal O_2 depletion, potentially supporting a more diverse benthic invertebrate and fish community.

Almost 2/3^{rds} of the littoral shelf areas with dense aquatic vegetation will be left within the pond to provide more than adequate spawning and nursery habitat for target warm-water fish species. In addition, marginal areas of the dredged portions with shallower sediments will redevelop with aquatic macrophyte beds to augment this habitat.

As noted previously, the creation of the wetland will convert approximately 30 acres of shallow littoral habitat in the northwest side of the pond to emergent wetland. Currently this habitat is choked with invasive milfoil as well as other aquatic bed species. Although this type of habitat is generally used by fish for spawning, nursery and forage, its value in Milford Pond for these functions is limited due to the overabundance of nuisance aquatic vegetation. This overabundance can locally affect water quality by reducing dissolved oxygen levels below the surface (due to its prevention of vertical mixing) as well as making it difficult for fish to swim and use these areas due to the high density of floating/emergent vegetation in the water column. Therefore, the conversion of this habitat to emergent wetland is expected to only minimally reduce the amount of shallow littoral fisheries habitat in the pond. In addition, the existing shallows along the perimeter of the dredging will be left intact, and will therefore continue to provide spawning and nursery area for the existing warmwater fish population in the pond.

D.2 - Phytoplankton and Benthic Environment

The dredging of Milford Pond is expected to have a positive effect on the phytoplankton community by removing the nutrient rich sediments that contribute to the nutrient release to the overlying water column that contributes to phytoplankton blooms during summer months. This may provide a more balanced phytoplankton community, desirable as a support of the food web for planktivorous fish, which in turn support the piscivorous fish, including the desirable game fish such as largemouth bass.

Some limited benthic communities likely exist in the soft organic sediments of Milford Pond. Macro invertebrate communities found in Milford Pond proper are most likely limited to species capable of surviving in slow moving, low dissolved oxygen habitats. Only minor and temporary impact to the existing benthic invertebrates are anticipated during the dredging program, with the temporary loss of insect larvae of terrestrial insects and some common freshwater snails. Both invertebrate populations will become re-established within 2-3 years, replenished by the seed stock available from the undredged portions of the pond. Therefore, it is anticipated that no long-term adverse affects on the aquatic invertebrates associated with Milford Pond will occur. To the contrary, bringing the pond back from an advanced stage of hypereutrophy towards a more typical eutrophic state, will benefit the benthic community, by exposing coarser, more oxygenated substrate suitable for habitation by a more diverse population.

D.3.- Fisheries

Pond dredging will result in the deepening of Milford Pond and the creation of open water habitats. The operation of the hydraulic or mechanical dredge will not directly affect the local fish population since the individual fish are expected to readily avoid the drag arms and/or bucket of the dredge. The aquatic habitat in Milford Pond is primarily limited to shallow pond, with a silty/mucky bottom, and emergent wetland communities. These areas are dominated by a dense growth of aquatic macrophyte species, which provide forage and cover for weed-loving aquatic organisms. Milford Pond, in its current state, has limited habitat diversity for other species of aquatic organisms. Based upon fish toxicology studies conducted by DEP as well as a fisheries assessment conducted by the USACE, Milford Pond supports populations of yellow perch, brown bullhead, chain pickerel, black crappie, largemouth bass, and bluegill sunfish. Habitat for these species is limited due to shallow depths with dense weeds impeding oxygenation and fish passage, the lack of gravel spawning beds (crappie and bass) and a lack of deeper open water areas for foraging (crappie, bass and perch) as well as overwintering. This proposed deepening of the pond should provide increased habitat area for open water species.

It should be noted that the deposition of the dredged material in the disposal area northwest of Clark Island will result in the filling in of approximately 30 acres of shallow littoral and aquatic bed habitat in the pond. Generally these areas provide spawning, nursery and forage habitat for adult, juvenile and larval stages of many warmwater fish species (i.e. largemouth bass, bluegill, black crappie). However as noted previously, the quality of this habitat for these functions has been impaired due to the dense aquatic weed growth which limits the mobility of many of the adults of these species in these areas, as well as the reduction of dissolved oxygen concentrations that can occur due to the prevention of atmospheric exposure and vertical mixing from the thick surface vegetation cover. In some Corps lakes/ponds, dissolved oxygen concentrations that were measured only a small distance (i.e. 1 foot) below the surface of water covered by floating aquatic vegetation (such as water lily) has been below 5 mg/L (Deweys Pond, Quechee, VT, and Hancock Brook Lake, Plymouth CT). The 5 mg/L dissolved oxygen concentration is generally considered the criterion below which many fish species will exhibit signs of stress, and concentrations of dissolved oxygen at or above this level are considered necessary for the survival and proliferation of healthy fish populations. It should be noted that some species of fish require higher concentrations than this depending upon water temperatures (i.e. trout and salmon). Therefore the conversion of this habitat to emergent wetland habitat is not expected to significantly reduce the amount of currently available shallow fisheries habitat. In addition, the dredging of the main section of the pond is expected to provide additional open water fisheries habitat with the opening of shallow habitat that is currently overgrown by aquatic vegetation. This is expected to benefit the overall fish habitat in Milford Pond. Therefore, the proposed pond dredging and wetland creation is expected to have a positive effect on the fisheries of Milford Pond.

D.4. –Wetlands

The Milford Pond Restoration Project will result in the restoration of approximately 30± acres of open water habitat areas, preserving approximately 50 ± acres of shallow pond and emergent wetland habitat in their current condition. The preservation of these areas will provide suitable habitat for wetland dependent species, while the restoration of open water communities will increase local habitat diversity, providing a more optimal balance for the overall ecosystem of the Milford Pond basin with habitats for fin fish and waterfowl. In addition it will convert approximately 30 acres of shallow open aquatic bed wetland habitat to emergent wetland habitat suitable for nesting aquatic birds, while also providing for the reestablishment of Atlantic white cedar. It is anticipated that the project will conform to the performance standards for BVW and other resources (310 CMR 10.54 to 10.58). There are no anticipated significant adverse impacts to wetland resource areas associated with this project. A hydraulic or mechanical dredging program does not require a pond drawdown, nor will it alter pond full levels, which have the potential to adversely affect bordering wetland resources. Therefore, the use of this dredging methodology will preserve large tracts of undisturbed wetland resource areas while creating additional emergent wetland habitat suitable for aquatic bird nesting.

The proposed dredging methodology, hydraulic or mechanical dredging will not affect the surface water levels. The dredging/dewatering process consists of pumping the sediment through a hydraulic discharge line from the pond to the disposal/wetland creation area north of Clark Island. The sediment will be placed into a containment area created by sediment containment structures, and allowing it to settle, with the excess water being allowed to slowly percolate through the tubes. The containments structures are expected to function as filters removing any residual turbidity or suspended solids that have not settled in the containment area. Therefore effects to wetlands from suspended solids area not expected to occur. In addition, the water level in the pond is not expected to be reduced, so bordering wetlands are not expected to be negatively affected by the dredging process.

In addition, during the dredging the spread of the invasive milfoil will be prevented by the use of the silt curtain. During the dredging, the fragments of this plant that will result from the dredging will be collected and disposed of where they will not be able to spread downstream in the Charles River.

The restoration site will be replanted with native wetland vegetation including the historic Atlantic white cedar. Plans to monitor the progress of the wetland and control any invasive species will be implemented following the completion of the project. A silt curtain will be employed downstream from the dredge in order to collect/capture fragments of the invasive milfoil and prevent their spread downstream in the Charles River. Fragments of milfoil collected within the silt curtain will be removed and disposed of where they cannot be transported to other water bodies and become established.

Dredging 18± acres of the 120-acre pond would increase depths and reduce aquatic macrophyte growth throughout selected areas of the pond, supplying deep open water areas while allowing some shallow, weedy pond habitat to remain. The presence of both deep, open water and shallow, weedy areas provides the optimal habitat for a diverse fisheries population and other wildlife, such as aquatic birds and mammals. The proposed project creates a diversity between open water (18acres ±), dense aquatic weed beds (12 acres ±), emergent marsh wetland (63 acres ±), and floating vegetated islands (< 1.0 acres). Provisions to prevent the disturbance of the floating vegetated islands will be incorporated into the detailed Plans and Specifications.

Erosion control measures will be provided at the Dilla Street and Rosenfeld Park staging areas when needed to control sediment from moving from the staging area to the surrounding water bodies and wetland areas. Erosion control measures may include silt fences as shown on the plans, and erosion control mats at the Dilla Street staging area during times when the upland soils are saturated and soft.

E. Threatened and Endangered Species

The project area contains no Federally-listed or proposed threatened or endangered species under the jurisdiction of the U.S. Fish and Wildlife Service (letters dated May 13, 2002 and November 19, 2004 (copies in Appendix B) and January 7, 2014 (Appendix D). However, the MA NHESP has mapped estimated and priority habitats of four State-listed bird species within the Milford Pond wetland habitat complex, including the Pied-billed Grebe, Least Bittern, King Rail, and the Common Moorhen. These four species were stated to occur in the vicinity of the project site by MA NHESP (April 12, 2002, January 5, 2005, and August 23, 2011; Appendices B, and D). These species are protected under the Massachusetts Endangered Species Act (M.G.L.c.131,s.40) and its implementing regulations (310 CMR 10.00). Habitat requirements for all four of the identified State-listed species include large contiguous cattail-dominant emergent marsh. Suitable habitat was found to be present around much of western littoral zones of the pond (Appendix H), in particular a large expanse of cattail marsh located on the southwestern side of Clark Island (Area W5, Appendix H) as well as a smaller area north of and abutting Clark Island (Area W9). The proposed area of dredging occurs primarily in the existing non-*Typha* areas, and the sediment relocation occurs in the northerly portions of the pond basin. Therefore, the planned areas of dredging and sediment placement do not appear to affect areas W5 or W9. The proposed dredging and sediment placement is limited to other less contiguous PEM areas and, therefore the project is unlikely to have an adverse impact to the State-listed waterfowl species.

These areas of emergent marsh habitat will be preserved by the proposed dredging program, except for a small, 2-acre area near the municipal swimming pool at the southern end of the pond, near the dam. In this area, the Town swimming pool and baseball field directly border the western shoreline and the eastern shoreline is composed of residential development with landscaped lawns to the water’s edge. The human disturbance associated with these high use areas during the breeding seasons of these very secretive and elusive birds is likely to discourage any potential nesting. In addition as noted previously, the emergent wetlands located adjacent to the pool lack the size (contiguous surface area) to provide desirable habtat and protective cover for the aquatic birds, and also lack the evidence of an active muskrat population that is an important enhancement of the other more desirable *Typha* areas. Therefore, no adverse impacts to State-listed birds are anticipated as a result of the conversion of this small portion of emergent vegetation growth to open water habitats. The detailed Plans and Specifications will depict a buffer zone between the existing cattail dominated wetland habitat and the proposed dredging limits. The project would be constructed with gradual slopes and adequate setbacks in order to avoid slumping of the emergent marsh wetland.

As noted previously, the disposal/wetland restoration site is located in an area of the pond that does not contain estimated and priority habitats of these four bird species (or other species), therefore no impact to these species from activities within the dewatering site are expected. The disposal/restoration area was designed to specifically leave these areas intact and will maintain a strip of open water between the actual created wetland and the western shore of the pond to provide open water forage habitat between the two emergent wetland areas along the northwest shore (i.e. between the existing shore of the pond and the created wetland). In addition the open waters east of Clark Island and the open coves on the north side of Clark Island will be kept open to allow pied billed Grebes to access open water with their chicks when disturbed. All construction activities (dredging and sediment relocation) will be conducted during a single season beginning prior to the nesting season and continuing through the end of the nesting season. This will prevent these birds from nesting in the pond during construction, thereby avoiding impacts, so that the birds avoid all construction activities. For the construction season, it is expected that the birds will disperse to nearby similar nesting habitat, where they would not be affected by the construction. These birds are expected to return to Milford Pond to nest again in the seasons following construction and the establishment of the additional emergent wetland vegetation and marsh habitat (Misty-Ann Marold, Chris Beulow, MA NHESP, Personal Communication, March 27, 2014).

It is expected that the newly created emergent wetland habitat will provide additional nesting areas for these birds, within the proximity to open water which is also necessary feeding habitat, while the deepened pond (from the dredging) will also increase the amount of open water habitat that is also used by these water birds. Therefore the proposed dredging and wetland creation at Milford Pond is not expected to have a negative effect on any state listed water bird species inhabiting the pond, but rather the project is expected to improve the overall habitat for these species in Milford Pond. MA NHESP will be required to comment on the project during the wetland permitting under the MA Wetlands Protection Act. During the Notice of Intent filing to the local conservation commission, MA NHESP will review and comment.

F. Historical and Archeological Resources

According to a letter dated December 8, 2000 from MHC, there are two recorded historical sites in the vicinity of the project site: the structural foundation remains of the Louisa Lake Ice Company located northwest of Dilla St. adjacent to Louisa Lake, and the Pine Grove Cemetery is at the Cedar and Dilla St. intersection (copies of letters in Appendix B). In a letter dated March 5, 2003, the Massachusetts Historical Commission has concluded that the project with dredging and disposal at Dilla Street was unlikely to affect any significant historic or archaeological resources (copy of letter in Appendix B). However, an email from the Senior Cultural Resource Monitor from the WTGH-Aquinnah requested that a site walk take place prior to construction to identify any potential culturally significant sites (copy of email in Appendix D). In a subsequent telephone conversation, the Monitor also requested that an observer be present during construction activities to monitor for cultural resources. Additional coordination will be conducted to schedule a preconstruction site walk, as well as the possibility of having an observer present during the construction activities.

G. Socioeconomic Resources and Environmental Justice

The restoration of Milford Pond will not have any disproportionate impacts on socioeconomic resources or environmental justice populations in the Town of Milford. There may be temporary interference with the limited available recreational activities around the pond during periods of active dredging. There will be some temporary increase in truck and other vehicular traffic associated with access to the dredge and wetland restoration area located on the western shoreline of Milford Pond. Access to this parcel is through Dilla Street. In addition there may some additional traffic along Route 85 (Cedar Street) however once the containment structures are in place and the dredge has been mobilized, the traffic would be only from the work crew travelling to and from the worksite daily. This increase in traffic is expected to be temporary lasting only for the duration of the project.

Minor increases in airborne contaminants and noise associated with the dredging equipment and additional traffic may occur. These negative impacts are temporary, but the long-term impact is a positive one. Milford Pond will become a more valuable cultural resource after it has been restored, providing recreational opportunities, such as boating and fishing, which are not currently available. All residents of Milford will benefit from the pond's improved aesthetic quality and recreational value.

H. Protection of Children

Adverse impacts to the safety of children associated with the restoration project are temporary. There will be safety concerns associated with increased truck travel through Route 85 (Cedar Street), a highly utilized travel corridor. However these are established roadways in existing developed areas where there is normal traffic daily. Access to the pond for dredging is planned through the existing boat ramp at Rosenfield Park off Cedar Street. This area is a large recreational field and park area used by children. Standard vehicle safety procedures will be in place during the deployment of any water craft and dredging plants and related equipment including motorized boats used to construct the containment area north of Clark Island. Other access points from land include the western shore from Dilla Street as well as Clark's Island. The Milford section of the Upper Charles Trail, a bicycle and walking trail runs along the western side of Milford Pond, with parking access areas off of Dilla Street near Fino Field at the southern section of the pond. This trail is also used by children as well as adults. During the deployment of construction machinery and related equipment, it is likely that this trail will need to be crossed at various times. Proper safety procedures and warnings will be in place reduce any potential adverse interactions with children and adults who may be using this bicycle trail, as well as the recreational fields on the eastern and southern sides of the pond. These would include a combination of fencing, signage, or other controls to prevent access. The crossing of the trails and use of the boat ramps located either at Rosenfield Park or off of Dilla Street will be temporary lasting only for the duration of the project.

In addition, areas of active dredging or filling will be fenced off or marked appropriately with warning signs or fencing or other controls to prevent access during the duration of the project. The completed restored wetland is not in an area that is expected to be used by children, since access to it would be primarily by boat or using specialized mud walking shoes. Therefore the moderate exposure risk from the few contaminants in excess of the S1 Standards, but below the S2 MA contingency standards is not expected to be significant.

The proposed dredging program will affect air quality, principally at the dredge site, due to the operation of the diesel powered dredge and pumps. Such air quality emissions are expected to be insignificant and are temporary. The project will not create permanent disproportionate impacts on children.

I. - Air Quality Statement of Conformity Requirements

U.S. Army Corps of Engineers guidance on air quality compliance is summarized in the Corps Planning Guidance Notebook (ER1105-2-100, Appendix C, Section C-7, pg. C-47). Section 176 (c) of the Clean Air Act (CAA) requires that Federal agencies assure that their activities are in conformance with Federally-approved CAA state implementation plans for geographic areas designated as non-attainment and maintenance areas under the CAA. The EPA General Conformity Rule to implement Section 176 (c) is found at 40 CFR Part 93.

Clean Air Act compliance, specifically with EPA's General Conformity Rule, requires that all Federal agencies, including Department of the Army, to review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the State Implementation Plan (SIP) attainment schedule of the NAAQS, or otherwise contradict the State's SIP.

The Commonwealth of Massachusetts is authorized by the EPA to administer its own air emissions permit program, which is shaped by its State Implementation Plan (SIP). The SIP sets the basic strategies for implementation, maintenance, and enforcement of the National Ambient Air Quality Standards (NAAQS). The SIP is the federally enforceable plan that identifies how that state will attain and/or maintain the primary and secondary National Ambient Air Quality Standards (NAAQS) established by the EPA (U.S. Environmental Protection Agency, 2004b). In Massachusetts, Federal actions must conform to the Massachusetts state implementation plan or Federal implementation plan. The Corps must evaluate and determine if the proposed action (construction and operation) will generate air pollution emissions that aggravate a non-attainment problem or jeopardize the maintenance status of the area for ozone. When the total direct and indirect emissions caused by the operation of the Federal action/facility are less than threshold levels established in the rule (40 C.F.R. § 93.153), a Record of Non-applicability (RONA) is prepared and signed by the facility environmental coordinator. Since the entire state of Massachusetts, with the exception of Dukes County is considered to be unclassifiable/attainment, then it is no longer necessary to evaluate whether or not the proposed action will jeopardize the maintenance status of a non-attainment area. However, since in the past the area was designated as non-attainment, air quality effects of the proposed action were evaluated as described below. These calculations can be compared to the present project to demonstrate that the proposed project it is not expected to significantly increase emissions concentrations in the region.

Construction and Operation

Construction would occur over a total period of about 22 months, with work being done seasonally. Construction activity at the proposed project site would require bulldozers, dump trucks, pick-up trucks, front-end loaders, dredges and other construction equipment, including small generators and graders.

During construction, equipment operating at Milford Pond would emit pollutants including nitrogen oxides that can lead to the formation of ozone. The dredging of 45 acres of the pond will involve, in addition to the hydraulic dredge, construction vehicles used to transport equipment to and from the site. These vehicles will be in compliance with the state's vehicle emission program.

Equipment operating on the construction site (non-road construction equipment) will emit pollutants that contribute to increased levels of criteria pollutants such as carbon monoxide, nitrogen oxides, and ozone. The emissions for construction vehicles and related equipment will have an insignificant impact to local air quality.

Construction of the proposed project could cause a temporary reduction in local ambient air quality because of fugitive dust and emissions generated by construction equipment. The extent of dust generated would depend on the level of construction activity and dryness. Proper dust suppression techniques would be employed to avoid creating a nuisance for nearby residents during dry and windy weather.

In order to minimize air quality effects during construction, all construction operations would comply with applicable provisions of the Commonwealth of Massachusetts air quality control regulations pertaining to dust, odors, construction, noise, and motor vehicle emissions. No direct or indirect increases or other changes in local or regional air quality are likely to occur with the construction and operation of the proposed project.

General Conformity

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. Federal agencies make this demonstration by performing a conformity review. The conformity review is the process used to evaluate and document project-related air pollutant emissions, local air quality impacts and the potential need for emission mitigation (Polyak, K and Webber, L. 2002). A conformity review must be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. Non-attainment areas are geographic regions where the air quality fails to meet the NAAQS.

The project is located in Worcester County, Milford Massachusetts. Worcester County was considered to be non-attainment for ozone, receiving a “moderate” classification under the new 8-hour ozone air quality classification. The General Conformity thresholds for ozone in a moderate non-attainment area have an emission rate threshold of 50 tons per year (tons/year) of VOC (volatile organic compounds) and 100 tons/year of NO_x (nitrogen oxides) (U.S. Army Environmental Center, 2002) (40 CFR 51.853, 7-1-03).

To conduct a general conformity review and emission inventory for the proposed environmental dredging of Milford Pond, a list of construction equipment was identified using the project construction cost estimate. The first column of the emissions calculations table (See Appendix K) provides a summary equipment list. The New England District prepared calculations of the worst-case project specific emissions of NOx and VOCs to determine whether project emissions would be under the General Conformity Trigger Levels. Because of the small scale of the project, several simplifying assumptions were applied in performing the calculations to prepare a worst-case analysis. The actual emissions would most likely be much lower, but in no case above the calculated values. For instance, the load factor is the average percentage of rated horsepower used during a source’s operational profile. To simplify the calculations, the Corps used a worst-case estimate of 1.0, or 100 percent, for all equipment. The Corps used 12 hours per day as worst-case hours of operation for most equipment. The Corps used the total construction duration minus non-work days (i.e. holidays, weekends, and weather days) to estimate days of operation, rather than the specific days of operation for each piece of equipment. Based on these calculations, the worst-case NOx emissions were 87.79 tons and the worst-case VOC emissions were 12.41 tons. In both cases, the total construction emissions were below the General Conformity Trigger Levels.

Detailed calculations (i.e. not worst case) for several projects of similar scale in the Corps of Engineers, Philadelphia District (small navigation, emergency streambank stabilization, and ecosystem restoration projects in New Jersey, and a road maintenance project in Delaware) had calculated emissions well below the 100 tons per year threshold. Table 6.8-1 summarizes the emissions estimates for these 4 projects. Detailed calculations for the Milford Pond dredging project would be likely to have values closer to this range. Appendix L contains the equipment list for the Milford Pond Project, and the calculations and listing of equipment for it and the 4 projects in the Philadelphia District.

Table 8.10-1
Estimated Project Emissions for Ozone at 4 Corps of Engineers Projects located in Severe Non-Attainment Areas

Project	Location	Type	Maximum Pollutant (tons) NOx	VOCs
Wills Hole Thorofare	New Jersey	Small Navigation-Dredging	9.80	0.25
Barnegat Bay Dredged Hole #6	New Jersey	Ecosystem Restoration	19.90	0.36
Manasquan River at Bergerville Rd	New Jersey	Streambank Stabilization	0.69	0.10
Summit Bridge Road Maintenance	Delaware	Road Maintenance	5.01	0.71
1 Combined totals:			35.40	1.42
Multiple of 2 combined totals (tons):			70.80	2.84

The total estimated direct and indirect emissions that would result from the dredging of 45 acres of Milford Pond are below the General Conformity trigger levels of 100 tons per year of NOx and 50 tons per year of VOCs.

It should be noted that the above calculations were conducted for the previously proposed alternative of dredging 45 acres of the pond with disposal of Dilla Street which would have required additional handling of the material (using dump trucks and excavators) and processing/dredging almost twice the amount of material. The existing project will involve dredging less than half of the material previously proposed, and will not involve additional transport and handling of it once it has been pumped to the wetland creation area. In addition the time required for dredging will be less, resulting in fewer emissions than those calculated above. Therefore due to the lower emissions expected in this project as well as the fact that Milford is considered to be in an ozone designation area that is considered “unclassifiable/attainment” the conformity rule is considered to be non-applicable for this project.

J. Farmland Soils

Due to the lack of prime agricultural soils or other significant farmland soils, and the lack of active agriculture within the project area, there will be no impact to farmland soils as a result of this project.

K. Flooding

The restoration of Milford Pond as presently proposed is not anticipated to have any significant effects on flooding within the vicinity. The dredging work will affect primarily land under water and will only slightly decrease the available flood storage associated with Milford Pond with the construction of the wetland. Although the pond’s volume will be increased by the restoration process, the flood attenuation characteristics of the pond will not change, as all volume changes will occur below the normal pool elevation.

However, although the material will be removed from the deeper areas of the pond, it will be placed back into the pond in the shallow area northwest of Clark Island, filling in approximately of 30 acres, by returning approximately the same volume of sediment to the pond. In addition, the wetland creation will involve the construction of several islands, which will emerge above the existing water level of the pond. Therefore, the net change in the volume of the pond will be only slightly greater than before the dredging due to the redistribution of the sediment to the northwestern area of the pond and the construction of the islands above the water level.

Although the net volume will be relatively unchanged, there will be some reduction to the existing flood storage capacity of the pond, due to the reduction in the total available surface area by the increased reduced depth of the disposal area, where the islands will be formed above the existing water level elevation, and the entire area of sediment deposition will be raised to the existing water elevation or slightly above it. This slight loss of surface area will result in an increase of 0.2 feet during moderate flood/or rain events, however it will not be changed for the 10 year flood event. In addition the banks of the pond rise steeply along its edges in the areas abutted by residential property, so the small increase during moderate rain events is not expected to significantly increase overall flood damage risk to the abutting properties. In addition, the normal operation of the dredge on Milford Pond, including discharge pipelines to the dewatering site, will not contribute to flooding.

VI. Cumulative Impacts

The current degraded condition of Milford Pond is a direct result of the adverse cumulative impact of cultural development within the watershed that has contributed nutrients and sediments into the pond basin. The proposed project would address these cumulative impacts in a restoration program, designed to provide long-term improvements to the habitat of the pond. In addition to the proposed restoration efforts to be undertaken as described within this environmental documentation, the Town is seeking additional remedial measures designed to ensure the enhancement and preservation of the long-term benefits of the restoration program. As part of its overall efforts to restore Milford Pond, the Town of Milford is actively working to preserve Milford Pond through a combination of water quality improvement projects within the 5000±-acre watershed, aggressive regulation of storm water runoff for new development with the watershed to Milford Pond, and via public education opportunities. In a July 2000 “Report On the Proposed Restoration Project for Milford Pond” (BEC 2000), a Storm Water Management Program component was recommended. Twenty-one storm water outfalls that discharge to Milford Pond were assessed and evaluated relative to the installation of various storm water Best Management Practices (BMPs) including sediment forebays, inlet/outlet modifications. It was recommended that 10 storm water outlets, which were the ones suitable for BMP construction, be reconstructed with hydrodynamic particle separators, sediment chambers, and open sedimentation basins. In addition, the Town of Milford is actively regulating development activities within the watershed to require the implementation of storm water management features on all new development. Further, in concert with other programs such as the Charles River

Watershed Association, the Town actively works through schools, the Conservation Commission, and other organizations to educate the public on the importance managing storm water pollution at the source through proper use or reduction in use of fertilizers and vegetative plantings**.**

The proposed dredging of Milford Pond, in association with the proposed storm drain/sediment controls discussed above, are expected to have long term positive effects on the ecosystem of Milford Pond. The dredging of the pond is expected to remove the nutrient rich fine sediment that has accumulated there. This sediment has reduced the maximum water depth to approximately 2 feet and created an environment conducive to the proliferation of dense vegetation, which has eliminated most of the open water habitat. The dredging is expected to restore deepwater fish habitat and open water waterfowl habitat. When done in conjunction with the proposed stormwater controls, the inflow of additional sediment into the pond will be significantly reduced, maintaining the restored ecosystem for a longer period of time. Over time, it is anticipated that the deepened pond will allow the proliferation of a more balanced warmwater fish assemblage, where the deeper areas provide for better over-wintering of the larger predator species (i.e largemouth and calico bass) by reducing the potential water quality stresses which occur during the winter in shallow ponds. These would include dissolved oxygen depletion in the shallow water column, resulting from the biological activity occurring in the organic rich sediments, as well as lower pH from reduced photosynthesis. The improved water quality would benefit all species of fish, not only the larger predators. In addition, the deeper areas would provide improved summer fish habitat, providing cooler areas for resting and feeding, while maintaining the shallows for nursery.

The removal of the dense areas of aquatic macrophytes and deepening of the pond will also restore dabbling and open water resting habitat for waterfowl. Currently, most of the open water in the pond becomes choked with vegetation early in the summer, which physically limits its use by waterfowl, which are unable to easily swim through the dense cover. The removal of the excess vegetation is expected to improve the waterfowl habitat by providing the increased dabbling and open water resting areas, which will have an overall positive long term effect on the ecosystem.

The creation of the emergent marshland with the dredged material is expected to provide additional nesting habitat for the four species of state listed waterbirds, while restoring the historic Atlantic white cedar to the pond. This is expected to restore a unique habitat to Milford Pond that historically existed in that location.

It is expected that there will be minimal negative cumulative effects from the proposed dredging of Milford Pond. The existing water level will be maintained, which will avoid the impacts associated with drawdown of the pool. The use of silt curtains will contain the suspended solids within the areas of active dredging and it is likely that most of the motile fish and wildlife species will avoid these areas. The existing fish and invertebrate populations occupying the dredging areas will be temporarily displaced to other areas, however they are expected to return and repopulate once the dredging has been completed. Additional dredging is not anticipated for several years, which will minimize future disturbance to the restored habitat and fish and wildlife populations.

Other activities, which could potentially have cumulative negative effects on the pond, include maintenance of the dam, and weed harvesting, which may be necessary in the future. Construction activities associated with dam maintenance would be confined to the area of the dam itself, and if done without lowering the water level would be unlikely to cause significant negative impacts to the ecosystem since the area would be contained using a cofferdam. Weed harvesting would be done systematically using a mechanical harvester, and would be limited to selected areas in order to minimize negative impacts. In addition, invasive species could become established in the restored wetland if the planted vegetation fails to become established and/or post construction monitoring or maintenance are not conducted as required. However, monitoring and maintenance plans are expected to be implemented for the project to ensure that the wetlands do become established with native vegetation as well as the Atlantic white cedars. Invasive species control may be necessary but this would have an overall positive effect on the project. Therefore it is unlikely that there will be significant cumulative impacts resulting from the dredging and other maintenance activities, which may be conducted at Milford Pond.

VII. Actions Taken to Minimize Impacts

This section addresses mitigation standards, which will be implemented to avoid, limit, or offset anticipated impacts associated with the dredging program and sediment processing.

A. Minimizing Turbidity -To minimize potential for increases in turbidity during hydraulic and/or mechanical dredging operations, a dredge outfitted with a cutterhead or bucket specifically designed to minimize turbidity in the dredging area will be used, and the dredge will be properly operated under methods that have been shown to control excess turbidity. A silt curtain will be placed downstream from the dredging operation in order to minimize downstream turbidities.

The dredge pipeline transporting the sediment slurry to the disposal area will be a continuous high-density polyethylene flexible pipeline with fused, watertight joints that do not have the potential for accidental release of sediment. Sediment containment structures (e.g., coir rolls) will be used to create the containment area for the dredged material, which will allow for the filtering of any excess water through the tube as it percolates back into the pond, reducing the amount of suspended solids that could return to the pond the pond.

B. Preventing Contaminant Releases - Prior to the start of dredging operations, the Contractor will be required to prepare and have approved a written fuel and oil containment and spill response plan which must address the activities to be required of the Contractor in response to an oil or fuel spill or leak from the dredging plant. An adequate spill response kit will be required on all craft at all times and will be replenished promptly if used. Additional protection of Milford Pond's water quality and wildlife population will be provided by the use of natural, fully bio-degradable vegetable oils in lieu of synthetic or petroleum oils for operation of all hydraulic equipment associated with the dredging plant.

C. Timing of Project and habitat avoidance - Construction activities are expected to be conducted within one construction season (Spring through Fall, with preliminary work done in the previous fall) in order to reduce exposure of listed species to dredging activities. Buffer zones are planned between the designated State-listed species habitat and the dredging and disposal areas.

D. Construction Monitoring of Aquatic Species– Before and during the wetland construction, the area will be surveyed for turtles and any visible amphibians. These will be re-located (according to established protocols) to areas of the pond outside of the wetland boundary to avoid entrapment and or suffocation by the inflowing sediments. During the construction, the inside perimeter of the sediment detention structures will be surveyed daily for displaced reptiles, amphibians and visible fish species. When possible these will be collected and relocated outside of the wetland boundary area.

E. Preventing the Spread of Invasive Species -As noted a turbidity curtain will be placed around the dredge in order to collect fragments of milfoil or other invasive species that may become free floating, uprooted or cut as a result of the dredging. These fragments will be collected and disposed of in order to prevent their being transported downstream and becoming established in the watershed.

F. Invasive Species Control in Constructed Wetland Area/Post Construction Monitoring – Following construction, the constructed wetland will be revegetated with native vegetation. The area will be monitored for invasive species, and if found these will be controlled and/or removed. In addition planted vegetation will be monitored and replanted if necessary.

G. Construction Noise Reduction - Potential construction activity noise associated with the dredged material processing site will be mitigated by requiring the contractor to use mufflers on all of the construction equipment to maintain noise at or below 60 decibels (dBA) at the perimeter of the project. Furthermore, work will be limited to normal daytime operational hours during weekdays only. This will limit the impact to neighboring residential communities.

H. Prevention of Unauthorized Access to Wetland Area. - In order to avoid an “attractive nuisance,” the sediment disposal site/wetland construction site as well as the dredging areas and access points will be posted to discourage unauthorized entry and further ensure public safety.

VIII. Coordination

During the project analysis, the Corps of Engineers coordinated with multiple parties in order to ensure input was received from Federal, State, municipal, and public interest groups. Such groups included USFWS, EPA, MA DEP, MA DFW, MA Natural Heritage and Endangered Species Program, MA Historic Commission, MA DEM, City of Milford, and the Milford Pond Restoration Committee. Coordination efforts were made during the initial environmental analysis conducted between 2001 and 2005. The second coordination effort was conducted during the revised environmental analysis that addressed the alternative of beneficially reusing the dredged material to create additional emergent wetland habitat.

A. Personal Communication, 2001 to 2014

Personal Communication during project coordination included the following persons:

John Kennelly, U.S. Army Corps of Engineers, Concord, MA
Townsend Barker, U.S. Army Corps of Engineers, Concord, MA.
Greg Billings, U.S. Army Corps of Engineers, Concord, MA.
Ben Piteo, U.S. Army Corps of Engineers, Concord, MA.
Siamac Vaghar, U.S. Army Corps of Engineers, Concord, MA.
Mike Tuttle, Project Manager, U.S. Army Corps of Engineers, Concord, MA.
Adam Burnett, Project Manager, U.S. Army Corps of Engineers, Concord, MA.
Michael Penzo, Marin Environmental, Inc., Wakefield, MA.
Michael Santora, P.E., Former Milford Town Engineer, Town of Milford, MA.
Vonnie Reis, P.E., Milford Town Engineer, Town of Milford, MA.

B. First Site Visit, 2002

An Interagency Coordinated Site Visit was held on May 7, 2002. The following personnel were in attendance:

Attendee	Organization
Mike Tuttle	U.S. Army Corps of Engineers
Greg Billings	U.S. Army Corps of Engineers
Mike Santora	Milford Town Engineer
Ken Levitt	U.S. Army Corps of Engineers
Bob Buckley	Milford Conservation Commission
Dave Pincumbe	U.S. Environmental Protection Agency
Ed Reiner	U.S. Environmental Protection Agency
Bob Rinaldi	MA Dept. of Environmental Mgt., Office of Waterways
Peg Savage	Charles River Watershed Association
Anthony A. Grillo	Town of Milford citizen
Achille Detaleri	Town of Milford citizen
Tom Jenkins	Baystate Environmental Consultants, Inc.
Ben Piteo	U.S. Army Corps of Engineers
Siamac Vaghar	U.S. Army Corps of Engineers
John Kennely	U.S. Army Corps of Engineers
John Seaver	Town of Milford Selectman
Larry Dunkin	Milford Town Planner
Shelly Leclaire	Milford Highway Surveyor
Robert Andreano	Milford Tax Collector (retired)
Louis P. Paxento	Milford Capital Planning
Emilio E. Diotalevi	Milford Pond Restoration Committee member
Denise Marie Mize	The Milford Daily News
Anthony DeLuca	Milford Building Commissioner
Reno DeLuzio	Milford Pond Restoration Committee member
Frank R. Andreath Sr.	Milford Pond Restoration Committee member
Dino DeBartolomeis	Town of Milford Selectman
Debra Atherton	Office of Senator Moore
Robert N. DeMarco Jr.	Milford Pond Restoration Committee member
Marie Partenti	State Representative

C. Correspondence, 2002-2005

1. Coordination Letters, 2002-2005

For the preparation of the 2005 Environmental Assessment, project coordination letters were mailed to Massachusetts and Federal agencies, pursuant to the Federal Fish and Wildlife Coordination Act, Federal Endangered Species Act, and the National Historic Preservation Act. Organizations receiving correspondence include the following:

Massachusetts Department of Environmental Protection
Massachusetts Historical Commission
U.S. Fish and Wildlife Service

Copies of pertinent letters are included in Appendix A.

2. First Public Notice, 2004

A Public Notice describing the project was distributed on December 6, 2004. A copy was included in the 2005 Milford Pond Aquatic Habitat Restoration Environmental Assessment.

3. Distribution of the 2004 Draft Environmental Assessment Report

Copies of the 2004 draft Milford Pond Aquatic Habitat Restoration Environmental Assessment were available at the Milford Town Hall and Milford Town Library in Milford Massachusetts.

4. Correspondence Received 1999 – 2003

Copies of Correspondences received during the first analysis period culminating with the 2005 Environmental Assessment were included in 2005 Milford Pond Aquatic Habitat Restoration Environmental Assessment. Correspondents included:

Cindy L. Campbell, Environmental Review Assistant, MA Division of Fisheries and Wildlife, July 22, 1999.
Christina Vaccaro, Environmental Review Assistant, MA Division of Fisheries and Wildlife, April 12, 2002.
Edward L. Bell, Senior Archaeologist, MA Historical Commission, December 8, 2000.
Dino DeBartolomesis, Milford Board of Selectmen, Milford, MA, September 10, 2001.
Yvonne Unger, Environmental Analyst, MADEP, May 13, 2002.
David M. Webster, Director, Massachusetts State Program Office, USEPA, May 29, 2002.
Edward L. Bell, Senior Archaeologist, MA Historical Commission, March 5, 2003.
Philip Morrison, Wildlife Biologist, US Fish and Wildlife Service, May 13, 2002.

<u>ENF Comment Letters</u>:
Edward L. Bell, Senior Archaeologist, Massachusetts Historical Commission, December 8, 2000.
Eric Worrall, Deputy Regional Director, Massachusetts Department of Environmental Protection, December 18, 2000.

Peggy Savage, Environmental Scientist, Charles River Watershed Association, December 12, 2000.
Michael Santora, P.E., Town Engineer, Milford, MA, November 29, 2000.
Reno DeLuzio, Town Planner, Milford, MA, December 6, 2000.
Anthony F. DeLuca, Jr., CBO/Building Commissioner, Milford, MA, December 4, 2000.
Michael A. Giampietro, Milford Conservation Commission, December 4, 2000.
Michael J. Bresciani, Park Director, Milford, MA, December 5, 2000.
Louis J. Celozzi, Milford, MA, December 4, 2000.
Richard Swift, Milford, MA, December 7, 2000.
Nazzareno Baci, Park Commissioner, Milford, MA, December 6, 2000.
Steven Janock, Milford, MA, December 6, 2000.
Anthony Gillo, Milford, MA, December 12, 2000.
Frank Andreotti, Milford, MA, December 8, 2000.
Ceasar G. Luzi, Milford, MA, December 10, 2000.
John R. Niro, Milford, MA, December 11, 2000.
Phyllis A. Ahearn, Milford, MA, December 9, 2000.
Timothy R. Sweeney, Milford, MA, December 10, 2000.
Gerald M. Moody, Milford, MA, December, 2000.
Matthew J. DeTore, Milford, MA, December 7, 2000.
Michael J. DeTore, Milford, MA, December 7, 2000.
Steven A. Matos, Milford, MA, December 1, 2000.
Donna Horrigan, Milford, MA, December 5, 2000.

D. Second Coordination Effort 2011 - 2014

Additional Coordination was conducted in 2011 to 2014 to address the alternative of beneficially reusing the dredged material to create additional emergent wetland habitat.

1. Second Site Visit, 2011

A coordinated site visit occurred on August 23, 2011. The following people were in attendance:

A second Interagency Coordinated Site Visit was held on August 23, 2011 (See Appendix C). The following personnel were in attendance:

Attendee	Organization
Adam Burnett	U.S. Army Corps of Engineers
Kenneth Levitt	U.S. Army Corps of Engineers
Ben Piteo	U.S. Army Corps of Engineers
Larry Oliver	U.S. Army Corps of Engineers
Grace Bowles	U.S. Army Corps of Engineers
Mike Santora	Milford Town Engineer
Vincenzo Valastro	Milford Finance Committee
Dino DeBartolomeis	Town of Milford Selectman
Barbara Auger	Town of Milford Treasurer
David Condrey	Milford Water Company

Reno DeLuzio	Milford Pond Restoration Committee member
Ed Reiner	U.S. Environmental Protection Agency
Jim Sprague	MA DEP
John Fernandes	MA State Representative
Elis Leduc	Charles River Watershed Association
Tom Jenkins	Baystate Environmental Consultants, Inc.
Kevin Rudden	Milford Town Crier
Brian Benson	Milford Daily News
Sean Riley	Office of State Senator Richard Moore
Virginia Purcell	Office of U.S. Congressman Richard Neal

2. Coordination Letters Sent in 2011

Coordination letters were sent to the following people concerning the wetland construction alternative on July 28, 2011 (See Appendix C):

Federal

Mr. Ed Reiner
U.S. EPA Region 1
5 Post Office Square
Mail Code 0EP06-1
Boston, MA 02109- 3912

Mr. Matt Schweisberg
Wetlands Protection Unit
U.S. EPA New England, Region 1
5 Post Office Square – Suite 100
Boston, Massachusetts 02109-3912

Mr. Mel Cote
U.S. EPA New England, Region 1
5 Post Office Square
Mail Code: OEP06-1
Boston, Massachusetts 02109-3912

Mr. Tom Chapman
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087

Mr. Peter Colosi
Assistant Regional Administrator
for Habitat Conservation
National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930-2276

State

Mr. James Sprague
Massachusetts Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108

Mr. Ken Chin
Massachusetts Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108

Mr. Martin Suuberg, Regional Director
Massachusetts Department of Environmental Protection
Central Regional Office
627 Main Street
Worcester, Massachusetts 01608

Mr. Kenneth L. Kimmell, Commissioner
Massachusetts Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108

Mark Tisa Ph.D
Massachusetts Division of Fisheries and Wildlife
One Rabbit Hill Road
Westborough, Massachusetts 01581

Thomas French Ph.D
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
One Rabbit Hill Road
Westborough, Massachusetts 01581

Rob Deblinger Ph.D
Massachusetts Division of Fisheries and Wildlife
One Rabbit Hill Road
Westborough, Massachusetts 01581

Mr. Richard Hartley
Massachusetts Division of Fisheries and Wildlife
Field Headquarters
1 Rabbit Hill Road
Westborough, Massachusetts 01581

Mr. Bill Davis
Central District
Massachusetts Division of Fisheries and Wildlife
211 Temple Street
West Boylston, Massachusetts 01583

3. Second Public Notice, 2014

A public notice was released on January 22, 2014 concerning the wetland construction alternative. A copy is included in Appendix J.

4. Responses to Comments on the 2014 Public Notice

Telephone and E-mail Comments on the Public Notice were received from the following agencies and citizens.

1. Ed Reiner
U.S. EPA Region 1
5 Post Office Square
Mail Code 0EP06-1
Boston, MA 02109- 3912
(E-mail 2/20/2014 and follow-up telephone call).

Comment: Ed Reiner asked if dam removal was considered as one of the alternatives, since there would be interest in establishing and/or restoring fish passage to Milford Pond from the Charles River since river herring historically occurred in the river and currently pass upstream in the lower sections of the Charles River. Dam removal would help to allow these fish to pass upstream into Milford Pond.

Response: The dam removal alternative is discussed in Section III. D. of this EA. Reasons that this alternative was not selected include:

1) The fact that the existing dam was built on a bedrock ledge that previously created an impoundment which supported the historic cedar swamp. Therefore this ledge may have historically functioned as an upstream migration barrier preventing or hindering the passage of many anadromous species into Milford Pond (Cedar Swamp Pond).

2) The water level of the existing impoundment created by the dam has allowed the formation of an extensive area of emergent cattail marsh which provides nesting and

forage habitat for four state listed species of water birds (i.e. Pied billed Grebe, Common moorhen, King rail, and Least bittern). If the dam is removed, the reduction of the water level would eliminate much of this emergent marshland and open water habitat, which would be expected to negatively affect these four species which rely on the emergent marsh as well as open water to forage and nest.

3) The town of Milford obtains much of its water from the Clark Island Wellfield. Water from the pond contributes to the underlying aquifer from which the town wells draw their water. If the water level of the pond is reduced, then impacts to the recharge rate of these wells could occur, reducing the amount drinking water provided by these wells and impacting the water supply for the town.

2. Maria Tur
U.S. Fish and Wildlife Service
New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
(Telephone Call 3/28/2014)

Comment. Maria Tur asked what the plans were to prevent the problem from recurring, and how the project would be maintained. What will be done in the future to reduce the inflow of sediment to the pond, as well as prevent and/or reduce the infestation of the pond by invasive species?

Response. As part of the requirements for the maintenance of the project by the town, and Operation and Maintenance plan will be prepared that will address how to prevent and control the spread of milfoil as well as other potential invasive species that could negatively affect the habitat in the pond (i.e. phragmites, purple loosestrife, knotweed, etc.). In addition the town is being required to update their stormwater management plan and best management practices (BMPs) to include ways of intercepting sediment that is washed into Milford Pond from the storm drains. This is expected to reduced the future sediment input into the pond, as well as the associated nutrients that contribute to the ponds eutrophication. In addition the restoring of the 12 foot depths to a larger area of the pond will inhibit the rooting of many of the invasive rooted aquatic vegetation species (i.e. milfoil) by providing a larger area of water that are too deep for many of these plants to root.

3. Marcy Setter, Milford MA
(E-mail February 13, 2014)

Comment. Marcy Setter supports the project stating that it “sounds like a very long over due project and very good in the long term for wildlife in the area.” She asked if the project would start this year, or is it still in the planning stages?

Response. The project is proposed to start in the fall of 2014, and stop for the winter, resuming again in the spring of 2015 and continuing through the summer. It is anticipated that it will be completed prior to the winter of 2015.

3. Gregg Johnson
Chairman, Capital Improvement Committee (Town of Milford)
Town Meeting Member (Town of Milford)
20 Howard St., Milford, MA 01757-3617
E-mail February 22, 2014 3:43 AM

Comment: The comment concerned the existence of a deep water area of the pond near the public boat launch, and the fact that dredging will occur in the southern section of the pond, and whether or not the two deep areas would be connected (see full text of email in Appendix D).

Response: The proposed dredging plan is expected to connect these two deepwater areas of the pond..

4. Edward R Eck
8 Meade St
Milford MA 01757
E-mail January 28, 2014 8:23 PM

Comment: (Full text of comment can be found in Appendix D). The comment requested a better photo of the pond. Edward Eck also asked about the noise from the dredging operation and how much odor could occur from the material. In addition he asked about clearing the upstream channel of the Charles River and if anything will be done to eliminate the invasive species along the path and in the channel. He also asked if the plan would affect the current flood control zones.

Response: The noise would be expected to be that of a diesel engine operating from approximately 7:00 A.M. to 7:00 P.M. 6 days a week. This would last for the duration of the project (i.e. April – September) for one season until the project is completed. Odors are difficult to predict, however it is assumed that in areas where there are anoxic sediments, some odor would occur. These also would be temporary, lasting for the duration of the project. Since dredging would not occur during the evening, associated odors would most likely be reduced or non-existent during the time of non-dredging. The upstream section of the channel is not planned to be dredged or cleared in this project. However, an operation and maintenance plan will be provided to the town which will address the control of invasive species in the water and along the edges of Milford Pond. The existing plan is not expected to significantly affect flood storage capacity of the pond (See Section V.C1 of this Environmental Assessment for further discussion).

The remaining comments/questions on the public notice were from dredging contractors, requesting additional information on the project including anticipated starting dates. These questions by the individuals representing the dredging contractors were answered by Adam Burnett, either by e-mail or telephone.

IX. References/Literature Cited

Baystate Environmental Consultants, Inc. 2000. "Environmental Notification Form on the Restoration of Milford Pond, Milford, Massachusetts." Town of Milford, Milford Pond Restoration Committee.

Baystate Environmental Consultants, Inc. 2000. "Report on the Proposed Restoration Project for Milford Pond, Milford, Massachusetts." Town of Milford, Milford Pond Restoration Committee.

Beavers Challenge Suburbs. Boston Globe. Globe Newspaper Company. July 3, 2011. Jaclyn Reiss Globe Correspondent. http://www.boston.com/news/science/articles/2011/07/03/beavers_challenge_suburbs/?page=2 . Website Accessed January, 2014.

Carr Research Laboratory, Inc. 1979. Options for Reclamation of Cedar Swamp Pond, Milford, Mass.

Commonwealth of Massachusetts, Division of Employment and Training, 2001. DET Data for Milford. www.detma.org.

DHCD. 2002. Milford Community Profile.

EOEA. 2002. The Environmental Justice Policy of the Executive Office of Environmental Affairs. www.state.ma.us/envir/ej/environmentaljustice.htm.

IEP. 1984. "Milford Landfill Hydrogeologic Assessment."

IEP, Inc. and Camp Dresser, and McKee, Inc. 1986. "Cedar Swamp Pond, Milford, MA Diagnostic/Feasibility Study Final Report" Town of Milford.

Federal Emergency Management Agency (FEMA). January 5, 1984. "Flood Insurance Study", with mappings.

Groundwater Associates. 1987. "Preliminary Hydrogeologic Report on the Clark Island Well Field, Milford Massachusetts."

Marin Environmental, Inc. 2002. Milford Pond Hydrogeologic Evaluation. June 25, 2002.

Massachusetts Department of Environmental Protection, Division of Watershed Management (MADEP). 1998. "Charles River Watershed 1997 and 1998 Water Quality Assessment Report.

MA DEP, 2008. Charles River Watershed 2002-2006 Water Quality Assessment Report. Massachusetts Department of Environmental Protection, Division of Watershed Management Worcester, Massachusetts. April, 2008.

Massachusetts Contingency Plan (MCP) at 310 CMR 40.000, MCP Method 1: Soil Category S-1 Standards. http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/mcp-method-1-soil-category-s-1-standards.html. Website accessed 2/12/2014.

Massachusetts Contingency Plan (MCP) at 310 CMR 40.000, MCP Method 1: Soil Category S-2 Standards. http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/mcp-method-1-soil-category-s-2-standards.html. Website accessed 2/12/2014.

Massachusetts Contingency Plan (MCP) at 310 CMR 40.000, MCP Method 1: Soil Category S-3 Standards. http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/mcp-method-1-soil-category-s-3-standards.html. Website Accessed 2/12/2014.

Massachusetts GIS Maps

Massachusetts Natural Heritage and Endangered Species Program (NHESP). 1986. “Rare and Endangered Wildlife Fact Sheets-Least Bittern *(Ixobrychus exilis)*.”

Massachusetts Natural Heritage and Endangered Species Program (NHESP). 1986. “Rare and Endangered Wildlife Fact Sheets- King Rail *(Rallus elegans)*.”

Massachusetts Natural Heritage and Endangered Species Program (NHESP). 1986. “Rare and Endangered Wildlife Fact Sheets-Common Moorhen *(Gallinula chloropus)*.”

Massachusetts Natural Heritage and Endangered Species Program (NHESP). 1990. “Rare and Endangered Wildlife Fact Sheets-Pied-billed Grebe *(Podilymbus podiceps)*.”

Massachusetts Natural Heritage and Endangered Species Program (NHESP). 2000-2001. “Massachusetts Natural Heritage Atlas.”

Massachusetts Surface Water Quality Standards. 314 CMR 4.0. Division Of Water Pollution Control, as amended December 2013. Website version http://www.mass.gov/eea/docs/dep/service/regulations/314cmr04.pdf. Accessed January, 2014.

Metcalf & Eddy. 2000. “Draft Environmental Impact Report for Utilization of Louisa Lake Overflow for Public Water Supply.” Milford Water Company.

Metcalf & Eddy. 2001. “Final Environmental Impact Report for Utilization of Louisa Lake Overflow for Public Water Supply.” EOEA#11394.

Town of Milford. 2002. Milford, Massachusetts Community Profile. www.milford.ma.us.

United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 1998. "Soil Survey of Worcester County, Massachusetts, Southern Part."

United States Army Corps of Engineers (USACE), New England District, Final Detailed Project Report and Environmental Assessment for the Aquatic Habitat Restoration of Milford Pond, Milford, Massachusetts, May 2005

Weston and Sampson. 1991. "Phase 1 Landfill Study of the Milford Landfill."

Weston and Sampson. 1994. "Comprehensive Site Assessment Report for the Milford Landfill."

Weston and Sampson. 1997. "Quantitative Risk Assessment, Milford Landfill – Post-Closure Use, Town of Milford, MA."

Whitman and Howard. 1991. "Zone II Delineations for the Godfrey Brook, Clark Island, and Dilla Street Well Fields."

Polyak, K and Webber, L. 2002. Technical Guide for Compliance with the General Conformity Rule. U.S. Army Center for Health Promotion and Preventative Medicine, Directorate of Environmental Health Engineering, Air Quality Surveillance Program.

MA DEP, 2002. Massachusetts Department of Environmental Protection, Division of Air Quality. Website accessed May 31, 2005.
http://www.mass.gov/dep/bwp/daqc/daqcpubs.htm#sip

EPA, 2005. EPA Green Book. Website accessed 5/31/2005.
http://www.epa.gov/oar/oaqps/greenbk/gnca.html#1123

X. Compliance with Environmental Federal Statutes and Executive Orders

1. Federal Statutes

1. Preservation of Historic and Archeological Data Act of 1974, as amended, 16 U.S.C. 469 et seq.

Not Applicable. The project does not affect historic or archaeological resources.

2. Clean Air Act, as amended, 42 U.S.C. 7401 et seq.

Public notice of the availability of this report to the Environmental Protection Agency will constitute compliance pursuant to Sections 176c and 309 of the Clean Air Act.

3. Clean Water Act of 1977 (Federal Water Pollution Control Act Amendments of 1972) 33 U.S.C. 1251 et seq.

A Section 404(b)(1) Evaluation and Compliance Review [**will be**] has been incorporated into this report. An application shall be filed for State Water Quality Certification pursuant to Section 401 of the Clean Water Act.

4. Coastal Zone Management Act of 1782, as amended, 16 U.S.C. 1451 et seq.

Not Applicable. Project is not located in Coastal Zone.

5. Endangered Species Act of 1973, as amended, 16 U.S.C. 1531 et seq.

Coordination with the U.S. Fish and Wildlife Service (FWS) and/or National Marine Fisheries Service (NMFS) has yielded no formal consultation requirements pursuant to Section 7 of the Endangered Species Act

6. Estuarine Areas Act, 16 U.S.C. 1221 et seq.

Not Applicable. This report is not being submitted to Congress.

7. Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12 et seq.

Public notice of availability to this report to the National Park Service (NPS) and Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans constitutes compliance with this Act.

8. Fish and Wildlife Coordination Act, as amended, 16 U.S.C. 661 et seq.

Coordination with the FWS, NMFS, and Massachusetts state fish and wildlife agencies constitutes compliance with the Fish and Wildlife Coordination Act.

9. Land and Water Conservation Fund Act of 1965, as amended, 16 U.S.C. 4601-4 et seq.

Public notice of the availability of this report to the National Park Service (NPS) and the Office of Statewide Planning relative to the Federal and State comprehensive outdoor recreation plans constitutes compliance with this Act.

10. Marine Protection, Research, and Sanctuaries Act of 1971, as amended, 33 U.S.C. 1401 et seq.

Not Applicable. This project does not involve the transportation nor disposal of dredged material in ocean waters pursuant to Sections 102 and 103 of the Act, respectively.

11. National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470 et seq.

Coordination with the State Historic Preservation Office determined that no historic or archaeological resources would be affected by the proposed project

12. National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321 et seq.

Preparation of this report signifies partial compliance with NEPA. Full compliance shall be noted at the time the Finding of No Significant Impact is issued.

13. Rivers and Harbors Act of 1899, as amended, 33 U.S.C. 401 et seq.

No requirements applicable for projects of the Corps of Engineers or programs authorized by Congress. The proposed Aquatic Ecosystem Restoration Project is being conducted pursuant to the Congressionally-approved continuing authority program: Section 206 of the Water Resources Development Act of 1996.

14. Watershed Protection and Flood Prevention Act as amended, 16 U.S.C. 1001 et seq.

No requirements applicable for projects of the Corps of Engineers.

15. Wild and Scenic Rivers Act, as amended, 16 U.S.C. 1271 et seq.

Not Applicable. Site is not a Wild and Scenic River.

2. Executive Orders

1. Executive Order 11988, Floodplain Management, 24 May 1977 amended by Executive Order 12148, 20 July 1979.

> Public notice of the availability of this report or public review fulfills the requirements of Executive Order 11988, Section 2(a) (2).

2. Executive Order 11990, Protection of Wetlands, 24 May 1977.

> Public notice of the availability of this report for public review fulfills the requirements of Executive Order 11990, Section 2(b). All wetlands impacts will be mitigated.

3. Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, 4 January 1979.

> Not Applicable. This project is located within the United States.

4. Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, 21 April 1997.

> Not Applicable. This project would not create a disproportionate environmental health of safety risk for children.

3. Executive Memorandum

Analysis of Impacts on Prime or Unique Agricultural Lands in Implementing NEPA, 11 August 1980.

> Not Applicable. The project does not involve or impact prime or unique agricultural lands.

Page Intentionally Blank

Finding of No Significant Impact

Milford Pond Aquatic Habitat Restoration Project
Milford, Massachusetts

The proposed Federal action involves the dredging of approximately18 acres of Milford Pond in Milford, Massachusetts, in order to deepen the pond to approximately 12 feet and remove the excessive aquatic vegetation and associated sediment with the beneficial re-use of the sediment to create additional emergent wetland in the northwest section of the pond. The excessive vegetative growth has eliminated most of the open water habitat and has degraded water quality in the pond. Work is authorized under Section 206 of the Water Resources Development Act of 1996 (WRDA). Approximately 250,000 cubic yards of fine sediment will be removed from Milford Pond, and placed in a containment area north of Clark Island (in the pond). This will restore open and deepwater habitat to the pond while reducing the amount of nutrient rich sediments, which contribute to the excessive growth of aquatic vegetation. This is expected to benefit both fish and waterfowl. Deepwater areas of the pond will be restored as fish habitat, and water quality is expected to improve due to the removal of the excess vegetation and organic sediment. In addition, open water areas of the pond will be restored for use by waterfowl.

The constructed wetland will be comprise approximately 30 acres and be replanted with native emergent wetland vegetation. In addition, the soil hydrology is expected to be suitable to restore the Atlantic white cedar to the pond, a species that historically inhabited the pond but was extirpated due to the construction of the dam in the in the 1930s and subsequent flooding of its habitat.

The material will be removed using a hydraulic or mechanical dredge, and pumped to the wetland construction/sediment disposal area. The area will be contained by using sediment containment structures which will contain the sediments and allow natural dewatering. Work is expected to be done during October to December in 2014 and March – December of 2015. It is anticipated that the project will be completed in one season. No significant long term or short-term adverse impacts to the environment are anticipated.

My determination of a Finding of No significant Impact is based on the Environmental Assessment and the following considerations:

a. The project will restore a degraded aquatic habitat, and increase the fisheries carrying capacity of the Milford Pond ecosystem and restore a historic cedar swamp.

b. The project will have no known negative impacts on any State or Federal rare or endangered species. The dredging will be limited primarily to the open water areas of the pond, leaving the margins and associated wetlands intact. This will maintain the existing habitat for the state listed King Rail, Common Moorhen, Pied-billed Grebe, and Least Bittern which inhabit the adjacent cattail marsh/emergent wetland. The constructed wetland will be designed to provide additional nesting habitat for these species.

c. The project will have no known negative impacts on any prehistoric archaeological sites recorded by the State of Massachusetts.

d. Sediment loading would be minimized by employing erosion control plans. Detailed erosion control measures will be in place prior to construction activities including those in the water to minimize turbidity.

e. The dredging is not expected to encroach on any of the State-listed threatened or endangered species habitat and a buffer zone will be provided along the perimeter of the habitat. areas.

f. The existing water level in the pond will not be lowered significantly in order to avoid impacts to existing fisheries, waterfowl and adjacent wetland habitat.

Based on my review and evaluation of the environmental effects as presented in the Environmental Assessment, I have determined that the the Milford Pond Aquatic Ecosystem Restoration Project is not a major Federal action significantly affecting the quality of the human environment. Under the Council on Environmental Quality ("CEQ") NEPA regulations, "NEPA significance" is a concept dependent upon context and intensity (40 C.F.R. § 1508.27). When considering a site-specific action like the proposed Milford Pond Aquatic Restoration Project, significance is measured by the impacts felt at a local scale, as opposed to a regional or nationwide context. Thus, the intensity of the impacts is measured here in the local context of the Milford Massachusetts area. The CEQ regulations identify a number of factors to measure the intensity of impact. These factors are discussed below, and none are implicated here to warrant a finding of NEPA significance. A review of these NEPA "intensity" factors reveals that the proposed action would not result in a significant impact—neither beneficial nor detrimental--to the human environment. Hence, an environmental impact statement is not required.

Impacts on public health or safety: The pond dredging and wetland construction will not create a negative effect on public health and safety. Although there will be increased truck traffic along Cedar Street and Dilla Street, it will be on existing roadways during primarily daylight hours, and will last for approximately 4 months through the duration of the project and will cease upon project completion. Other potentially hazardous areas of the work area will be fenced off to prevent public access. In addition, the Clark Island wellfield which provides water for the Town of Milford will not be affected by the project operations. The project will improve the natural ecology and water quality of the pond. The dredged material has been tested and is suitable for disposal in the wetland construction area.

Unique characteristics: The design of the wetland restoration restores a unique cedar swamp habitat, as well as increasing rare bird species habitat, while avoiding impacts to existing habitat. This will improve the overall aquatic habitat of the pond. There are no known cultural or historic resources, designated parklands, wild and scenic rivers, or prime farmlands impacted.

Controversy: The concept of "controversy" in NEPA significance analysis is not simply whether there is opposition to the proposal, but whether there is a substantial technical or scientific dispute over the degree of the effects on the human environment. Concerns over the lack of fish passage were expressed by the EPA and U.S. Fish and Wildlife Service. However, these concerns were addressed in the Environmental Assessment. Fish passage would need to be provided at 14 downstream dams before any benefits could be realized at Milford Pond. The Commonwealth of Massachusetts Department of Fisheries and Wildlife Natural Heritage and Endangered Species Program has expressed their support of the project as planned, since it will create additional habitat beneficial to the state listed water bird species currently inhabiting Milford Pond.

Uncertain impacts: The impacts of the proposed project are not uncertain, they are understood based on past experiences the Corps has had with wetland restoration and construction.

Precedent for future actions: The decision here is based upon the facts of the proposed project, and will not create a precedent for future Corps permit decisions, which, like this decision, will be based upon their own merits and their own facts.

Cumulative significance: As discussed in the Environmental Assessment, to the extent that other actions are expected to be related to the proposed pond dredging and wetland restoration, these actions will provide little measurable cumulative impact, certainly not to the level of NEPA significance.

Historic resources: Consultation with the Massachusetts SHPO concluded that the project would not likely affect historic properties eligible for listing on the National Register of Historic Places. A historical and archaeological resource survey, well as a site walk will be conducted for the project site prior to construction to research the likelihood that archaeological deposits may exist and to locate and identify those resources. In addition an observer may be present during construction in order to guide construction activities to avoid adverse effects to potentially significant archeological resources.

Endangered species*:* There are no species present in the project area that are listed pursuant to the federal Endangered Species Act. Coordination is being conducted with the State Natural Heritage and Endangered Species Program office concerning the four state listed water bird species. It is expected that they will concur that the project will benefit these species as well as improve overall aquatic habitat in the pond. In addition, measures will be employed during construction to avoid and minimize impacts to these species (See EA).

Potential violation of state or federal law: This action would not violate federal law, and as will be evidenced by the expected issuance of state wetlands permits and water quality certification, does not violate state law.

Therefore, this project is exempt from requirements to prepare an Environmental Impact Statement.

17 April 14
Date

Charles P. Samaris
Colonel, Corps of Engineers
District Engineer

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS, CONCORD, MA
CLEAN WATER ACT SECTION 404 (b)(1) EVALUATION

PROJECT: **Milford Pond Aquatic Habitat Restoration Project**
.

PROJECT MANAGER: Adam Burnett Phone: (978) 318-8547

FORM COMPLETED BY: Kenneth Levitt Phone: (978) 318-8114

PROJECT DESCRIPTION:

Milford Pond is located in the headwaters of the Charles River in the center of the town Milford, Worcester County, Massachusetts, approximately 1 mile from Interstate 495. The existing shallow pond is approximately 120 acres, and was formed by impounding the Charles River by constructing a dam at an existing bedrock outcrop. This outcrop formed the natural discharge of what was historically a cedar swamp. The proposed project is to dredge approximately 250,000 cubic yards of clean sediment from the pond in order to deepen it to 12 feet, from its existing maximum depth of approximately 5 feet.

The purpose of this project is to improve the aquatic health of the Milford Pond ecosystem. The proposed project will involve dredging of pond sediments using either a hydraulic or mechanical dredge,, and the creation of approximately 30 acres of wetland using the dredged sediments. The dredged material will be disposed of at the northwest corner of the pond in shallow aquatic bed habitat. The constructed wetland will be planted with emergent wetland vegetation as well as Atlantic white cedar trees, a species historically inhabiting the pond.

NEW ENGLAND DISTRICT
U.S. ARMY CORPS OF ENGINEERS, CONCORD, MA
EVALUATION OF CLEAN WATER ACT SECTION 404 (b)(1) GUIDELINES

PROJECT: Milford Pond Aquatic Habitat Restoration Project, Milford MA.

1. Review of Compliance (Section 230.10(a)-(d)).

		YES	NO
a.	The discharge represents the least environmentally damaging practicable alternative and if in a special aquatic site, the activity associated with the discharge must have direct access or proximity to, or be located in the aquatic ecosystem to fulfill its basic purpose.	X	
b.	The activity does not appear to: 1) violate applicable state water quality standards or effluent standards prohibited under Section 307 of the CWA; 2) jeopardize the existence of Federally listed threatened and endangered species or their habitat; and 3) violate requirements of any Federally designated marine sanctuary.	X	
c.	The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, and economic values.	X	
d.	Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem.	X	

2. Technical Evaluation Factors (Subparts C-F).

		N/A	Not Significant	Significant
a. Potential Impacts on Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C)				
	1) Substrate		X	
	2) Suspended particulates/turbidity		X	
	3) Water column impacts		X	
	4) Current patterns and water circulation		X	
	5) Normal water fluctuations		X	
	6) Salinity gradients	X		

		N/A	Not Significant	Significant
b.	Potential Impacts on Biological Characteristics of the Aquatic Ecosystem (Subpart D)			
	1) Threatened and endangered species		X	
	2) Fish, crustaceans, mollusks, and other organisms in the aquatic food web		X	
	3) Other wildlife (mammals, birds, reptiles, and amphibians)		X	
c.	Potential Impacts on Special Aquatic Sites (Subpart E).			
	1) Sanctuaries and refuges	X		
	2) Wetlands		X	
	3) Mud flats		X	
	4) Vegetated shallows		X	
	5) Coral reefs	X		
	6) Riffle and pool complexes	X		
d.	Potential Effects on Human Use Characteristics (Subpart F).			
	1) Municipal and private water supplies		X	
	2) Recreational and commercial fisheries		X	
	3) Water-related recreation		X	
	4) Aesthetics impacts		X	
	5) Parks, national and historic monuments, national seashores, wilderness areas, research sites and similar preserves		X	

3. <u>Evaluation and Testing (Subpart G).</u>

a.	The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)	
	1) Physical characteristics	X
	2) Hydrography in relation to known or anticipated sources of contaminants	X
	3) Results from previous testing of the material or similar material in the vicinity of the project	X
	4) Known, significant sources of persistent pesticides from land runoff or percolation	X
	5) Spill records for petroleum products or designated hazardous substances (Section 311 of CWA)	

	6) Public records of significant introduction of contaminants from industries, municipalities, or other sources.	
	7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	
	8) Other sources (specify)	X
	List appropriate references. Environmental Assessment for Milford Pond Aquatic Ecosystem Restoration Project, Section IV. C.3.	

	YES	NO
b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredged material is not a carrier of contaminants or that levels of contaminants are substantively similar at extraction and disposal sites and not likely to require constraints. The material meets the testing exclusion criteria.	X	

4. <u>Disposal Site Delineation (Section 230.11(f)).</u>

a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material. (Check only those appropriate.)		
	1) Depth of water at disposal site	X
	2) Current velocity, direction, variability at disposal site	X
	3) Degree of turbulence	
	4) Water column stratification	
	5) Discharge vessel speed and direction	
	6) Rate of discharge	
	7) Dredged material characteristics (constituents, amount, and type of material, settling velocities)	X
	8) Number of discharges per unit of time	
	9) Other factors affecting rates and patterns of mixing (specify)	
	List appropriate references. See Environmental Assessment for Milford Pond Aquatic Habitat Restoraiton Project	

	YES	NO
b. An evaluation of the appropriate information factors in 4a above indicated that the disposal sites and/or size of mixing zone are acceptable.	X	

5. Actions to Minimize Adverse Effects (Subpart H).

	YES	NO
All appropriate and practicable steps have been taken, through application of recommendation of Section 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.	X	

List actions taken

1) See Environmental Assessment Section VII.

6. Factual Determination (Section 230.11).

A review of appropriate information, as identified in Items 2 – 5 above, indicates there is minimal potential for short or long term environmental effects of the proposed discharge as related to:		
	YES	**NO**
a. Physical substrate at the disposal site (review Sections 2a, 3, 4, and 5 above)	X	
b. Water circulation fluctuation and salinity (review Sections 2a, 3, 4, and 5)	X	
c. Suspended particulates/turbidity (review Sections 2a, 3, 4 and 5)	X	
d. Contaminant availability (review Sections 2a, 3, and 4)	X	
e. Aquatic ecosystem structure, function and organisms (review Sections 2b and 2c, 3, and 5)	X	
f. Proposed disposal site (review Sections 2, 4, and 5)	X	
g. Cumulative effects on the aquatic ecosystem	X	
h. Secondary effects on the aquatic ecosystem	X	

7. Findings of Compliance or Non-compliance

	YES	NO
The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines.	X	

17 April 14
Date

Charles P. Samaris
Colonel, Corps of Engineers
District Engineer

7. Findings of Compliance or Non-compliance

	YES	**NO**
The proposed disposal site for discharge of dredged or fill material complies with the Section 404(b)(1) guidelines.	X	

Date

Charles P. Samaris
Colonel, Corps of Engineers
District Engineer