



# **Santuit Pond Dam Rehabilitation and Fish Passage Mashpee, Massachusetts Environmental Assessment**

*Prepared for*

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Natural Resources Conservation Service  
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## LIST OF ACRONYMS

APE	Area of Potential Effect
BMPs	Best Management Practices
BVW	Bordering Vegetated Wetland
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CMR	Code of Massachusetts Regulations
DCR	Massachusetts Department of Conservation and Recreation
DEP	Massachusetts Department of Environmental Protection
DFW	Massachusetts Division of Fish and Wildlife
DMF	Massachusetts Division of Marine Fisheries
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	United States Environmental Protection Agency
F.R.	Federal Register
FEMA	Federal Emergency Management Agency
FWS	United States Fish and Wildlife Service
LUW	Land Under Water
MassGIS	Massachusetts Geographic Information System
MCC	Mashpee Conservation Commission
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MHC	Massachusetts Historic Commission
MWPA	Massachusetts Wetlands Protection Act
NAAQS	National Ambient Air Quality Standards
NAVD88	North American Vertical Datum 1988
NEPA	National Environmental Policy Act
NHESP	(Massachusetts) Natural History and Endangered Species Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NO <sub>x</sub>	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PAL	Public Archeology Laboratory

Sf	Square feet
THPO	Tribal Historic Preservation Officer
U.S.C.	United States Code
USDA	United States Department of Agriculture
VOC	Volatile Organic Compounds

## 1. INTRODUCTION

### 1.1 SCOPE OF THE DOCUMENT

Under the National Environmental Policy Act (NEPA)<sup>1</sup>, the federal agencies that fund or propose actions are required to prepare a detailed statement on the environmental impacts that a federal action may have on the quality of the human environment. The Natural Resources Conservation Service (NRCS), an agency within the U.S. Department of Agriculture<sup>2</sup> (USDA), has prepared this Environmental Assessment (EA) pursuant to implementing regulations for NEPA<sup>3</sup>, USDA Department Policy for the NEPA<sup>4</sup>, NRCS Regulations<sup>5</sup>, and NRCS Policy<sup>6</sup>. This EA evaluates the Proposed Action and No Federal Action Alternative, as described in Section 2 of this document.

The format of this EA follows the guidelines set forth in the National Environmental Compliance Handbook (NRCS 2003). Section 2 of this document provides a thorough description of the Proposed Action and No Federal Action Alternatives. The affected environment of the proposed project area is described in Section 3. The affected environment description outlines existing environmental conditions, including land use, air quality, noise, geology and soils, water resources, sediments, vegetation, wildlife resources, aquatic resources, wetland resources, threatened and endangered species, cultural resources, environmental justices, and socioeconomic resources. Section 4 identifies potential environmental consequences of the evaluated alternatives. Section 5 provides a discussion of the alternatives and conclusions. Section 6 provides a list of the preparers who aided in the completion of this EA. Section 7 outlines the federal, state, and local agencies and persons consulted in the preparation of the document.

Restoration of fish passage was previously included in the Cape Cod Water Resources Restoration Project (CCWRRP) Areawide Plan – Environmental Impact Statement (EIS) published in November 2006 (NRCS 2006). The Plan-EIS stated that as individual projects are proposed, further site-specific environmental analysis (i.e., EAs) would be performed and tiered to the Plan-EIS. Since that time, it has been determined that the dam, as well as the fish ladder,

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<sup>1</sup> 42 U.S.C. §4321 *et seq.*

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<sup>3</sup> 40 CFR parts 1500-1508

<sup>4</sup> 7 CFR Part 1b

<sup>5</sup> 7 CFR Part 650

<sup>6</sup> General Manual Title 190, Part 410

need to be rehabilitated. As such, the impacts of the proposed dam rehabilitation were not previously evaluated in the Plan-EIS. Given the overall scope of the original plan (i.e., the Areawide Plan-EIS), the addition of the work to the dam does not rise to the threshold of requiring a Supplemental Plan – EIS. Therefore, in accordance with the Areawide Plan-EIS, and to further meet NEPA requirements due to additional work not specifically included in the Plan-EIS (i.e., rehabilitation of the dam embankment, spillways, etc.), this standalone EA tiered to the Plan-EIS is being prepared to determine if significant impacts would occur from the additional work, or if a Finding of No Significant Impact (FONSI) is appropriate.

The Santuit Pond Dam Rehabilitation and Fish Passage project is included as part of the CCWRRP since the cornerstone of the proposed project is rehabilitation of the fish ladder allowing diadromous fish access to the Santuit Pond upstream of the dam. The program authority for this project is Public Law (PL) 83-566; the funding authority is the American Recovery and Reinvestment Act (ARRA) of 2009.

## 1.2 BACKGROUND

The Santuit Pond area including the dam and adjacent bogs has been in cranberry production since at least the mid-1800s (PAL 2012). The original construction date of the dam is unknown. The area has been in active cranberry production up until at least 2001 when it was purchased by the Cotuit Golf Development, LLC (Cotuit). The Town of Mashpee acquired the land in 2002 after Cotuit failed to successfully develop the area, and ceased commercial production of cranberries. Activity has been limited to upkeep and maintenance of the Santuit Pond Dam.

In February 2008, the Massachusetts Department of Conservation and Recreation (DCR) issued a Certificate of Non-Compliance and Dam Safety Order (see Appendix A) finding the dam to be in poor condition and classifying it as an intermediate size, significant hazard potential structure. Since that time, the Town has been completing required inspections every six months and a Phase II Inspection and Investigation was completed in August 2009 (Weston & Sampson 2009) as required. One of the deficiencies identified in that report is the condition of the primary spillway/fish ladder. The timber structure (i.e., stoplog) is neither hydraulically adequate for the spillway design flood (100 year storm) nor recommended for long term stability. Leakage was observed in several locations and erosion of both the upstream and downstream slopes was undercutting the spillway.

The NRCS is working with federal, state, and local agencies to restore diadromous fish species in Barnstable County, Massachusetts (i.e., Cape Cod). These agencies include the U.S. Fish and Wildlife Service (FWS), U.S. Environmental Protection Agency (EPA), the U.S. Army Corps of Engineers (Corps), and the DCR, as well as the Town of Mashpee, Massachusetts. Restoration of the Santuit Pond Dam, specifically the fish ladder, will allow diadromous fishes, including alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) (collectively referred to as “river herring”) and American eel (*Anguilla rostrata*), access to suitable breeding habitat.

The Santuit River begins at the Santuit Pond in the Town of Mashpee, Barnstable County, Massachusetts (Figure 1, Appendix B), and flows approximately 2.25 miles south where it ultimately discharges into Shoestring Bay. A total of three municipalities, the Towns of Mashpee, Barnstable, and Sandwich are located at least partially within the Santuit Pond watershed. The Santuit River is one of the largest tributaries of Shoestring Bay. Figure 2 (Appendix B) shows the project area on an aerial photograph.

Diadromous fish include both anadromous and catadromous species. Anadromous fish are those which spend most of their adult lives in saltwater and migrate to freshwater streams, rivers, and lakes to reproduce. Catadromous fish are those which spend most of their adult lives in freshwater and migrate to saltwater to reproduce. Santuit Pond supports a population of alewife and American eel (Division of Fish and Wildlife 2007). Similar to many rivers in southern New England, the Santuit River likely once supported an abundance of diadromous fish, including Atlantic salmon (*Salmo salar*), American shad (*Alosa sapidissima*), river herring, and American eel. Settlements along well-known fishing areas along the river probably used these resources as a major component of their diet. As dams and other obstructions were constructed during the Industrial Revolution, it became increasingly difficult for diadromous fish to migrate upstream to spawn in the watershed above those structures. Eventually, the river became obstructed to the point that upstream passage was not available and the historic diadromous fish runs were eliminated or critically imperiled as they could not return to their breeding grounds.

The proposed Santuit Pond Dam Rehabilitation Project would rehabilitate the dam to return it to a safe working condition and allow diadromous fish populations to the headwaters of the Santuit River (i.e., Santuit Pond).

### 1.3 DESCRIPTION OF THE PROPOSED PROJECT

Santuit Pond Dam is an earthen embankment dam located along the southern end of Santuit Pond. The Santuit Pond Dam<sup>7</sup> is classified as an intermediate size, low hazard structure. The dam includes a primary spillway, auxiliary spillway, and fish ladder. Existing site conditions are depicted on drawing number C-1 of the Engineering Drawings (see Appendix C). The original construction date of the dam is not known.

Based on observations and investigations undertaken by Weston & Sampson (2012), the earth embankment does not appear to have an impervious zone (i.e., clay core) or core wall cutoff. Upstream slopes are over-steepened along the normal water line and generally unprotected, except in the vicinity of the spillway structures. Existing crest elevations range from approximately elevation 43.2 North American Vertical Datum 1988 (NAVD88) to elevation 45.1 with an average elevation of 43.6. Downstream embankment slopes range from 1H:1V near the normal water line before flattening out to 4-7H:1V and are generally covered with forest litter, brush, and trees.

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<sup>7</sup> National Dam Id No. MA02445

The primary spillway is a timber structure located near the left abutment. The 6-foot long weir is comprised of a 3-foot wide wooden stop log channel on the right and the 2.5-foot wide fish ladder on the left. The stop logs are generally set at elevation 42.5. The stop log channel discharges onto a timber splash pad with a base elevation of approximately 39.6. The upstream invert of the fish ladder is approximately elevation 42.5. The fish ladder extends into the downstream area approximately 30 feet with a downstream invert of elevation 39.5. Timber retaining walls are located along the downstream face of the dam to the immediate left and right of the primary spillway. Concrete cutoff walls approximately 8 inches thick extend to the right and left of the timber spillway near the upstream side of the embankment. Existing site conditions are depicted on drawing number C-1 of the Engineering Drawings (Appendix C).

The auxiliary spillway is a concrete structure with two stop log inlets and three stop log outlets. The upstream stop log inlets have weir lengths of 3.3 feet and are separated by a concrete pillar which also supports a concrete bridge. The concrete is heavily deteriorated and the stop log slots have been compromised. The three outlets are located approximately 15 feet downstream. Two outlets are approximately 3.3 feet wide and are controlled by steel sheets that have been placed in the stop log slots. Existing site conditions are depicted on drawing number C-1 of the Engineering Drawings (Appendix C).

The outlets of the auxiliary spillway divert into swales that were used to flood downstream cranberry bogs. Discharge from the primary spillway is diverted around the cranberry bogs and becomes the Santuit River.

The project proposes to demolish the existing primary spillway and fish ladder configuration and replace them with a multi pool-and-weir fish passage structure in approximately the same alignment and footprint. The new principal spillway structure is proposed to consist of a cast-in-place reinforced concrete design. The existing auxiliary spillway is also proposed to be demolished and removed. Proposed improvements to the embankment include demolition of the existing embankment to below surface grades and reconstructing the embankment with compacted soil up to proposed finished grades. The embankment crest will be leveled/raised to a minimum width of 8 feet. The upstream slope will be regraded to a maximum slope of 2.5:1V and protected with a riprap blanket. The downstream slope will be graded no steeper than 3H:1V and revegetated.

#### **1.4 PURPOSE AND NEED**

The Santuit Pond Dam and Fish Ladder currently does not comply with state dam safety criteria. Additionally, the existing fish ladder at the dam is in disrepair and is currently not in an operable condition which prevents diadromous fish access to suitable habitat upstream of the dam in the Santuit Pond. In order to restore diadromous fish access to the pond, the fish ladder and the dam need to be rehabilitated. The Project supports the purposes of Public Law 83-566 because Cape Cod has significant land or water management problems that can be solved or alleviated by measures for water quality management and public fish and wildlife.

Previous inspections of the dam between 1999 and 2011 have noted several deficiencies (Weston & Sampson 2012). Several areas of leakage and/or seepage and erosion have been observed in various areas of the dam including the embankment, auxiliary spillway, and primary spillway in addition to other structural deficiencies noted in the inspection reports. As a result of the deficiencies noted in early reports, the DCR issued a Certificate of Non-Compliance and Dam Safety Order (dated 22 February 2008) to the Town of Mashpee Conservation Commission (MCC), the owner of the dam (Appendix A). Rehabilitation of the dam is required in order to bring the dam into compliance with the Massachusetts dam safety regulations<sup>8</sup>, which will return the dam to a safe operating condition.

Additionally, there is a need to continue to recover native diadromous fish populations that are in significant decline in southern New England. In addition to restoring the dam to a safe working condition, the Santuit Pond Dam Rehabilitation Project will improve and repair the degraded fish ladder at the dam which is currently in poor condition and is not functioning adequately. As such, repair of the fish ladder will restore diadromous fish passage into the Santuit Pond.

The NRCS has recognized the need to direct federal resources to address the decline of critical fish habitats, such as required by diadromous fisheries that were once widespread throughout Massachusetts's watersheds. A precipitous decline in river herring populations since at least 2002 has prompted Massachusetts and many other states to ban the taking of river herring from their waters and has caused the National Marine Fisheries Service (NMFS) to declare river herring as a Species of Concern throughout their range.

NRCS's involvement in the proposed Santuit Pond Dam Rehabilitation Project supports the Commonwealth's restoration priorities. Restoration of the non-functioning fish ladder at the dam will restore fish passage to Santuit Pond and provide diadromous fish access to suitable breeding grounds. Restoration of the dam embankment as well as the fish ladder is necessary in order to maintain the pond and suitable breeding habitat in the upstream impoundment for diadromous fish.

## **1.5 COORDINATION EFFORT**

### **1.5.1 Stakeholders**

The following stakeholder agencies and entities have been contacted in order to solicit input concerning the proposed project:

- Town of Mashpee, Massachusetts
- Massachusetts Department of Conservation and Recreation
- Massachusetts Office of Dam Safety
- Massachusetts Division of Fish and Wildlife (DFW)
- Massachusetts Division of Marine Fisheries (DMF)

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<sup>8</sup> 302 CMR 10.00

- Massachusetts Natural Heritage and Endangered Species Program (NHESP)
- Mashpee Wampanoag Tribe
- Massachusetts Historical Commission (MHC)
- United States Army Corps of Engineers (Corps)
- United States Environmental Protection Agency
- United States Fish and Wildlife Service
- National Marine Fisheries Service
- Federal Emergency Management Agency (FEMA)

Coordination letters and comments received (if any) are provided in Appendix D.

### **1.5.2 Project Sponsors**

The local sponsoring organization of the Santuit Pond Dam Rehabilitation and Fish Passage is the Town of Mashpee. In addition, the Cape Cod Water Resources Restoration Project Watershed Plan and EA, which this project is tiered from, identified three additional project sponsors including the Cape Cod Conservation District, Barnstable County Commission, and the Executive Office of Environmental Affairs, representing the Office of Coastal Zone Management and the Division of Marine Fisheries.

### **1.5.3 Planning Team**

An interdisciplinary planning team provided for the administration of this project through the NRCS nine-step planning process according to the procedures in the NRCS National Planning Procedures Handbook (NRCS 2006). Some of the tasks undertaken by the planning team include preliminary investigations, hydrologic and engineering analysis, economic analysis, formulation and evaluation of alternatives, and preparation of the EA. The planning team included representatives of the NRCS Massachusetts state office, the NRCS National Water Management Center, the Town of Mashpee, and technical consultants under contract to the NRCS or the Town.

### **1.5.4 Public Participation**

As part of the CCWRRP's Areaside Plan-EIS, the Barnstable County Commission's Coastal Resources Committee hosted an initial meeting in Barnstable on 11 October 2001. Support was unanimous for continued development of the CCWRRP to help restore the area's natural resources. Over the next four years local, state, and federal officials were contacted for information and guidance. Several articles were published in newspapers informing the public of the problems and opportunities with restoring degraded salt marshes and anadromous fish runs, and improving water quality for shellfish beds. A public meeting was held on 18 May 2005, to seek public input on the Plan-EIS then in early stages of development.

The CCCD made over 400 mailings to citizens, town officials, and state and federal representatives informing them of the CCWRRP and asking for their opinions and support. The

CCCD and NRCS partnership also met individually with Wampanoag Tribe of Gay Head (Aquinnah) Tribe and the Mashpee Wampanoag Tribe.

### **1.5.5 Agency Consultation**

Consultation under the Endangered Species Act was completed in August 2012 with a letter from FWS indicating that no federally listed threatened or endangered species or critical habitat are present in the project area (refer to Appendix E). It was determined from MassGIS that habitat for a state-protected species lies in the Hop Brook floodplain. Consultation with Massachusetts NHESP indicated that a state-listed species of special concern, the eastern box turtle, has been found in the area (refer to Appendix E). Ultimately, the Town is responsible for completing the consultation and obtaining any permits that may be required.

## 2. DESCRIPTION OF ALTERNATIVES

### 2.1 FORMULATION OF ALTERNATIVES

The following sections describe the proposed alternatives for dam rehabilitation at the Santuit Pond Dam that have been evaluated for this EA. The proposed Alternatives include the Proposed Action and No Federal Action Alternative.

#### 2.1.1 Alternative 1 – Proposed Action

In this Alternative, the existing primary spillway and fish ladder configuration would be demolished and would be replaced with a pool-and-weir fish passage structure in approximately the same alignment and footprint. The new principal spillway structure would consist of a cast-in-place reinforced concrete design. The existing auxiliary spillway would be demolished and removed. Engineering Plans depicting the Proposed Action are provided in Appendix C.

Proposed improvements to the embankment include the removal of all surface vegetation and root systems leaving only mineral soil exposed within the embankment excavation subgrade. Existing soils will be excavated to elevation 41.0 or to 2 feet below the existing surface grades, whichever is deeper, to allow observation of the complete footprint of the embankment. Any additional exposed organic matter will be removed and the exposed surfaces re-compacted prior to embankment reconstruction with properly placed and compacted mineral soil up to proposed finished grades. Following the grubbing of vegetation and excavation of organics, the embankment crest will be leveled/raised to elevation 45.0 using compacted granular fill with a minimum width of 8 feet. Acceptable surplus excavated materials would be used to backfill normal excavations or to replace other materials unacceptable for use as backfill. Surplus excavated material not needed for the project would be hauled away and disposed of at appropriate locations. Disposal of all surplus excavated material would be in accordance with all applicable Federal, State and local rules and regulations. Massachusetts regulations<sup>9</sup> that govern the removal and disposal of surplus excavated materials would be strictly followed. All material collected in the course of the clearing and grubbing would be either processed for re-use on the site or disposed of in a satisfactory manner away from the site in compliance with relevant Federal, State and local guidelines and requirements.

The upstream slope will be regraded to a maximum slope of 2.5H:1V and protected with a minimum 2-foot thick riprap blanket consisting of 12-inch diameter angular stone chinked with smaller stones extending from the dam crest (elevation 45.0) to elevation 41.0 and underlain with a layer of geotextile and a minimum of 6-inch thick bedding of crushed stone. The downstream slope will be graded no steeper than 3H:1V with a 6-inch thick layer of loam placed over the graded slopes and seeded with an erosion control matting.

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<sup>9</sup> 310 CMR 40.0032

Sections of the downstream slope toe that are below elevation 42.0 will include a purpose-designed mineral soil filter to control seepage through the embankment that will consist of a 12-inch thick layer of sand covered in 6-inch thick layer of crushed stone. The filter will not include a drain or collection pipe; seepage will be allowed to flow to the adjacent downstream wetlands.

Temporary dewatering during construction would be necessary to implement upstream slope repairs and primary/auxiliary spillway replacement in-the-dry. Dewatering the pond using the existing stoplog channel at the primary and auxiliary spillways would likely be used for this purpose. Otherwise, a cofferdam system will be necessary. Due to the size of the reservoir and relative shallow upstream depths, lowering the pond approximately 1.5 feet using the stoplog channels would be necessary. Sequencing of work would be planned to utilize the primary and auxiliary spillways for water control during spillway replacement. A localized cofferdam system may still be required in some areas to ensure work performed along the upstream side of the dam is performed in-the-dry.

Construction would likely begin prior to the start of the migratory fish run (April 1). The first part of the dam to be rehabilitated would be the primary spillway and associated fish ladder. During construction of the primary spillway, water will be routed through the existing auxiliary spillway. Construction on the primary spillway and fish ladder will be completed prior to April 1 so that the new fish ladder is in place prior to the beginning of the start of the fish run. In order to avoid potential impacts to migratory fish runs, construction that would require dewatering activities will cease between the period of April 1 and June 15. During that period, migratory fish will be allowed to travel through the completed fish ladder and spawn in the Santuit Pond immediately upstream of the dam. After June 15, dewatering activities will resume and construction on the remaining parts of the dam will commence.

Construction access to the dam would likely be from Tobisett Street to the west of the dam (Figure 1, Appendix B). As such, impacts to regulated resources may occur as a result of construction access; however, additional impacts to regulated resources as a result of construction are not expected. Prior to construction, the construction access route would be properly evaluated for impacts to regulated resources and every effort would be made to avoid impacts to those resources.

It is not feasible to restrict rehabilitation to the fish ladder only because the ladder is part of the primary spillway which is in a degraded condition. As such, rehabilitation of the fish ladder would require rehabilitation of the primary spillway and appurtenances (i.e., embankment, etc.) Therefore, the Proposed Action proposes to rehabilitate not only the fish ladder, but the other components of the dam as well. In general, the proposed rehabilitation would include replacing the existing primary spillway and fish ladder with a pool-and-weir style fish pass that would also function as the primary spillway, demolishing and removing the existing auxiliary spillway and re-grading/re-aligning the embankment structure to meet dam safety requirements. The total cost of this Alternative is expected to be approximately \$420,000.

### **2.1.2 Alternative 2 – No Federal Action Alternative**

The No Federal Action Alternative depicts the most probable future conditions to be realized in absence of any of the alternative plans studied. The Town of Mashpee, the owner of the dam, has determined that it would rehabilitate the dam to meet current federal and state dam safety criteria without federal funds. The Town may use other alternative rehabilitation methods or develop its own plan to bring the dam into compliance with federal and state safety criteria. It is assumed that the Town would implement the same plan as described in Alternative 1. This assumption was made because the recommended plan is the most cost-effective and least environmentally damaging of all plans considered. The total cost of this Alternative is expected to be approximately \$420,000.

## **2.2 ALTERNATIVE REMOVED FROM CONSIDERATION**

The following section includes alternatives that were considered but were not found to be feasible and therefore, are not evaluated in this EA

### **2.2.1 Dam Removal**

Santuit Pond Dam impounds Santuit Pond, which is widely used for recreation as well as water storage for cranberry production. Removal of Santuit Pond Dam would cause Santuit Pond to be drained resulting in the loss of suitable breeding habitat in the upstream impoundment (i.e., Santuit Pond) as well as the loss of recreational opportunities (i.e., boating, fishing, swimming) the pond provides. It is likely that local residents, including those owning property on the pond, would oppose a plan for dam removal. Furthermore, the ability of the pond to provide water for cranberry harvesting would be lost. Given the loss of functions Santuit Pond provides, removal of the dam was found to not meet the purpose and need for suitable breeding habitat for diadromous fish, recreation, and irrigation. As such, this alternative is unfeasible and was removed from further consideration.

### **2.2.2 Rehabilitate the Dam with a Cutoff Wall**

In this Alternative, a vertical interlocking sheetpile wall would be installed through the existing embankment in addition to the proposed rehabilitation of the primary spillway and fish ladder. This Alternative would have resulted in similar environmental impacts as compared to the Proposed Action; however, this Alternative was removed from consideration because of the exorbitant additional cost. The total cost of this Alternative is expected to be approximately \$710,000. As such, this Alternative was found to be unfeasible.

### **2.2.3 Rock-Ramp Fishpass**

In this Alternative, the primary spillway would be replaced with a rock ramp that would provide a passable, rock-lined slope for fish passage. This would require that rip-rap or other suitable rock material be placed within the downstream river channel at a slope of approximately 1H:7V

beginning at the top of the principal spillway and extending downstream. As such, this Alternative would require the filling of approximately 180 square feet (sf) of regulated resources (i.e., Land Under Water [LUW], etc.). Additionally, a rock-ramp fishpass would not be as effective as a pool-and-weir style fishpass that is currently proposed. As such, a rock-ramp fishpass was not considered to be a viable option and was removed from further consideration.

## 2.3 PROJECT CONCERNS

The matrix shown in Table 1 outlines the primary concerns that NRCS considered when identifying alternatives for the project. The concerns listed in Table 1 include those that had an integral role in developing the alternatives analysis and do not constitute all factors that were considered.

TABLE 1 SUMMARY OF PROJECT CONCERNS

<b>Concern</b>	<b>Degree of Concern</b>	<b>Degree of Significance to Decision Making</b>
Dam safety	High	High
Fish habitat	High	High
Cultural resources	High	Low
Land use	Moderate	Moderate
Wetlands	Moderate	Moderate
Wildlife habitat	Moderate	Moderate
Threatened & endangered species	Moderate	Moderate
Water quality	Moderate	Low
Soil resources	Moderate	Low
Air quality	Moderate	Low
Environmental Justice and Civil Rights	Moderate	Low
Invasive species	Moderate	Low
Riparian areas	Moderate	Low
Flood damages	Moderate	Moderate
Water resources	Low	Low

## 2.4 REGULATORY APPROVAL

The following is a list of the permits, regulatory approvals, and consultations that will be required for the proposed project. Specific permitting requirements will be identified for the proposed project prior to the start of construction.

- Massachusetts Order of Conditions
- Massachusetts Chapter 253 Application to Alter a Dam
- Massachusetts Endangered Species Act<sup>10</sup> (MESA) review

<sup>10</sup> M.G.L. c. 131A

- Clean Water Act<sup>11</sup> (Section 404 Category II General Permit
- National Historic Preservation Act<sup>12</sup> Section 106 consultation
- Endangered Species Act<sup>13</sup> (ESA)Section 7 consultation
- 
- National Pollution Discharge Elimination System (NPDES)
- Erosion and Sediment Control Plan

The following is a list of permits and regulatory approvals that might be required. Specific permitting requirements will be identified for the proposed project prior to the start of construction

- Massachusetts Environmental Policy Act<sup>14</sup> (MEPA) review
- Federal Emergency Management Agency review

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<sup>11</sup> 33 U.S.C. §1251 *et seq.*

<sup>12</sup> 16 U.S.C. §470 *et seq.*

<sup>13</sup> 7 U.S.C. § 136

<sup>14</sup> M.G.L. c. 30, §§ 61-62H

### 3. AFFECTED ENVIRONMENT

The following sections describe the environments that have the potential to be affected by the proposed project. These environments include ecological, cultural, social, aesthetic, and economic resources.

#### 3.1 DAM SAFETY

Both the federal government, under the NRCS and the Commonwealth of Massachusetts, under the DCR, have developed specific dam safety criteria (Chapter 253 Section 44-48, and 302 CMR 10.00, respectively).

The dam does not meet current dam design and safety criteria. A dam breach analysis completed by Weston & Sampson (2012) showed that no residential or commercial buildings are likely to be impacted as a result of the hypothetical breach. The model predicted overtopping of one roadway embankment (Old Mill Road) by up to 0.8 foot., but detour routes are readily accessible. The dam is considered to be in poor condition due to seepage at the primary spillway, eroded condition of the earth embankment sections and vegetation growing on the embankment sections and inadequate hydraulic capacity. Therefore, rehabilitation of the dam is necessary in order to bring the dam into compliance with federal and state dam safety guidelines and standards. Rehabilitation of the dam would conform to NRCS criteria and the DCR standards for a low hazard dam and intermediate structure, respectively.

#### 3.2 LAND USE

Land use in the vicinity of the Project Area (Figure 3, Appendix B) is predominantly open (i.e., forest, wetlands, etc.) Table 2 below provides a summary of the land uses within a half mile to the Santuit Pond Dam.

TABLE 2 SUMMARY OF LAND USES

<b>Land Use</b>	<b>Acreage</b>	<b>Percent</b>
Agriculture	34.5	6.9
Open <sup>1</sup>	360.2	71.7
Residential	105.4	20.9
Commercial/Industrial	2.1	0.5
Other	0	0
<b>Total</b>	<b>503.2</b>	<b>100</b>
Source: MassGIS (2005)		
<sup>1/</sup> Includes forest, open land, wetlands, and other undeveloped lands.		

### 3.3 AIR QUALITY

The Clean Air Act<sup>15</sup> (CAA) requires the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered to be harmful to the environment and to public health. There are two types of air quality standards. Primary standards include limits to protect public health and secondary standards include limits to protect public welfare. The EPA has set NAAQS for six principal pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide (DEP 2011).

The Town of Mashpee does not fall within a nonattainment area for 8-hour ozone as defined by the EPA<sup>16</sup>. The CAA defines a "nonattainment area" as a locality where air pollution levels persistently exceed NAAQS, or that contributes to ambient air quality in a nearby area that fails to meet standards. The only locality in the Commonwealth that is within a nonattainment zone identified by the EPA is Dukes County which consists of Martha's Vineyard and the Elizabeth Islands (EPA 2012).

### 3.4 NOISE

Sensitivity to ambient noise levels differs among land use types. For example, libraries, schools, churches, and hospitals are generally more sensitive to noise than commercial and industrial land uses. The majority of land uses surrounding Santuit Pond, specifically in proximity to the dam, include suburban and undeveloped land uses, which generally have higher sensitivity to ambient noise levels.

### 3.5 GEOLOGY AND SOILS

The geology and soils of Barnstable County were formed during the last continental glacial period and the rise in sea level that followed glaciations (Soil Conservation Service 1993). The moving ice scraped, ground, and picked up the bedrock of southern New England, and deposited it as the glacial and postglacial sediments of Cape Cod. The rock debris, called drift, was carried south by the ice and deposited along the ice front. Later, as the sea drowned these glacial land forms, the drift along the shoreline was eroded and re-deposited as beaches and pits. Windblown sand was deposited as dunes.

The soils in the vicinity of the project area are predominantly derived from glacial outwash parent material deposited by meltwaters following glacial recession (Soil Conservation Service 1993). These areas typically consist of well sorted sands and gravel that may or may not be overlain by finer, wind deposited eolian material. Mapped soils are depicted on Figure 4 (Appendix B).

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<sup>15</sup> 42 U.S.C. Sec. 7401 *et seq.*

<sup>16</sup> <http://www.epa.gov/oar/oaqps/greenbk/hncs.html#MASSACHUSETTS>

### 3.6 WATER RESOURCES

Santuit Pond forms the headwaters of Santuit River which flows south from the pond toward Shoestring Bay. The pond is groundwater fed with no contributing tributaries. The Santuit River flows for approximately two miles before reaching Shoestring Bay. The Santuit Pond watershed consists of a total of 1,408 acres. Water resources in proximity to the dam are shown on Figure 1 (Appendix B).

The Santuit River begins in Mashpee, Massachusetts at Santuit Pond and flows approximately two miles south before flowing into Popponesset Bay. A total of three municipalities, the Town of Barnstable, the Town of Mashpee, and the Town of Sandwich, ranging from urbanized to undeveloped areas, in Massachusetts are located at least partially within the Santuit Pond Watershed (Figure 5, Appendix B). Santuit Pond is a kettle hole pond and is fed by groundwater. As such, there are no surface tributaries to Santuit Pond. The only natural drainage from Santuit Pond is the Santuit River to the south, although there are numerous man-made drainage channels from Santuit Pond to provide water to adjacent cranberry bogs, some of which are still operational in the northern portion of the pond.

High levels of nutrients such as nitrogen and phosphorous and noxious aquatic plants have led to degraded water quality in many areas of the Cape Cod watershed. The Massachusetts Department of Environmental Protection (DEP) had designated Santuit Pond as “impaired” due to elevated levels of nutrients and noxious aquatic plants (Division of Watershed Management 2010). The Town has recently installed six solar water circulators (i.e., SolarBees) to help improve the water quality of Santuit Pond. The purpose of the SolarBees is to reduce the abundance of algae in the pond by increasing the amount of oxygenation in the bottom of the pond thereby reducing the release of phosphorous from the otherwise anaerobic sediments.

According to the Massachusetts Surface Water Quality Standards<sup>17</sup>, the Santuit River is designated as Class B waters from its headwaters south to the point where it discharges into marine waters. According to the regulations<sup>18</sup>, Class B waters are “designated as a habitat for fish, other aquatic life, and wildlife, including their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. 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.”

### 3.7 SEDIMENT

Due to the low-energy environment that generally occurs upstream of dams, finer sediments being carried in the watershed tend to settle and accumulate in headponds. Consequently, contaminants that are common in urban and suburban stormwater runoff can bind to the sediments and accumulate in the low-energy environment upstream of dams. There is no

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<sup>17</sup> 314 CMR Sec. 4.00

<sup>18</sup> 314 CMR Sec. 4.05(3)(b)

evidence to suggest contamination exists within headpond sediment other than levels found within normal roadway runoff deposition.

Sediments downstream of the dams are predominantly sand and gravel, and are generally coarser than sediments found upstream of the dam. This is an expected result as the river bed immediately downstream of the dam is a moderately high-energy environment that does not allow for settling of finer settlements.

### 3.8 VEGETATION

The portion of the riparian corridor that lies within the project area is mainly undeveloped land and cranberry bogs (both active and fallow). Vegetation communities within natural parts of the watershed include deciduous and coniferous forest, scrub-shrub, agricultural fields (cranberry bogs), and emergent plant communities. In addition, the Santuit River is associated with emergent and submergent aquatic wetlands, as well as fringing emergent, scrub-shrub, and forested wetlands.

Upland vegetation communities within the vicinity of the project site typically consist of red maple (*Acer rubrum*) and oak (*Quercus* spp.) dominated deciduous forests, and white pine (*Pinus strobus*) and pitch pine (*Pinus rigida*) dominated coniferous forests. Typical understory vegetation in these areas consist of American beech (*Fagus grandifolia*), sweet pepperbush (*Clethra alnifolia*), arrow wood (*Viburnum dentatum*), multiflora rose (*Rosa multiflora*), and greenbrier (*Smilax rotundifolia*). Herbaceous vegetation mainly includes goldenrod (*Solidago* spp.) and various grasses and sedges.

Forested wetland communities in the vicinity of Santuit Pond Dam are typically dominated by red maple; however, floodplain species may include gray birch (*Betula populifolia*), black willow (*Salix nigra*), and bebb willow (*Salix bebbiana*). Scrub-shrub species typically include sweet pepperbush, alder (*Alnus serrulata*), highbush blueberry (*Vaccinium corymbosum*), red-twig dogwood (*Cornus stolonifera*), arrow wood, and swamp rose (*Rosa palustris*). Herbaceous and emergent plant communities are generally dominated by broadleaf cattail (*Typha latifolia*), wool grass (*Scirpus atrovirens*), and various sedges and rushes.

### 3.9 WILDLIFE RESOURCES

Wildlife in the Cape Cod region has been subjected to human disturbances the last 10,000 years. European settlement exacerbated changes in wildlife populations, including the extirpation and/or reduction in populations of large predators and other vertebrates by hunting and habitat loss (McNab and Avers 1994). Some formerly displaced species have become re-established on abandoned agricultural lands, with the exception of large predators, whose niche has been partially filled by mid-size predators, such as the coyote (*Canis latrans*) (McNab and Avers 1994). Common wildlife species in the project area include the white-tailed deer (*Odocoileus virginianus*), gray and red squirrels (*Sciurus carolinensis* and *Tamiasciurus hudsonicus*,

respectively), white-footed mouse (*Peromyscus leucopus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and an assortment of resident and migratory birds.

A large percentage of the watershed's mammals, amphibians, reptiles, and birds depend on wetland or riparian habitat. Common amphibians are red-backed salamander (*Plethodon cinereus*), American toad (*Bufo americanus*), wood frog (*Lithobates sylvaticus*), green frog (*Lithobates clamitans*), pickerel frog (*Lithobates palustris*), gray treefrog (*Hyla versicolor*), and spring peeper (*Pseudacris crucifer*). Reptiles include snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), and common garter snakes (*Thamnophis sirtalis*).

### 3.10 AQUATIC RESOURCES

According to published reports discussing the natural history of Santuit Pond and the Santuit River, historical diadromous fish passage existed in the river prior to the construction of dams, bridges, and other infrastructure (DFW 2007). These diadromous fish most likely included anadromous fish species such as alewife and blueback herring. The most recent published survey by the DFW in 1998 (DFW 2007) found largemouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), golden shiners (*Nemigonus crysoleucas*), pumpkinseeds (*Lepomis gibbosus*), alewife, yellow perch (*Perca flavescens*), brown bullhead (*Ameiurus nebulosus*), white sucker (*Catostomus commersonii*), white perch (*Morone americana*) and American eel (*Anguilla rostrata*) to be present within the pond.

According to data provided by the National Oceanic and Atmospheric Administration (NOAA), there is no Essential Fish Habitat (EFH) within Santuit Pond or the Santuit River (NOAA 2012). Additionally, river herring are a Candidate Species for listing under the Endangered Species Act<sup>19</sup>.

### 3.11 WETLAND RESOURCES

Wetland and open water resources in the project area include Santuit Pond, Santuit River, and its associated fringing wetlands (including the cranberry bogs) (Figure 6, Appendix B). According to the Corps, the Santuit River is considered to be a navigable waterway of the U.S. up to Sampson's Mill Road located approximately 1.5 linear miles south of the Santuit Pond Dam. Therefore, the Santuit River, including Santuit Pond, is not regulated by the Corps under Section 10 of the Rivers and Harbors Act. However, the Santuit River and Santuit Pond are regulated by the Corps under Section 404 of the Clean Water Act<sup>20</sup> as they are considered waters of the United States. Under DEP regulations, the Santuit River is considered a River as it is a perennial watercourse that flows to the ocean.

In portions of the Santuit River in the vicinity of the dam there still exist natural floodplains and fringing riparian wetlands that are not bordered by steep walls or fill areas. These wetlands

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<sup>19</sup> 16 U.S.C. § 1531 *et seq.*

<sup>20</sup> 33 U.S.C. § 1251 *et seq.*

typically consist of hydric soils, are dominated by hydrophytic vegetation, and are periodically flooded by the Santuit River. Therefore, these areas meet state and federal wetland criteria. Additionally, there are numerous abandoned cranberry bogs which are fed by an interconnected network of drainage channels that are fed by Santuit Pond. Some of the cranberry bogs are still in production while other areas have not been used for cranberry production for quite some time and are beginning to evolve from cranberry bogs to emergent and shrub-swamp wetlands commonly found on Cape Cod.

Wetlands in the vicinity of the dam where project construction may be located were field-delineated by Weston & Sampson in April 2009 and in June 2010 (C-2P, Appendix C). During the delineation, state-regulated wetland resources identified at the site, as defined in the Massachusetts Wetlands Protection Act (MWPA) Regulations<sup>21</sup>, included Banks<sup>22</sup>, Bordering Vegetated Wetlands<sup>23</sup> (BVWs), LUW<sup>24</sup>, and Riverfront Area<sup>25</sup>, as described below. Figure 6 (Appendix B) depicts the approximate locations of those resources in proximity to the project area.

**Banks:** Bank wetland resources in the vicinity of the dam are limited to the banks of the Santuit River and the auxiliary spillway channel. The majority of the Banks onsite are vegetated and comprised of mineral soil material.

**Bordering Vegetated Wetlands:** BVWs are located along the northern and southern portions of the dam embankment as well as adjacent to the primary and auxiliary spillway channels. These BVWs meet the definition of a Freshwater Wetland<sup>26</sup> according to the MWPA; therefore, a 100-foot Buffer Zone<sup>27</sup> is applied. The delineated portion of the BVWs include forested, scrub shrub, and emergent wetland communities.

**Land Under Water:** LUW in the vicinity of the dam is limited to land under the Santuit Pond, Santuit River, and the in the auxiliary spillway channel. The LUW is generally comprised of mineral soil material.

**Riverfront Area:** Riverfront Area is defined by 310 CMR 10.58 as the area of land between a river's mean annual high water line and a parallel line measured 200 feet horizontally from this high water line. The Santuit River is defined as a River<sup>28</sup> as it is a perennial body of water that empties into another River. The boundary of the Riverfront Area associated with the Santuit River extends landward 200 feet from the mean annual high water line. Riverfront Area located

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<sup>21</sup> 310 CMR 10.00

<sup>22</sup> 310 CMR 10.54

<sup>23</sup> 310 CMR 10.55

<sup>24</sup> 310 CMR 10.56

<sup>25</sup> 310 CMR 10.58

<sup>26</sup> 131 M.G.L. § 7

<sup>27</sup> 310 CMR 10.04

<sup>28</sup> 310 CMR 10.58(2)1.

within the potential project construction areas consists of existing cleared and previously disturbed land associated with the Santuit Pond Dam and adjacent cranberry bogs.

### **3.12 FLOODPLAINS**

Floodplains are generally characterized as areas of land which are subject to flooding during a 100-year flood. Floodplains are typically considered to be hazardous to development activities. Usually, naturally vegetated floodplains provide habitat for wildlife, floodflow reduction, sedimentation control, maintain water quality, and aid in the transport and deposition of sediment and nutrients within riverine systems.

The entirety of the upstream portion of the site including the entire impoundment, and the downstream portion of the project area, are not mapped within the 100 year floodplain (Figure 7, Appendix B).

### **3.13 THREATENED AND ENDANGERED SPECIES**

The NHESP maintains a database of the locations of state-listed endangered, threatened, or special concern species in the state. According to the NHESP (MassGIS 2008a and 2008b), there is one polygon in the project area where rare species may occur (see Figure 8, Appendix B). A letter of inquiry was submitted to the NHESP requesting information regarding potential rare species that may be present in the vicinity of the dam. In a letter response, dated 2 April 2012, the NHESP indicated that the eastern box turtle (*Terrapene carolina*), a state-listed species of Special Concern, is known to occur within the project limits (Appendix E).

A review of the FWS's Federally Listed Endangered and Threatened Species in Massachusetts indicates that the piping plover (*Charadrius melodus*) and the roseate tern (*Sterna dougallii*) are both known to occur within the town (FWS 2011); however, the piping plover is known to only occur along coastal beaches and the roseate tern is known to occur only along coastal beaches and the Atlantic ocean. The dam is not located on a coastal beach or the Atlantic Ocean. As such, a letter of "no species present" (Appendix E) was obtained from the FWS.

### **3.14 INVASIVE SPECIES**

Invasive species are introduced non-native species that can thrive in areas beyond their natural range of dispersal. The concern with invasive species is that they often out-compete other native species resulting in monocultural habitats which can promote disease, reduce biodiversity, degrade suitable habitat, and can potentially result in the extirpation of rare or sensitive species.

The invasive species infestation at the Santuti Pond Dam include common invasive species found in wetland environments including purple loosestrife (*Lythrum salicaria*), reed canary grass (*Phalaris arundinacea*), and common reed (*Phragmites australis*). The over infestation level at the site is low, with less than 5 percent of the entire site being infested with invasive species.

### **3.15 RECREATION**

Santuit Pond provides a variety of recreational opportunities for local residents including fishing, boating, and swimming. There are multiple locations around the pond that are owned by the Town that provide access to the pond. The Santuit Pond Estates maintains a private beach along the eastern shore of the pond. The pond provides excellent fishing for largemouth bass, chain pickerel, pumpkinseed, and brown bullhead (DFW 2007). The Town owns lands adjacent to the southern portion of the pond in proximity to the dam that provide opportunities for outdoor recreation (e.g., hiking, bird watching, etc.)

### **3.16 CULTURAL RESOURCES**

The area surrounding Santuit Pond and the Santuit River has played a historically significant role since before European settlement of North America. The land surrounding Santuit Pond provided excellent lands for agriculture, gathering, and provided sustenance for daily life due to the plentiful natural resources of the area including herring, eel, trout, and upland game (e.g., white-tail deer). Additionally, the geologic feature known as the “Great Trout burial ground” in Native American folklore is located to the east of the Santuit Pond Dam.

Industry was never able to establish a foothold in the area. The local economy during the colonial era was dominated by farming, wood cutting, natural resource harvesting. The Mashpee Basket and Broom Manufacturing Company was established in the town in 1866; however, the company transitioned their business to cranberry production in later years.

Two dams were constructed along the Santuit River, downstream of the Santuit Pond Dam, between Route 28 and Old Mill Road. Baxter’s Smithy operated a small waterwheel and Sampson’s Mill ground corn and grains for the Wampanoag and other locals.

The Santuit River remains a major feature within the area today. Along its course the river provides significant recreational, agricultural, and cultural resources. Fishing and hiking areas exist along the river as do numerous cranberry bogs.

In addition, historic districts and sites are abundant in the Santuit River valley south of Fallmouth Road. According to the National Register of Historic Places, historic places downstream of the project site the Santuit Historic District, Charles Baxter House, Santuit Post Office, Hawley Gideon House, Nelson Roadhouse House, and Sampson’s Folly – Josiah Sampson House (National Park Service 2012).

Public Archeology Laboratory (PAL) completed a Historic Properties Survey for the site in 2011 (PAL 2012). In summary, PAL found that the proposed project would not have an effect on any historic resource within the area of potential effect (APE). However, PAL recommended that the NRCS, with the Town of Mashpee, coordinate with the MHC regarding the results of their survey to seek their concurrence with a finding of no effect on cultural resources. Appendix F contains the 2011 PAL survey. Consultation with the MHC and the Tribal Historic Preservation

Officer (THPO) of the Mashpee Wampanoag Tribe is currently ongoing. The MHC has not yet issued their findings. The THPO has verbally concurred that there are no historic resources impacted as a result of the proposed project; however, a formal declaration of their concurrence is still forthcoming. Any correspondence received from either of the regulatory agencies will be incorporated into subsequent versions of this EA.

If cultural resources are discovered during construction, all work at the site will immediately cease and the SHPO and THPO will be contacted to investigate any encountered cultural resources.

### **3.17 ENVIRONMENTAL JUSTICE**

Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations<sup>29</sup> requires that “each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations” (CEQ 1997a). According to data provided by the Massachusetts Geographic Information System (MassGIS), there are no Environmental Justice Zones within the vicinity of the site (Figure 9, Appendix B). The closest Environmental Justice Zone is located approximately 5 linear miles to the south along the northwestern border of Waquoit Bay.

### **3.18 SOCIOECONOMIC RESOURCES**

The Town of Mashpee, founded in 1870, is approximately 27.2 square miles in area, with an estimated population of 14,006 according to the 2010 census (U.S. Census Bureau 2011). The population density of Mashpee equals approximately 514.9 persons per square mile of land area. The town contains a mixture of residential, commercial, and open space land uses. Major points of interest in the town include the historic Old Indian Meeting House, South Cape Cod Beach State Park, and the Lowell Holly Reservation. Table 3 summarizes the socioeconomic resources of the Town.

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<sup>29</sup> 59 F.R. 7629, 16 February 1994

TABLE 3 SUMMARY OF SOCIOECONOMIC RESOURCES

	<b>Mashpee</b>		<b>Barnstable Co.</b>		<b>Massachusetts</b>		<b>United States</b>	
<b>Population and Race</b>	14,006		215,888		6,547,629		308,745,538	
White	12,484	89.1%	200,194	92.7%	5,400,458	82.5%	231,040,398	74.8%
Black/African American	320	2.3%	4,062	1.9%	508,413	7.8%	42,020,743	13.6%
Asian	171	1.2%	2,287	1.1%	394,211	6.0%	17,320,856	5.6%
Other	187	1.4%	3,320	1.5%	369,611	5.6%	21,748,084	7.0%
Native American	432	3.1%	1,324	0.6%	50,705	0.8%	5,220,579	1.7%
Hispanic or Latino of any race	315	2.2%	4,687	2.2%	627,654	9.6%	50,477,594	16.3%
<b>Age</b>	47.5		49.9		39.1		37.2	
Median age	47.5		49.9		39.1		37.2	
Over 18 years of age	11,309	80.7%	178,639	82.7%	5,128,706	78.3%	234,564,071	76.0%
Over 65 years of age	3,298	23.5%	53,879	25.0%	902,724	13.8%	40,267,984	13.0%
<b>Language Spoken At Home</b>	97.3%		92.5%		78.3%		79.4%	
English only	972	97.3%	192,666	92.5%	4,849,884	78.3%	229,673,150	79.4%
“less than very well”	15	1.5%	5,017	2.4%	546,663	8.8%	25,223,045	8.7%
Spanish	0	0.0%	2,991	1.4%	484,965	7.8%	36,995,602	12.87%
Indo-European	27	2.7%	10,943	5.3%	555,058	9.0%	10,666,771	3.7%
Asian-Pacific	0	0.0%	1,239	0.6%	230,616	3.7%	9,340,583	3.2%
Other languages	0	0.0%	413	0.2%	70,396	1.1%	2,539,640	0.9%
<b>Disability Status</b>	0.0%		0.0%		10.8%		11.9%	
Population five years of age and older	0	0.0%	0	0.0%	699,252	10.8%	36,354,712	11.9%
<b>Education</b>	99.7%		94.7%		89.1%		85.6%	
High school graduate or higher	99.7%		94.7%		89.1%		85.6%	
High school including GED	113	15.7%	41,346	25.2%	1,168,464	26.2%	58,225,602	28.5%
Associates degree	112	15.5%	15,547	9.5%	337,594	7.6%	15,553,106	7.6%
Bachelor’s degree	216	29.9%	40,015	24.4%	992,307	22.3%	36,244,474	17.7%
Graduate or professional degree	143	19.8%	26,501	16.1%	746,592	16.7%	21,333,568	10.4%
<b>Employment, Class of Worker and Commuter Status</b>	35.7%		85.3%		81.2%		79.0%	
Labor force pool (population > age 16)	11,596	35.7%	184,116	85.3%	5,313,877	81.2%	243,832,923	79.0%
Employed	7,053	56.6%	104,121	56.6%	3,225,103	60.7%	139,033,928	57.0%
Unemployment	286	2.5%	6,845	3.7%	365,805	6.9%	16,883,085	6.9%
Private for profit workers	2,857	40.5%	39,434	37.9%	2,599,288	80.6%	108,824,974	78.3%

	<b>Mashpee</b>		<b>Barnstable Co.</b>		<b>Massachusetts</b>		<b>United States</b>	
Self-employed workers – includes agriculture, forestry, fishing, hunting	187	2.7%	3,920	3.8%	198,627	6.2%	8,740,557	6.3%
Non-profit workers	467	6.6%	6,170	5.9%	397,866	12.3%	10,970,221	7.9%
Government	882	12.5%	10,630	10.2%	424,996	13.2%	21,291,233	15.3%
Federal	250	3.5%	1,959	1.9%	64,128	1.0%	4,938,966	1.6%
State	190	2.7%	2,105	2.0%	116,608	1.2%	6,270,462	2.0%
Local	442	6.3%	6,566	6.3%	232,967	3.6%	10,453,506	3.4%
<b>Occupation</b>								
Management, professional and related occupations	271	48.3%	39,067	37.5%	1,402,764	43.5%	49,975,620	35.9%
Service occupations	55	9.8%	20,134	19.3%	559,683	17.4%	25,059,153	18.0%
Sales and office occupations	176	31.4%	25,953	24.9%	756,845	23.5%	35,711,455	25.0%
Production, transportation, and material moving occupations	35	6.2%	11,948	6.7%	285,760	8.9%	16,590,396	11.9%
Construction, extraction, and maintenance occupations	24	4.3%	26,927	11.5%	220,046	6.8%	12,697,304	9.1%
<b>Commuting to Work</b>								
Worked in county of residence	103	1.5%	1,991	1.9%	2,072,085	64.2%	99,361,852	72.6%
Worked outside county of residence	5,866	83.2%	86,672	83.2%	958,412	29.7%	32,364,811	23.6%
Worked outside the state of residence	933	13.2%	13,133	12.6%	121,049	3.8%	5,214,347	3.8%
<b>Housing</b>								
Number of households		6,118		95,755		2,547,075		116,716,292
Number of housing units		9,882		160,281		2,808,254		131,704,730
Occupied	6,118	61.9%	95,755	59.7%	2,547,075	90.7%	116,716,292	88.6%
Owner occupied	5,030	82.2%	74,110	77.4%	1,587,158	62.3%	75,986,074	65.1%
<b>Income</b>								
Median annual household income		\$89,236		\$95,755		\$62,072		\$50,046
Median family income		\$107,375		\$75,056		\$78,653		\$60,609
Per capita income		\$46,106		\$35,246		\$33,203		\$26,059
FT*, year-round male median income		\$48,750		\$53,480		\$56,959		\$46,500
FT*, year-round female median income		\$54,216		\$41,990		\$46,213		\$36,551
<b>Poverty</b>								
Number of families	325	7.8%	3,088	5.0%	208,860	8.2%	13,188,941	11.3%

## **4. ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES**

Environmental consequences of the proposed alternatives are presented in the following sections. The Santuit Pond Dam Rehabilitation Project would improve and repair the Santuit Pond Dam including the primary and auxiliary spillways, embankment, and fish ladder thereby restoring the dam to a safe working condition and restoring diadromous fish passage within the Santuit River and Santuit Pond. The following environments would not be impacted under the proposed alternatives and are not evaluated in the environmental consequences section: land-use, geology, environmental justice, and socioeconomic resources.

The following is a description of the effects that each alternative would have on the natural and human environment. For each resource topic presented, the existing conditions are summarized to provide a better understanding of the effects. Because the dam would be rehabilitated under both alternatives (by the Town with no federal funding under Alternative 2 and with federal funding under Alternative 1), the effects of the alternatives are the same for all resource categories.

### **4.1 DAM SAFETY**

#### **4.1.1 Present Condition**

The dam does not meet current dam design and safety criteria. The dam is considered to be in poor condition due to seepage at the primary spillway, eroded condition of the earth embankment sections and vegetation growing on the embankment sections and inadequate hydraulic capacity.

#### **4.1.2 Alternative 1 – Proposed Action**

The embankment crest would be raised to elevation 45.0. The crest would have a minimum width of 8 feet and would include a stone dust walking path finished surface. The upstream slope would be surfaced with a layer of riprap to protect the slope. Portions of the downstream slope below elevation 42.0 would include a mineral seepage filter. The existing primary spillway and fish ladder structures would be replaced with a reinforced concrete combination pool-and-weir fish ladder and primary spillway structure. The new structure would include six multi-level (notched) weirs. The lowest weir notch would include a full depth stop log channel to allow impoundment drawdown. The existing auxiliary spillway would be demolished and removed and the earthen embankment would be extended through the former auxiliary spillway footprint.

The rehabilitation would bring the dam into compliance with federal and state criteria, and the threat of the dam failing would be reduced.

#### **4.1.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.2 AIR QUALITY**

### **4.2.1 Present Condition**

The Town of Mashpee does not fall within a nonattainment area for 8-hour ozone as defined by the EPA<sup>30</sup>. The only locality in the Commonwealth that is within a nonattainment zone identified by the EPA is Dukes County which consists of Martha's Vineyard and the Elizabeth Islands (EPA 2012).

### **4.2.2 Alternative 1 – Proposed Action**

Rehabilitation of the dam and associated fish ladder at the Santuit Pond Dam would occur over an estimated three to four month period. Construction activity would likely require the use of excavators, dump trucks, pick-up trucks, forklifts, and other construction equipment.

Construction would involve construction vehicles transporting construction equipment to and from the site. The project area is not within a nonattainment area for 8-hour ozone, which means that the applicability of the CAA General Conformity Rule does not need to be assessed. Emission calculations for a construction project of this size are expected to result in nitrogen oxide (NO<sub>x</sub>) emissions of approximately 9 tons/year (volatile organic compounds [VOC] emissions are negligible compared to NO<sub>x</sub> emissions and therefore, were not evaluated). This level of emissions would be well below the 100 tons/year General Conformity Rule threshold. As such, no further air quality analysis is required.

### **4.2.3. Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.3 NOISE**

### **4.3.1 Present Condition**

The majority of land uses surrounding Santuit Pond, specifically in proximity to the dam, include suburban and undeveloped land uses, which generally have higher sensitivity to ambient noise levels.

### **4.3.2 Alternative 1 – Proposed Action**

No permanent noise impacts would occur as a result of the Proposed Action. Minor, temporary noise impacts from construction vehicles and equipment would occur, but would be limited to the three to four month construction period at each dam. Under normal circumstances, these temporary impacts would occur between 6:00 a.m. and 8:00 p.m. on business days.

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<sup>30</sup> <http://www.epa.gov/oar/oaqps/greenbk/hncc.html#MASSACHUSETTS>

### **4.3.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.4 WATER RESOURCES**

### **4.4.1 Present Condition**

Santuit Pond forms the headwaters of Santuit River. The pond is groundwater fed with no contributing tributaries. The only natural drainage from Santuit Pond is the Santuit River to the south, although there are numerous man-made drainage channels from Santuit Pond to provide water to adjacent cranberry bogs, some of which are still operational in the northern portion of the pond.

### **4.4.2 Alternative 1 – Proposed Action**

The rehabilitation of the dam and associated fish ladder is not expected to permanently impact water resources at the project site. Temporary impacts include minor impacts to turbidity at the construction site and for some distance downstream during construction and minor alterations of the streambanks and possibly minor excavation of streambeds downstream of the dam would occur during installation of the fish ladder. However, best management practices (BMPs), such as cofferdams and silt fences, would be installed to minimize impacts as part of a mitigation plan. An erosion and sediment control plan would be prepared prior to the start of construction. All activities within the Santuit River and upstream Santuit Pond would require coordination and approval through state and federal regulatory agencies prior to the start of construction. Alterations to the streambanks and beds are not expected to significantly alter the overall bank or river configurations. The footprint of the dam is proposed to be only minimally increased as a result of rehabilitation. That expansion is necessary in order to restore the dam to a safe operating state that complies with federal and state dam safety criteria.

Additionally, the solar water circulators (i.e., SolarBees) will not be impacted as a result of the proposed action. The Town will be notified prior to the commencement of construction activities in order to properly remove or otherwise protect the SolarBees so they are not damaged as a result of rehabilitation of the Santuite Pond Dam.

### **4.4.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.5 FLOODPLAINS**

### **4.5.1 Present Condition**

The entirety of the upstream portion of the site including the entire impoundment, and the downstream portion of the project area, are not mapped within the 100 year floodplain (Figure 7, Appendix B).

### **4.5.2 Alternative 1 – Proposed Action**

As previously discussed, there are no floodplains mapped within proximity to the project area (Figure 7, Appendix B). As such, the Proposed Action would have no permanent or temporary impacts to the 100-year floodplain along the river.

### **4.5.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.6 SEDIMENTS**

### **4.6.1 Present Condition**

Due to the low-energy environment that occurs upstream of the dam, finer sediments being carried in the watershed settle and accumulate in the headpond. The original date of construction for the dam is unknown as is the original construction dimensions of the dam. As such, the volume of sediment behind the dam is unknown. Sediments downstream of the dams are predominantly sand and gravel, and are generally coarser than sediments found upstream of the dam.

### **4.6.2 Alternative 1 – Proposed Action**

The rehabilitation of the dam and fish ladder is not expected to result in permanent impacts from sediment transportation. The dam rehabilitation would involve only temporary disturbance to the riverbed and BMPs, such as cofferdams, would be employed to minimize the transport of sediment downstream. The rehabilitation does not propose to excavate sediments behind the dam in the upstream impoundment.

Minor impacts associated with the transportation of sediment could occur as a result of construction activities. Prior to excavation activities that could mobilize sediments, characterization of the sediment upstream of the dam would occur. If necessary, impacted sediment upstream of the dam would be excavated and disposed of in a permitted disposal site to prevent transportation downstream. Temporary dewatering during construction would be necessary to implement upstream slope repairs and primary/auxiliary spillway replacement in-the-dry. Dewatering the pond using the existing stoplog channel at the primary and auxiliary

spillway could be used for this purpose. Otherwise, a cofferdam system would be necessary. In this case, due to the size of the reservoir and relative shallow upstream depths, lowering the pond as much as possible using the stoplog channels is recommended. The sills of the primary spillway stoplog channel and auxiliary spillway channels are elevation 40.1 and elevation 39.5, respectively. Two structures (primary and auxiliary spillway) are available to lower and maintain a lower water surface elevation in the pond. Sequencing of work should be planned to utilize this water control feature during spillway replacement. A localized cofferdam system may still be required in some areas to ensure work performed along the upstream side of the dam is performed in-the-dry.

#### **4.6.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

### **4.7 VEGETATION**

#### **4.7.1 Present Condition**

The portion of the riparian corridor that lies within the project area is mainly undeveloped land and cranberry bogs (both active and fallow). Vegetation communities within natural parts of the watershed include deciduous and coniferous forest, scrub-shrub, agricultural fields (cranberry bogs), and emergent plant communities. In addition, the Santuit River is associated with emergent and submergent aquatic wetlands, as well as fringing emergent, scrub-shrub, and forested wetlands.

#### **4.7.2 Alternative 1 – Proposed Action**

The rehabilitation of the dam and fish ladder would likely result in permanent impacts to the existing vegetation in the vicinity of the proposed project. As previously discussed, in order to bring the dam into compliance with federal and state dam safety criteria and to restore the dam to a safe working condition, the footprint of the dam embankment needs to be expanded. As such, a portion of the vegetated wetland to the south of the dam would need to be impacted (<1 acre) by extending the footprint of the dam into the wetland resulting in the loss of the scrub-shrub wetland habitat vegetation which would be replaced with the mowed grass upland habitat type of the dam embankment. However, scrub-shrub wetland habitat is not a limited resource in the area.

Temporary disturbances to upland vegetation of less than 1 acre would likely occur during construction to allow for access to the project sites and for rehabilitation of the dam embankment. Upon completion of the project, the majority of the embankment would be seeded with a native grass seed that would be maintained as mowed turf. Other areas disturbed during construction would be stabilized and reseeded or replanted with native vegetation.

A mitigation plan will be prepared during the final engineering process to compensate for the proposed impacts to vegetation resources. Preliminary compensatory mitigation design planning

has identified an area to the southeast of the project area adjacent to an existing abandoned cranberry bog that contains suitable acreage for compensatory mitigation. Compensatory mitigation will be at least a 1:1 ratio and will consist of the establishment of scrub-shrub wetland habitat by expanding the existing cranberry bog

#### **4.7.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

### **4.8 WILDLIFE RESOURCES**

#### **4.8.1 Present Condition**

Common wildlife species in the project area include the white-tailed deer (*Odocoileus virginianus*), gray and red squirrels (*Sciurus carolinensis* and *Tamiasciurus hudsonicus*, respectively), white-footed mouse (*Peromyscus leucopus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), and an assortment of resident and migratory birds. A large percentage of the watershed's mammals, amphibians, reptiles, and birds depend on wetland or riparian habitat. Common amphibians are red-backed salamander (*Plethodon cinereus*), American toad (*Bufo americanus*), wood frog (*Lithobates sylvaticus*), green frog (*Lithobates clamitans*), pickerel frog (*Lithobates palustris*), gray treefrog (*Hyla versicolor*), and spring peeper (*Pseudacris crucifer*). Reptiles include snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), and common garter snakes (*Thamnophis sirtalis*).

#### **4.8.2 Alternative 1 – Proposed Action**

Temporary adverse impacts wildlife habitat are likely to occur as a result of the Proposed Action. Temporary adverse temporary impacts of less than 1 acre are likely to occur as a result from construction activities such as construction access, demolishing the existing fish ladder, excavation and grading of the embankment, and dewatering. During construction, the project area would become inhospitable for wildlife. Once construction has completed, the area would be available for wildlife to utilize again although a minor acreage of successional habitat would be transformed to mowed grass habitat as part of the embankment.

#### **4.8.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

### **4.9 AQUATIC RESOURCES**

#### **4.9.1 Present Condition**

The most recent published survey by the DFW in 1998 (DFW 2007) found largemouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), golden shiners (Nutemigonus

*cryosleucas*), pumpkinseeds (*Lepomis gibbosus*), alewife, yellow perch (*Perca flavescens*), brown bullhead (*Ameiurus nebulosus*), white sucker (*Catostomus commersonii*), white perch (*Morone americana*) and American eel (*Anguilla rostrata*) to be present within the pond.

#### **4.9.2 Alternative 1 – Proposed Action**

The Proposed Action is expected to have an overall positive effect on the aquatic resources of the Santuit River. Permanent beneficial impacts are likely to occur as a result from rehabilitating the dam by maintaining the impoundment behind the dam (i.e., Santuit Pond) for fish habitat and by rehabilitating the fish ladder to allow river herring access to the pond for spawning. However, temporary adverse impacts (<1 acre) as a result of drawdown of the impoundment would occur via the loss of suitable habitat along the perimeter of the impoundment that would otherwise be available for aquatic organisms. Additionally, as a result of the necessary rehabilitation of the embankment, a minor permanent loss of aquatic habitat (i.e., LUW) of less than 1 acre would likely occur from the expansion of the dam footprint into the upstream area of the impoundment. Land Under Water is not a limited resource on Cape Cod.

#### **4.9.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

### **4.10 WETLAND RESOURCES**

#### **4.10.1 Present Condition**

Wetlands in the vicinity of the dam where project construction may be located were field-delineated April 2009 and in June 2010 (C-2P, Appendix C). During the delineation, wetland resources included Banks, BVW, LUW, and Riverfront Area (Figure 6, Appendix B).

#### **4.10.2 Alternative 1 – Proposed Action**

Rehabilitation of the dam and fish ladder is expected to result in moderate permanent impacts to wetland resources in the vicinity of the project area. As previously discussed, in order to bring the dam into compliance with state dam safety criteria, the footprint of the dam must be expanded. As such, wetland resources to the north and south of the dam would need to be permanently impacted. As a result of the proposed project 1,608 sf of temporary impacts and 3,369 sf of permanent impacts are expected<sup>31</sup>.

In addition to the impacts described above, temporary disturbances to state-regulated 100-foot Buffer Zone adjacent to the wetland resources are likely to occur. BMPs would be utilized to ensure that those temporary impacts are minimized.

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<sup>31</sup> “Riverfront Area” is a regulated upland resource by the DEP. It is not a regulated wetland or otherwise aquatic regulated resource by the Corps.

Table 4 summarizes the proposed impacts to wetland resources in greater detail. Drawing C-2P in the Engineering Drawings (Appendix C), depicts the proposed wetland impacts. A mitigation plan would be prepared during the final engineering process to compensate for the proposed impacts to wetland resources.

TABLE 4 SUMMARY OF PROPOSED WETLAND IMPACTS

Resource	Adverse		
	Temporary (sf)	Permanent (sf)	Total (sf)
BVW	343	1,515	1,858
LUW	1,265	1,854	3,119
Riverfront Area (0-100 ft) <sup>1/</sup>	-	-	9,900
Riverfront Area (100-200 ft) <sup>1/</sup>	-	-	9,200
<b>Total</b>	1,608	3,369	24,077
<sup>1/</sup> Impacts to Riverfront Area (an upland regulated resource regulated only by the DEP) are only identified as total impacts by Weston & Sampson			

#### 4.10.3 Alternative 2 – No Federal Action Alternative

Same as the Proposed Action.

### 4.11 THREATENED AND ENDANGERED SPECIES

#### 4.11.1 Present Condition

The NHESP has indicated that the eastern box turtle, a state-listed species of Special Concern, is known to occur within the project limits. There are no known occurrences of federally-listed threatened or endangered species.

#### 4.11.2 Alternative 1 – Proposed Action

There are no federally-listed threatened or endangered species present within proximity to the project area. As such, no impacts to federally-protected species would occur.

The eastern box turtle, a state-listed Species of Concern, is known to occur within the project area. As such, as a result of the expansion of the dam’s footprint, it is likely that approximately 1,500 sf of suitable habitat (i.e., BVW) for the eastern box turtle would be permanently lost. The loss of habitat is required in order to expand the footprint of the dam which is necessary in order to bring the dam into compliance with federal and state dam safety criteria. However, the NHESP has indicated during the planning process that the loss of 1,500 sf of suitable habitat would not be considered a “take” since there is an abundance of suitable habitat for the eastern box turtle in the area. Furthermore, as part of the planning process, the NHESP has an

opportunity to comment on the specifics of the project during the public comment period of the Draft EA. Any comments received by the NHESP will be incorporated into subsequent versions of the EA.

In addition to permanent impacts, minor temporary impacts to suitable eastern box turtle habitat would likely result from construction access and other construction activities. Temporary impacts include the loss of access to suitable habitat during construction as a result of excavation, construction access, and other construction related activities. Once construction has been completed, disturbed areas would be restored to their pre-construction condition. Additionally, other mitigation measures such as exclusion fencing and other BMPs would likely be included in order to reduce any incidental take of eastern box turtles.

A mitigation plan to compensate for the proposed permanent impacts to the eastern box turtle would be prepared and submitted to the DFW for concurrence prior to construction. An area to the southeast of the dam adjacent to an existing cranberry bog has been identified as a suitable location for compensatory mitigation. Mitigation ratios would be at least a 1:1 ratio and would consist of expanding the existing cranberry bog.

#### **4.11.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

### **4.12 RECREATION**

#### **4.12.1 Present Condition**

Santuit Pond provides a variety of recreational opportunities for local residents including fishing, boating, and swimming. The Town owns lands adjacent to the southern portion of the pond in proximity to the dam that provide opportunities for outdoor recreation. There are multiple locations around the pond that are owned by the Town that provide access to the pond. The Santuit Pond Estates maintains a private beach along the eastern shore of the pond.

#### **4.12.2 Alternative 1 - Proposed Action**

No permanent impacts are expected. Minor, temporary impacts to recreation would occur during construction because there would be reduced access to the area for hiking and biking as well as a temporary drawdown of the impoundment, which would impact water-dependent recreation.

Permanent beneficial impacts to recreation generally include continued maintenance of the upstream impoundment behind the dam, thus resulting in the preservation of water-dependent recreational opportunities provided by Santuit Pond.

### **4.12.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.13 CULTURAL RESOURCES**

### **4.13.1 Present Condition**

PAL completed a Historic Properties Survey for the site in 2011 (PAL 2012) that found that the proposed project would not have an effect on any historic resource within the APE. However, the NRCS, with the Town of Mashpee, are currently in coordination with the MHC and THPO regarding the results of their survey to seek their concurrence with a finding of no effect on cultural resources. The MHC has not yet issued their findings. The THPO has verbally concurred that there are no historic resources impacted as a result of the proposed project; however, a formal declaration of their concurrence is still forthcoming. Any correspondence received from either of the regulatory agencies will be incorporated into subsequent versions of this EA.

### **4.13.2 Alternative 1 – Proposed Action**

Rehabilitation of the dam requires that the dam be demolished and rebuilt in order to properly bring the dam into compliance with federal and state dam safety regulations. As previously discussed, the attached PAL report (Appendix F) found that the project would not impact any historic resources within the APE. Furthermore, that report also states that the dam and the surrounding cranberry bogs do not meet the criteria to be considered a historic resource eligible for listing on the National Historic Register. However, PAL recommended that the NRCS, with the Town of Mashpee, coordinate with the MHC regarding the findings of PAL's historic resource survey.

Consultation with the MHC and the THPO is currently ongoing. The MHC has not yet issued their concurrence with the findings of the PAL investigation. The THPO has verbally concurred that there are no historic resources impacted as a result of the proposed project; however, a formal declaration of their concurrence is still forthcoming. Any correspondence received from either of the regulatory agencies will be incorporated into subsequent versions of this EA.

### **4.13.3 Alternative 2 – No Federal Action Alternative**

Same as the Proposed Action.

## **4.14 CUMULATIVE IMPACTS**

The Council on Environmental Quality (CEQ) defines cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-

federal) or person undertakes such other actions” (CEQ 1997b). A cumulative effects analysis must take into consideration both direct and indirect effects of the proposed action, as well as the action’s spatial and temporal effects when considered with other, past, recent, or future actions.

#### **4.14.1 Past Actions**

Barnstable County played a major role in the founding of America. As the country has become increasingly industrialized, impacts on the waterways have increased. Industrial modification of the river began in the late 1600s with dams being constructed to harness the power of the river. In addition to fish passage obstructions as a result of industrialization, the water quality in the river has also degraded.

Historical evidence shows that the river once supported thriving populations of diadromous fish. As dams and other structures were built in the river, it become increasingly more difficult for fish to travel in the watershed beyond those various impediments. Eventually, the river became so obstructed to the point that a passage upstream was not available and the historic diadromous fish runs were eliminated.

#### **4.14.2 Proposed Alternatives**

The proposed project is not expected to have any significant adverse cumulative impacts on the Santuit River including lands within and adjacent to the project area and areas downstream of the dam. The proposed project would restore previous impacts on the Santuit River by repairing the non-functioning fish ladder and would thus have a beneficial effect on the fisheries, ecological, and economical aspects of the project area. Additionally, by rehabilitating the dam to bring it into compliance with federal and state dam safety criteria, the dam would continue to operate in a safe condition which would ensure the continued safety of downstream populations as well as maintain the resources (i.e., open water, fisheries, etc.) upstream of the dam.

The proposed alternative is not expected to adversely contribute to the overall negative impacts in conjunction with other projects in the area. The minimal amount of adverse impacts that are required for this project are necessary in order to achieve the project goals of restoring diadromous fish passage and rehabilitating the dam to a safe condition. As such, the small amount of adverse impacts resulting from the proposed project are outweighed by the permanent positive (i.e., beneficial) impacts. The project, as a whole, would have a net benefit on ecological resources.

#### **4.14.3 Reasonable Foreseeable Future Actions**

Reasonable foreseeable construction activities at the Santuit Pond Dam which could cumulatively affect the ecosystem are not anticipated in the near future. The project area is already relatively developed compared to other comparable communities in Barnstable. Additionally, the area is surrounded by protected resources (e.g., rare species habitat and wetlands). Beneficial future actions that could occur include treatment of stormwater runoff from

the residential developments and restoration of hydrological flows between the numerous cranberry bogs.

In the Areawide Plan-EIS for the CCWRRP, a total of 79 priority projects were identified (the Santuit Pond Dam was not identified in that Plan-EIS, but was later added). Those 79 priority projects included 28 salt marsh restorations, 26 stormwater remediation projects, and 25<sup>32</sup> fish passage restoration projects. The salt marsh restoration projects will all have a net beneficial impact by improving salt marsh estuarine habitats. The stormwater remediation projects will also have a net beneficial impact by improving water quality, thus, improving shellfish beds. The fish ladder projects will all have a beneficial impact to wildlife by allowing diadromous fish passage to suitable habitats. In general, the projects identified as part of the CCWRRP will all have a net beneficial impact on the natural resources of Cape Cod.

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<sup>32</sup> With the addition of the Santuit Pond Dam Rehabilitation and Fish Ladder Project, there are 26 fish passage restoration projects identified as part of the CCWRRP.

## **5. COMPARISON OF ALTERNATIVES AND CONCLUSIONS**

### **5.1 PROPOSED ACTION**

The Proposed Action is expected to provide a net ecological and economical benefit as a result of the restoration of the Santuit Pond Dam in Mashpee, Massachusetts. The Proposed Action includes the restoration of the Santuit Pond Dam primary and auxiliary spillways, embankment, and fish ladder. Rehabilitation of the dam is necessary in order to bring the dam into compliance with state dam safety criteria. The existing degraded fish ladder is not longer properly functioning and in need of rehabilitation. Specific benefits of the Proposed Actions include:

- Enhancement of base food source for commercially important fisheries through the improvement of access to spawning habitat for diadromous fishes in Santuit Pond
- Continued protection from dam failure to downstream communities

Potential negative impacts of the Proposed Action include:

- Minimal fills (< 1 acre) placed in regulated resources (i.e., wetlands) for dam rehabilitation
- Minimal loss (< 1 acre) of suitable habitat.

### **5.2 NO FEDERAL ACTION ALTERNATIVE**

The No Federal Action Alternative depicts the most probable future conditions to be realized in absence of any of the alternative plans studied. The Town, the owner of the dam, has determined that it would rehabilitate the dam to meet current dam safety standards without federal funds. The Town may use other alternative rehabilitation methods identified in the Santuit Pond Dam Design Folder, 50% Design Submission (Weston & Sampson 2012) or develop its own plan to bring the dam into compliance with state standards, but it is assumed that the Town would implement the same plan as described in Alternative 1. This assumption was made because the recommended plan is the most cost-effective and least environmentally damaging of all plans considered.

### **5.3 COMPARISON OF ALTERNATIVES**

Table 5 is provided as a comparison of the major environmental and socioeconomic benefits of the two alternatives.

TABLE 5 ALTERNATIVES SUMMARY AND COMPARISON

Affected Environment	Under Proposed Action	Under No Federal Action Alternative
Dam Safety	+	+
Land use	NI	NI
Air quality	NI	NI
Noise	NI	NI
Geology and soils	NI	NI
Water resources	-	-
Sediment	NI	NI
Vegetation	-	-
Wildlife resources	NI	NI
Aquatic resources	+/- <sup>1</sup>	+/- <sup>1</sup>
Wetland resources	-	-
Threatened and endangered species	-	-
Recreation	-	-
Cultural resources	NI	NI
Environmental justice	NI	NI
Socioeconomic resources	NI	NI
NOTES: NI: No impact. +: Indicates item has a positive impact. -: Indicates item has a negative impact. <sup>1/</sup> Both permanent adverse (habitat loss) and beneficial (restoration of access to breeding habitat) will occur.		

## 5.4 CONCLUSION

The proposed Santuit Pond Dam Rehabilitation Project would improve and repair the dam and associated fish ladder thereby maintaining the safety of the dam and restoring diadromous fish passage in the Santuit River to Santuit Pond. Rehabilitation of the dam will result in permanent adverse impacts to regulated resources (i.e., rare species habitat and wetlands); however, those impacts are necessary in order to bring the dam into compliance with federal and state dam safety criteria. Beneficial impacts as a result of the project include restoring diadromous fish passage to suitable breeding grounds as well as maintaining the resources within the impoundment and the continued safety of downstream communities.

Detailed mitigation plans to address the proposed adverse impacts to environmental resources will be prepared as part of the final engineering design process. An area to the southeast of the dam adjacent to an existing cranberry bog has been identified as a suitable location for compensatory mitigation. Mitigation will consist of the establishment of scrub-shrub wetland habitat by expanding the existing cranberry bog at a rate of at least 1:1.

**6. LIST OF PREPARERS**

<b>Name and Present Title</b>	<b>Education</b>	<b>Experience (Years)</b>
<b>Natural Resources Conservation Service</b>		
Luis E. Laracuente, P.E., State Conservation Engineer	BS, Civil Engineering	29
Donald W. Liptack, District Conservationist	BS, Wildlife Management MS, Resource Management and Administration	33
Abigail Franklin, Anadromous Fish Restoration Project Manager	BA, Natural Science MS, Wildlife and Fisheries Conservation	13
<b>EA Engineering, Science, and Technology, Inc.</b>		
Sam Whitin, Project Manager	BS, Biology	12
P. Chase Bernier, AWB <sup>®</sup> , Project Scientist	BT, Wildlife Management	5
<b>Weston &amp; Sampson</b>		
Mark P. Mitsch, P.E., Senior Associate	BS, Forest Engineering MS, Civil Engineering	30
Mel Higgins, Senior Environmental Scientist	BA, Economics and French MEM, Water Resources	19

## 7. AGENCIES AND PERSONS CONTACTED

<p>Amy Coman-Hoenig        Endangered Species Review Assistant        Natural Heritage and Endangered Species Program        1 Rabbit Hill Road        Westborough, MA 01581</p>	<p>Edward M. Lambert, Mr.        Commissioner        Massachusetts Department of Conservation and        Recreation        251 Causeway Street, Suite 600        Boston, MA 02114-2104</p>
<p>Mr. Jason Zimmer        District Manager, Southeast Wildlife District        Massachusetts Division of Fish and Wildlife        195 Bournedale Road        Buzzard's Bay, MA 02532</p>	<p>Mr. Thomas Chapman        Supervisor        Northeast Regional Office        U.S. Fish and Wildlife Service        300 Westgate Center Drive        Hadley, MA 01035-9587</p>
<p>Brona Simon        State Historic Preservation Officer and Executive        Director        Massachusetts Historical Commission        220 Morrissey Boulevard        Boston, MA 02125</p>	<p>Tribal Historic Preservation Officer        Mashpee Wampanoag Tribe        P.O. Box 10408        Mashpee, MA 02649</p>
<p>Mr. H. Curtis Spalding        Regional Administrator        U.S. Environmental Protection Agency        Region I, New England        5 Post Office Squire, Ste. 100        Boston, MA 0209</p>	<p>Brad Chase        Massachusetts Division of Marine Fisheries        Quest Campus        1213 Purchase St, 3<sup>rd</sup> Floor        New Bedford, MA 02740</p>
<p>Mr. Don Boyce        Regional Administrator, Region I        Federal Emergency Management Agency        99 High Street, 6<sup>th</sup> Floor        Boston, MA 02110</p>	<p>Regulatory Office        New England District        U.S. Army Corps of Engineers        696 Virginia Road        Concord, MA 01742</p>
<p>Catherine Laurent        Director        Town of Mashpee Department of Public Works        350 Meetinghouse Road        Mashpee, MA 02649</p>	<p>Andrew McManus        Town of Mashpee Conservation Agent        16 Great Neck Road North        Mashpee, MA 02649</p>

## 8. REFERENCES

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**APPENDIX A**

**CERTIFICATE OF NON-COMPLIANCE AND DAM  
SAFETY ORDER**

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RECEIVED

OCT 22 PM 1:40

OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS  
TOWN OF MASHPEE

dcr  
Massachusetts



February 22, 2008

Certified Mail No. 7007 0710 0005 4302 0987  
Return Receipt Requested

Town of Mashpee Conservation Commission  
16 Great Neck Road North  
Mashpee, MA 02649

**Subject: CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**

**Dam Name:** Santuit Pond  
**Location:** Mashpee  
**National ID No:** MA02445  
**Known Condition:** Poor  
**Hazard Potential:** Significant

Dear Town of Mashpee Conservation Commission:

In accordance with 302 CMR 10.08, the Department of Conservation and Recreation (DCR), Office of Dam Safety (ODS) has determined that **Santuit Pond** does not meet accepted dam safety standards and is a potential threat to public safety. Therefore, you are being issued a **CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER**.

Records at the Office of Dam Safety indicate Town of Mashpee Conservation Commission to be the Owner of the Santuit Pond, National Inventory of Dams No. MA02445. The Dam is classified by the Department of Conservation and Recreation (DCR), Office of Dam Safety (ODS) as an **Intermediate Size, Significant Hazard Potential** Structure. Significant Hazard Potential Dams are dams that may cause the loss of life and property damage in the event of dam failure.

COMMONWEALTH OF MASSACHUSETTS · EXECUTIVE OFFICE OF ENERGY & ENVIRONMENTAL AFFAIRS

Department of Conservation and Recreation  
251 Causeway Street, Suite 600  
Boston MA 02114-2119  
617-626-1250 617-626-1351 Fax  
www.mass.gov/dcr



Deval L. Patrick  
Governor

Timothy P. Murray  
l.t. Governor

Ian A. Bowles, Secretary  
Executive Office of Energy & Environmental Affairs

Richard K. Sullivan, Jr., Commissioner  
Department of Conservation & Recreation

On 6/26/1999, an inspection of the Santuit Pond was completed by engineering consultant, Haley & Aldrich. As a result of this inspection, the dam was determined to be **STRUCTURALLY DEFICIENT** and in **POOR** condition. The dam has been found to be in need of repair, breaching or removal to bring the dam into compliance with dam safety regulations.

The basis for the CERTIFICATE OF NON-COMPLIANCE and POOR CONDITION findings are the inspection report results for the Santuit Pond.

MGL Chapter 253, Sections 44-48 set forth the jurisdiction for the Office of Dam Safety and its authority to take action and order actions to be taken. For your information a copy of the Dam Safety Regulations, 302 CMR 10.00 Dam Safety, is enclosed.

**DAM SAFETY ORDER:**

In accordance with the authority of MGL Chapter 253, Section 47, POOR or Inadequate Dams, and pursuant to 302 CMR 10.07 Inspection Schedule and 10.08 Compliance with Inspection Results you are hereby **ORDERED** to comply with the following:

- 1) **Conduct Follow-up Inspections:** The owner shall complete follow-up visual inspections at 6-month intervals, conducted by a registered professional civil engineer qualified to conduct dam inspections, at your cost, until adequate repairs are made or the dam is adequately breached. The first Follow-up inspection shall be submitted to ODS no later than **May 31, 2008**.

Follow-up inspections are to be summary in format and shall provide a written description, including photographs, of any changes in condition. Your engineer is to use the attached Office of Dam Safety Poor Condition Dam Follow-up Inspection Form to report follow-up inspection findings. The form is also available electronically on the Office of Dam Safety web site. Your engineer shall include a cover letter on engineering firm letterhead that briefly summarizes the current follow-up inspection and findings. Your engineer shall sign and stamp the cover letter.

You shall submit two (2) hard copies and one (1) electronic pdf copy of all completed follow-up visual inspection reports to ODS within 30 days of the date of follow-up inspection field work.

- 2) **Conduct Phase II Inspection and Investigations.** The owner shall within 180 days of receipt of this CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER hire at your cost, a qualified registered professional engineer with dam engineering experience (engineer) to conduct a Phase II Inspection and Investigation of the dam to evaluate the structural integrity and spillway hydraulic adequacy of your dam and to develop/implement a plan to bring the dam into compliance with dam safety regulations by adequately repairing, breaching or removing the dam (see attached Phase II Investigation Outline).

- a. The owner shall commence the Phase II Inspection and Investigation no later than **August 15, 2008**. The Phase II Inspection and Investigation is to conform to the attached Phase II Investigation Outline. You are to, in a letter to ODS, no later than **July 31, 2008**, identify your selected engineer and inform ODS of the start date of the Phase II work.
- b. The Phase II Inspection and Investigation is to be completed, signed and stamped by your engineer and copies of the Phase II final report are to be delivered to ODS no later than **November 31, 2008**.

You shall include a cover letter with the submitted Phase II report which describes your selected alternative to bring the dam into compliance with dam safety regulations. The owner shall submit a statement of your intent to implement inspection report recommendations to address structural and operational deficiencies to ODS upon submission of the required Phase II Inspection and Investigation completed by your engineer.

- 3) **Bring the dam into compliance and complete all repair, breach or removal work no later than November 31, 2009.** With your Phase II submittal, you must also provide a proposed timeline to design, permit and construct the selected alternative to repair, breach or remove the dam. The selected alternative must be completed, and the dam brought into compliance with Dam Safety regulations, by November 31, 2009.
- 4) **Additional Requirements:**
  - a. You shall furnish copies of all required submittals listed above via certified mail.
  - b. In order to maintain compliance with the Commonwealth's Wetlands Protection Laws you may have to seek requisite approval from your local Conservation Commission in accordance with G.L. c. 131, §40. You are obligated to contact and maintain communication with the Mashpee Conservation Commission and any other local, state or federal permitting agency the ensure compliance with the Wetlands Protection Act and any other regulatory requirements.
  - c. You must inform the following parties about the condition of the dam and your developing plans to bring the dam into compliance with dam safety regulations: all abutters of the impoundment upstream; property owners within one-half mile downstream of the Santuit Pond; Jason Zimmer, District Manager, Southeast Wildlife District, Division of Fisheries & Wildlife, 195 Bournedale Road, Buzzards Bay, MA 02532; Liz Kouloheras, Department of Environmental Protection, Southeast Region, 20 Riverside Drive, MA 02347; Ernie Virgilio, Mashpee Emergency Management Director; Theresa M. Cook, Chair, Board of Selectmen, Town of Mashpee.

Please be advised that in accordance with G.L. c. 253, § 47, "any person ... who fails to comply with the provisions of this chapter or of any order, regulation or requirement of the department relative to dam safety, shall be fined an amount not to exceed \$500 for each offense, to be fixed by the court." Furthermore, each violation shall be regarded as a separate and distinct offense and, in case of a continuing violation, each day's continuance thereof shall be deemed to be a separate and distinct offense.

Nothing in this order releases the owner from the requirements of any prior Dam Safety Order issued for this dam, including any Dam Safety Order to submit follow-up inspections on a 6-month schedule.

In accordance with 302 CMR 10.08, this CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER will be recorded at the Registry of Deeds. Issuance of a Certificate of Compliance following adequate repair or breaching of the dam will be required to discharge the CERTIFICATE OF NON-COMPLIANCE and DAM SAFETY ORDER.

Please direct any technical questions, correspondence, or submittals to Edward Hughes, Department of Conservation and Recreation, Office of Dam Safety, 251 Causeway Street, Suite 800, Boston, MA 02114. Legal questions should be directed to the DCR Assistant General Counsel, Ariana Johnson, 251 Causeway Street, Suite 600, Boston, MA 02114. Additional dam safety information can be found at the DCR-ODS website. <http://www.mass.gov/dcr/pe/damSafety/index.htm>.

Thank you for your cooperation.

Sincerely,



Richard K. Sullivan, Jr.  
Commissioner

CC: Theresa M. Cook, Chair, Board of Selectmen, Town of Mashpee  
Ernie Virgilio, Mashpee Emergency Management Director  
John Fitzsimmons Chair of Mashpee Conservation Commission  
Paul Sneeringer, U.S. Army Corps  
Liz Kouloheras, DEP Wetland Section Chief  
Deerin Babb-Brott, MEPA  
Jason Zimmer, DFW  
Jack Murray, DCR  
Michael Misslin, DCR  
William Salomaa, DCR  
Edward Hughes, DCR  
Ariana Johnson, Esq., DCR  
Elizabeth Sorenson, DCR  
Joan Kimball, Riverways

Department of Conservation and Recreation  
Office of Dam Safety  
Phase II Inspection and Investigation Outline

I.	Review of existing information.....
II.	Updated Detailed Phase I surface inspection in compliance with Office of Dam Safety Phase I Inspection format.....
III.	Subsurface Investigations – borings, sampling, analysis.....
IV.	Topographic Survey, wetlands flagging/delineation, of sufficient detail to support not only the Phase II effort, but sufficient for the future implementation of design phase.....
V.	Stability and seepage analyses – Seismic and static stability evaluation of dam (upstream and downstream slopes, internal materials), seepage potential, internal erosion potential, piping potential.....
VI.	Hydrologic/Hydraulic Analysis and spillway inadequacy resolution.....
VII.	Alternatives analysis and presentation of conceptual designs and associated estimated design, permitting and construction costs to bring the dam structure into compliance with Chapter 253 Section 44-48 and 302 CMR 10.00 Dam Safety Regulations by either executing selected repair plan or breach plan.....
VIII.	Final Report Presented to the Office of Dam Safety.....

**Commonwealth of Massachusetts  
Department of Conservation and Recreation  
Office of Dam Safety Poor Condition Dam Follow-up Inspection Form**

(Complete this inspection form and provide a cover letter on consulting firm letterhead that briefly summarizes the current follow-up inspection and findings. The cover letter shall be signed and stamped by the Registered Professional Engineer in charge of the inspection)

**Dam Name:**  
**Dam Owner:**  
**Nat. ID Number:**  
**Hazard Potential:**  
**Location of Dam (town):**  
**Coordinate location (lat, long):**  
**Date of Inspection:**  
**Weather:**

**Consultant Inspector(s):** firm name and name of Registered Professional Engineer in charge of inspection.

**Others in Attendance at Field Inspection:** include list of names, affiliation and phone numbers.

**Attachments:** Updated site sketch with photo locations, Updated photos, and copy of locus map from Phase I report and other applicable attachments.

- I. Previous Inspection date/Overall Condition:**
  - Date of most recent formal Phase I Inspection Report:
  - List the overall condition reported in most recent Phase I Inspection Report:
- II. Previous Inspection Deficiencies:**
  - List identified deficiencies in the most recent Phase I Inspection Report:
- III. Overall Condition of Dam at the Time of the Current Follow-up Inspection:**
  - a. State the current condition
  - b. Have conditions changed since the previous inspection? Yes or no.
- IV. Comparison of Current Conditions to Condition Listed in Previous Phase I Inspection Report:**
  - a. Have any of the deficiencies listed in the previous Phase I Inspection Report worsened?
  - b. If yes, list the changes.

- c. Are there any additional deficiencies that have been identified in the current inspection?
- d. If yes, list the deficiencies and describe.

**V. Dam Safety Orders:**

- List dam safety orders that have been issued to the dam owner pertaining to this dam.

**VI. Maintenance:**

1. Indicate if there exists an operation and maintenance plan for the dam.
2. Indicate if it appears the dam is being maintained.

**VII. Recommendations:**

**VIII. Other Comments or Observations:**

**IX. Updated Site Sketch with Photo Locations:**

**X. Updated Photos:**

**XI. Copy of Locus Map from Phase I Report:**

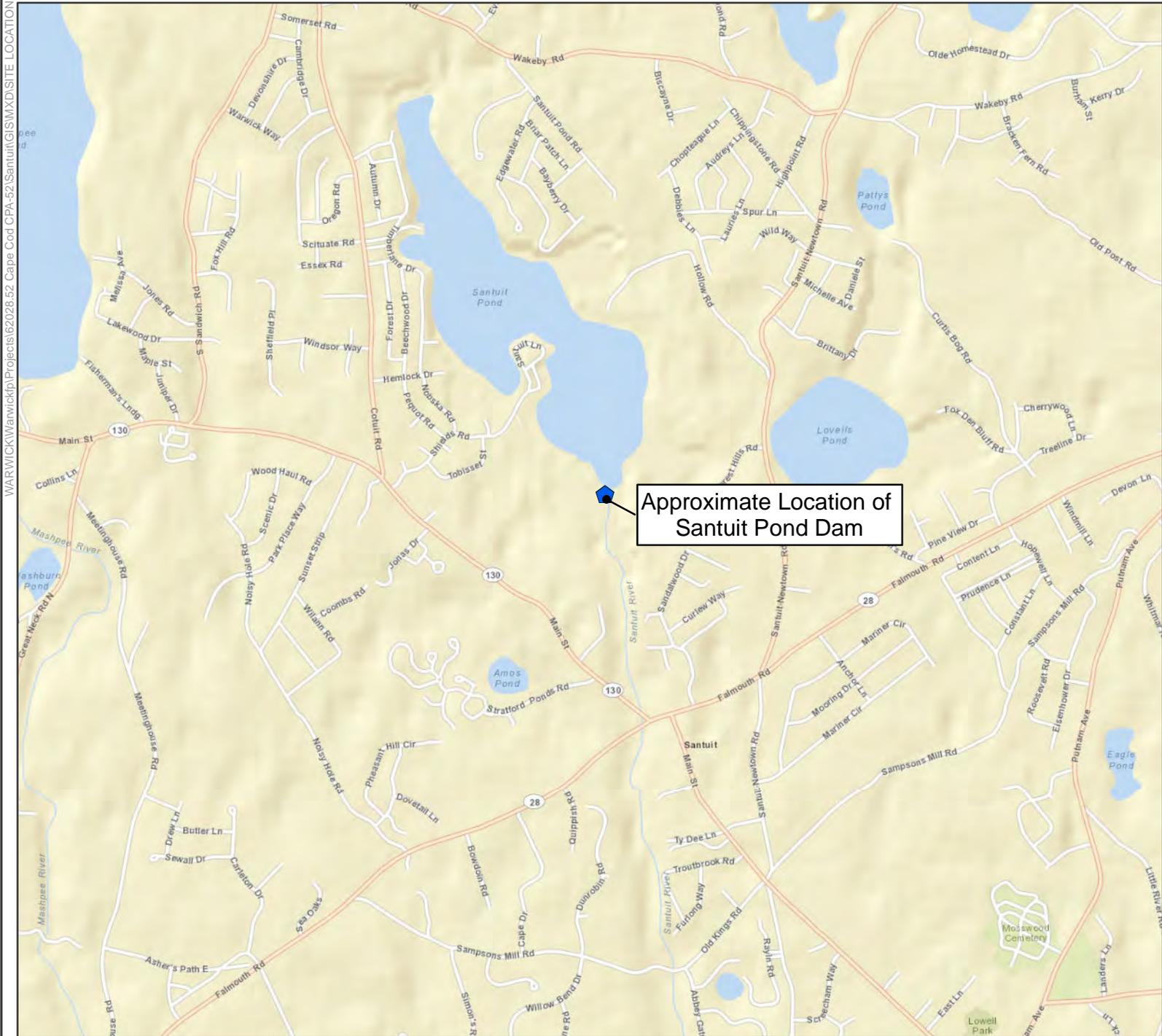
**XII. Other applicable attachment:**

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**APPENDIX B**

**FIGURES**

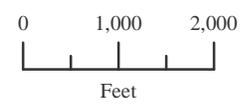
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Santuit Pond Dam Rehabilitation  
 Figure 1. Site Location

Legend

-  Project Location



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*Santuit Pond*

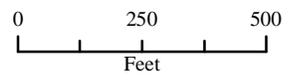
*Santuit River*

Santuit Pond Dam Restoration

Figure 2. Aerial Photograph

Legend

- Limit of Work
- Santuit River



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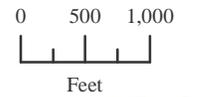


### Santuit Pond Dam Restoration

Figure 3. Land Uses

#### Legend

-  Project Location
-  Agriculture (Cranberry Bog)
-  Residential
-  Commercial/Industrial
-  Open
-  Other
-  Santuit River



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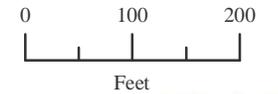


### Santuit Pond Dam Restoration

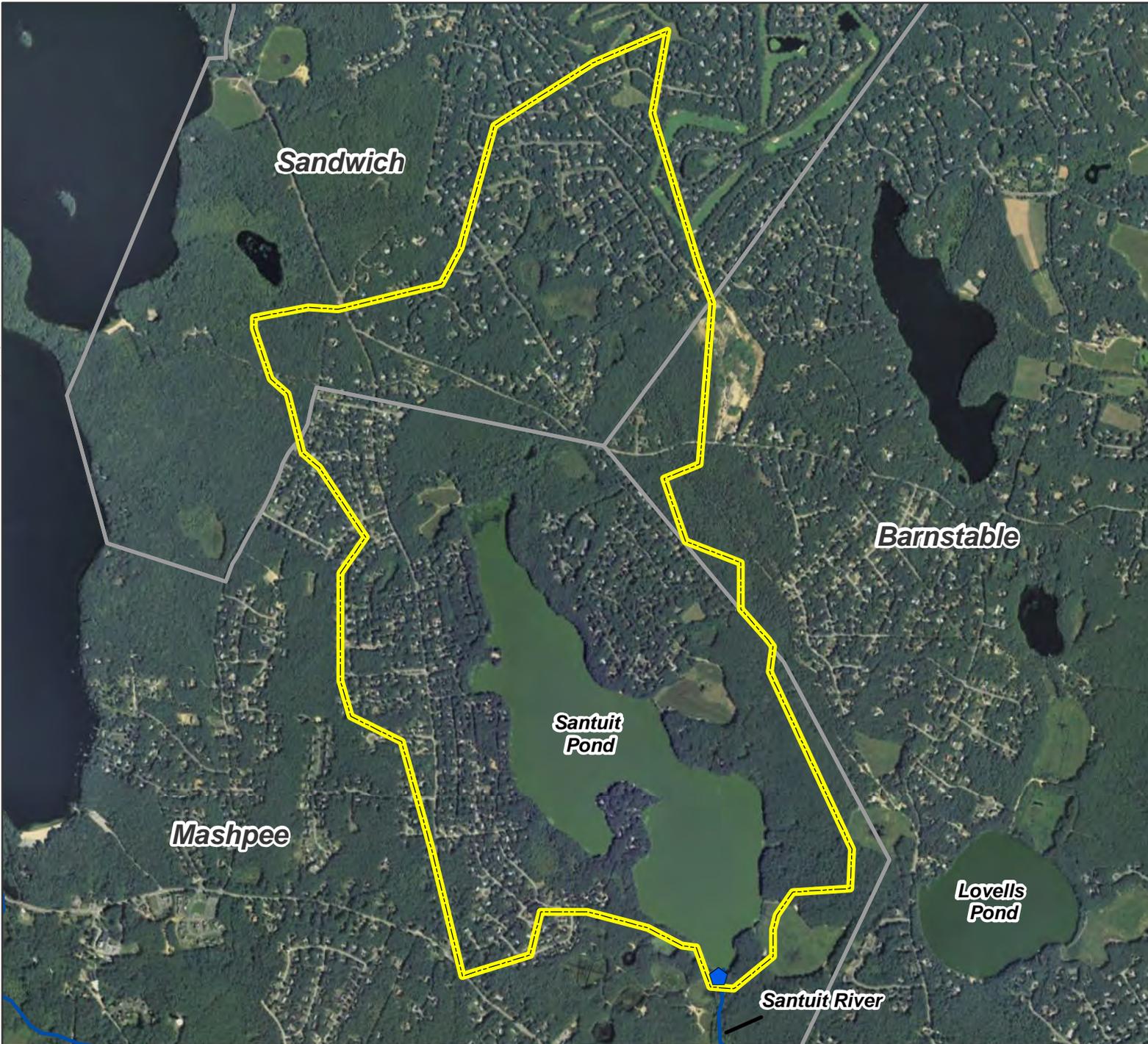
Figure 4. Soils

#### Legend

-  Limit of Work
-  1; Water
-  252C; Carver coarse sand
-  252D; Carver coarse sand
-  254A; Merrimac sandy loam
-  254B; Merrimac sandy loam
-  254C; Merrimac sandy loam
-  256A; Deerfield loamy fine sand
-  259B; Carver loamy coarse sand
-  264A; Eastchop loamy fine sand
-  265A; Enfield silt loam
-  55A; Freetown coarse sand
-  Santuit River



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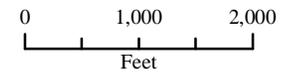


Santuit Pond Dam Restoration

Figure 5. Watershed

Legend

- Project Location
- Watershed
- Town Boundary
- Santuit River



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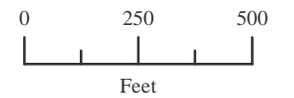


### Santuit Pond Dam Restoration

Figure 6. Assessed Wetlands

#### Legend

-  Limit of Work
-  Land Under Water
-  Boring Vegetated Wetland (Bog)
-  Santuit River



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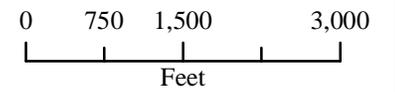


Santuit Pond Dam Restoration

Figure 7. Floodplain

Legend

-  Limit of Work
-  100 Year Floodplain
-  500 Year Floodplain
-  Santuit River



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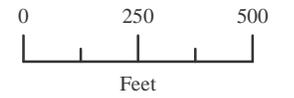


Santuit Pond Dam Restoration

Figure 8. Rare Species Habitat

Legend

-  Limit of Work
-  Priority Habitat for Rare Species
-  Estimated Habitat for Rare Species
-  Santuit River



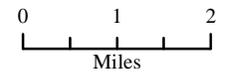
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Santuit Pond Dam Restoration  
Figure 9. Environmental Justice

Legend

-  Project Location
-  Environmental Justice Zones

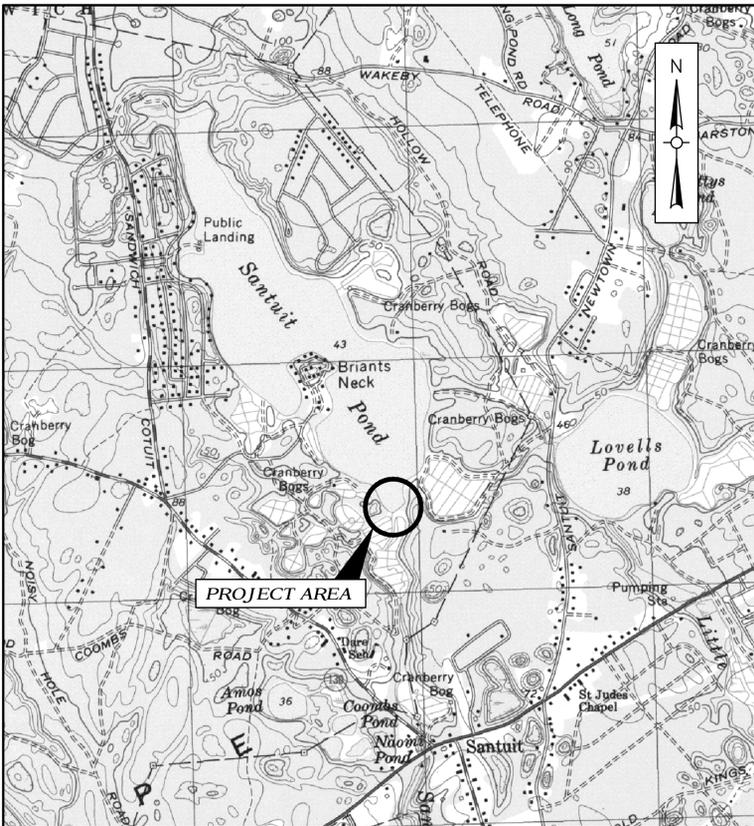


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**APPENDIX C**

**ENGINEERING DRAWINGS**

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LOCUS MAP  
SCALE: 1"=1,200'

# TOWN OF MASHPEE MASSACHUSETTS

## DEPARTMENT OF PUBLIC WORKS

### SANTUIT POND DAM REHABILITATION

MASSACHUSETTS OFFICE OF DAM SAFETY ID NO. 'UNKNOWN'

NATIONAL DAM ID NO. MA02445

MASSACHUSETTS OFFICE OF DAM SAFETY HAZARD RATING: LOW

MASSACHUSETTS OFFICE OF DAM SAFETY SIZE RATING: INTERMEDIATE

**APRIL 2012**

DRAWING INDEX

- G-1 ABBREVIATIONS, NOTES AND LEGEND
- G-2 CONSTRUCTION ACCESS AND ABUTTING PROPERTIES
- G-3 CONSTRUCTION STAGING AREA AND SITE ACCESS
- C-1 EXISTING SITE CONDITIONS
- C-2 PROPOSED CONDITIONS
- C-2P PROPOSED CONDITIONS (PERMITTING)
- S-1 STRUCTURAL PLAN AND NOTES
- S-2 STRUCTURAL ELEVATIONS AND SECTIONS
- S-3 STRUCTURAL ELEVATIONS AND DETAILS
- D-1 CIVIL SECTIONS
- D-2 CIVIL SECTIONS
- D-3 CIVIL DETAILS
- D-4 CIVIL DETAILS

**Weston&Sampson**<sup>®</sup>

Five Centennial Drive, Peabody, Massachusetts 01960-7985

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## LEGEND

DESCRIPTION	EXISTING	PROPOSED
TEMPORARY WATER		---4"W---
STORM DRAIN	---D---	---18"D RCP---
GAS	---G---	---4"G---
ELECTRIC	---E---	---E---
TELEPHONE	---T---	---T---
STORM DRAIN MANHOLE	⊙	●SDMH
ELECTRICAL MANHOLE	⊙	●EMH
TELEPHONE MANHOLE	⊙	●TMH
CATCH BASIN	□	■CB
HYDRANT	⊕	⊕
UTILITY POLE	⊕	⊕
GUY POLE	⊕	⊕
LIGHT POST	☆	
EDGE OF PAVEMENT	---	---
EDGE OF UNPAVED ROAD	---	---
CURB	---	---
STONE WALL	○○○○○○○○	○○○○○○○○
RETAINING WALL	RET WALL	RET WALL
FENCE	---X---X---	---X---X---
INDIVIDUAL DECIDUOUS TREE	*	*
INDIVIDUAL EVERGREEN TREE	⊙	⊙
TREE LINE	~~~~~	~~~~~
SURVEY MARKER	□	□
PROPERTY LINE	---P---	---
EASEMENT LINE	---	---
LIMIT OF WORK	---	---
SPOT ELEVATIONS	x 141.5	x 141.5
CONTOUR LINES	---56---	---56---
DEPRESSION CONTOUR LINES	TTTTT	TTTTT
WETLAND	↓↓↓	↓↓↓
WETLAND FLAGS		1 2
RIPRAP	○○○○○○○○	○○○○○○○○
BOLLARD	○B	●B
SIGN	+	+
BENCH MARK	⊕	⊕
BORING	⊕B-10	⊕B-11
PROBE	⊕P-10	⊕P-11
STRAW BALES		
ROCK OUTCROP		
DRAINAGE DITCH / SWALE	---	---
TREE TO BE REMOVED	---	---
SILT CURTAIN	---	---
SURVEY BOUND	---	---

NOTE: ITEMS SHOWN IN THE LEGEND MAY NOT BE PRESENT IN THESE PLANS

## SANTUIT POND INFLOW-STAGE RELATIONSHIP

STORM EVENT	INDEX PRECIPITATION IN 24-HOURS (IN.)	PEAK INFLOW (CFS)	PEAK STAGE (EL.)	INCREMENTAL WATER SURFACE ELEVATION INCREASE ABOVE EL. 377 (FT.)	OUTFLOW (CFS)
2-YEAR	3.3	34	42.7	0.2	3.0
5-YEAR	4.2	63	42.8	0.3	4.5
10-YEAR	4.9	94	43.0	0.5	6.8
25-YEAR	6.1	154	43.3	0.8	12.2
50-YEAR	7.3	216	43.5	1.0	18.1
100-YEAR	8.4	281	43.8	1.3	24.4

### NOTES:

- NORMAL BASE FLOW IS ASSUMED TO BE APPROXIMATELY 0.3 CFS.
- THE WATER SURFACE ELEVATION AT THE START OF THE STORM EVENTS IS ASSUMED TO BE EL. 42.5 TO REPRESENT THE NORMAL POOL ELEVATION OF SANTUIT POND.
- PEAK STAGE VALUES PRESENTED IN THE TABLE WERE DETERMINED ASSUMING OUTFLOW GOVERNED BY EXISTING CONDITIONS AT SANTUIT POND DAM. THEREFORE, PEAK STAGES MAY VARY BASED ON THE CONFIGURATION OF THE DAM DURING CONSTRUCTION WHEN LARGE STORM EVENTS OCCUR.
- THIS TABLE IS PROVIDED TO AID THE CONTRACTOR IN PREPARING A POND LEVEL MANAGEMENT PLAN AND ACTION PLAN SHOULD A STORM EVENT OCCUR DURING CONSTRUCTION. THE INFORMATION PRESENTED IN THE TABLE ARE THE RESULTS OF COMPUTER-SIMULATION MODELING OF THE HYDROLOGY OF SANTUIT POND WATERSHED AND THE HYDRAULICS OF SANTUIT POND DAM CONDUCTED BY WESTON & SAMPSON. THIS INFORMATION IS TO BE USED AS A GUIDELINE ONLY AS THE CHARACTERISTICS OF LARGE STORMS AND AVAILABLE SPILLWAY WEIR LENGTH MAY DIFFER FROM THE ASSUMPTIONS MADE IN THE MODELING EFFORT.
- IN ALL CASES, WORK SHALL BE SUSPENDED UNTIL WATER LEVELS ARE CONTROLLED DURING AND FOLLOWING STORM EVENTS DURING CONSTRUCTION.

## GENERAL NOTES

- THE CONTRACTOR SHALL CALL DIGSAFE AT 1-888-344-7233 AT LEAST 72 HOURS, SATURDAYS, SUNDAYS, AND HOLIDAYS EXCLUDED, PRIOR TO EXCAVATING AT ANY LOCATION. A COPY OF THE DIGSAFE PROJECT REFERENCE NUMBER(S) SHALL BE GIVEN TO THE OWNER PRIOR TO EXCAVATION.
- LOCATIONS OF EXISTING PIPES, CONDUITS, UTILITIES, FOUNDATIONS AND OTHER UNDERGROUND OBJECTS ARE NOT WARRANTED TO BE CORRECT AND THE CONTRACTOR SHALL HAVE NO CLAIM ON THAT ACCOUNT SHOULD THEY BE OTHER THAN SHOWN.
- ALL PAVEMENT DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPLACED IN ACCORDANCE WITH THE SPECIFICATIONS AND AS SHOWN ON THE DRAWINGS.
- ALL AREAS DISTURBED BY THE CONTRACTOR BEYOND PAYMENT LIMITS SHALL BE RESTORED AT NO ADDITIONAL COST TO THE OWNER.
- THE CONTRACTOR SHALL NOT STORE ANY APPARATUS, MATERIALS, SUPPLIES, OR EQUIPMENT ON DRAINAGE STRUCTURES OR WITHIN 100 FEET OF WETLANDS UNLESS IDENTIFIED ON THE PLANS AS THE STAGING AND STOCKPILE AREA. THIS AREA WILL BE PROTECTED FROM EROSION AND CONTAMINATION INTO ANY RESOURCE AREA BY EROSION AND SEDIMENTATION CONTROL AS SHOWN ON SHEET D-3.
- THE BASE PLAN IS BASED ON TOWN OF MASHPEE GEOGRAPHICAL INFORMATION SYSTEM (GIS) MAPPING AND A TOTAL STATION SURVEY CONDUCTED BY WESTON & SAMPSON IN APRIL 2009.
- THE VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 1988).
- THE HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 1983).
- PROPERTY LINE INFORMATION WAS PROVIDED BY THE TOWN OF MASHPEE AS GIS DATA. PROPERTY LINES ARE THEREFORE APPROXIMATE.
- BENCHMARKS USED FOR THE SURVEY AND PROVIDED FOR CONSTRUCTION ARE TWO HUB AND TACK SURVEY STATIONS LABELED BM1 AND BM2 ON SHEETS C-1 AND C-2.
- WETLAND AREAS WERE DELINEATED BY A WESTON & SAMPSON CERTIFIED WETLAND SCIENTIST IN APRIL 2008, THE WETLAND FLAGS WERE LOCATED VIA TOTAL STATION SURVEY. ADDITIONAL WETLAND AREAS WERE DELINEATED BY WESTON & SAMPSON IN JUNE 2011 AND LOCATED VIA GPS.
- EXISTING CONDITIONS ARE BASED PRIMARILY ON THE REFERENCED TOPOGRAPHIC SURVEY. CURRENT CONDITIONS MAY VARY FROM THOSE SHOWN ON THE DRAWINGS. IT IS THE CONTRACTOR'S RESPONSIBILITY TO VISIT THE SITE TO INSPECT THE CURRENT CONDITIONS PRIOR TO SUBMITTING BID DOCUMENTS. ANY VARIATIONS FROM THE CONDITIONS SHOWN, WHICH WILL IMPACT THE CONSTRUCTION COST OR METHOD SHOULD BE BROUGHT TO THE ENGINEER'S ATTENTION IN WRITING AND SHOULD BE INCLUDED IN THE BID PRICE. NO ADDITIONAL COMPENSATION WILL BE APPROVED DUE TO OBSERVABLE SURFICIAL SITE CONDITIONS NOT SHOWN ON THE DRAWINGS.
- RIGHT AND LEFT IS REFERENCED AS THOUGH STANDING IN SANTUIT POND FACING DOWNSTREAM (SOUTH).
- THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING ALL EROSION AND SEDIMENTATION CONTROLS AS SHOWN ON SHEET C-2 THROUGHOUT CONSTRUCTION.
- INSTALL AND MAINTAIN SITE PERIMETER FENCING WHERE NECESSARY AND PREVENT ACCESS BY THE PUBLIC TO THE SITE AT ALL TIMES DURING CONSTRUCTION. ALL SUCH WORK SHALL BE CONSIDERED INCIDENTAL TO THE WORK.
- PLAN AND CONDUCT ALL CONSTRUCTION ACTIVITIES TO ACCOMMODATE DISCHARGE FROM THE DAM TO THE DOWNSTREAM CHANNEL, INCLUDING ALL STORM FLOWS. DURING CONSTRUCTION, A MINIMUM OUTFLOW OF 0.3 CFS SHALL BE MAINTAINED AT ALL TIMES. THE CONTRACTOR MAY USE THE INFLOW STAGE RELATIONSHIP TABLE PROVIDED ON THIS SHEET AS A GUIDE TO ESTIMATED FLOWS UNDER VARIOUS CONDITIONS.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL CONSTRUCTION DEWATERING AND SURFACE WATER CONTROL TO ACHIEVE FIRM, DRY EXCAVATION SUBGRADE CONDITIONS AND ALLOW ALL CONSTRUCTION IN-THE-DRY. MAINTAIN GROUNDWATER LEVEL 24-INCHES BELOW THE EXCAVATION/ BACKFILL LEVEL AT ALL TIMES.
- THE CONTRACTOR SHALL MAINTAIN SIDE SLOPES AND DRAINAGE SWALES DURING CONSTRUCTION TO PREVENT PONDING AND EROSION.
- THE CONTRACTOR SHALL MAINTAIN EXCAVATION SLOPES DURING CONSTRUCTION IN ACCORDANCE WITH THE MINIMUM AND MAXIMUM SLOPES SPECIFIED IN THE CONTRACT AND AS REQUIRED BY STATE OR FEDERAL EXCAVATION SAFETY REGULATIONS. ANY LATERAL SUPPORT SYSTEM USED IN THE FIELD SHALL BE INCIDENTAL TO THE APPROPRIATE WORK ITEM AND CONFORM TO SPECIFICATION 02300.
- UNSUITABLE MATERIALS MAY BE ENCOUNTERED IN THE EXCAVATIONS. THE CONTRACTOR WILL BE REQUIRED TO OVER-EXCAVATE, AS DIRECTED BY THE ENGINEER, TO SUITABLE SUBGRADE. THE CONTRACTOR SHALL REPLACE THE EXCAVATED MATERIAL WITH SUITABLE FILL MATERIAL AS DIRECTED BY THE ENGINEER. FILTER FABRIC MAY BE REQUIRED AT THE ENGINEER'S DISCRETION, AND IS CONSIDERED INCIDENTAL TO THE WORK.
- THE CONTRACTOR IS RESPONSIBLE FOR REMOVING AND PROPERLY DISPOSING EXCESS FILL, TREES, PAVEMENT, AND DEMOLITION DEBRIS RESULTING FROM CONSTRUCTION ACTIVITIES AT A PROPER OFF-SITE AREA IN ACCORDANCE WITH SPECIFICATION 02300 AND 02330. THE CONTRACTOR SHOULD ALSO BE AWARE OF THE DREDGED SOIL SAMPLING REQUIREMENTS OUTLINED IN SPECIFICATION 2300.

## ABBREVIATIONS

BM	BENCHMARK
CONC	CONCRETE
DIA	DIAMETER
ELEV, EL.	ELEVATION
EXIST	EXISTING
FT	FEET, FOOT
MIN	MINIMUM
MISC	MISCELLANEOUS
N	NORTH
R	PROPERTY LINE
SECT	SECTION
SPEC	SPECIFICATION
TYP	TYPICAL
W/O	WITHOUT
WF	WETLAND FLAG

## INSTRUMENTATION

### STAFF GAGE

- INSTALL PERMANENT STAFF GAGE (STYLE "A", STANDARD U.S.G.S. GAGE, 4 IN. WIDE, IRON GAGE FINISHED WITH PORCELAIN ENAMEL, SUCH AS RICKLY HYDROLOGICAL COMPANY OF COLUMBUS, OHIO, CATALOG NUMBER 801-024 AND 801-025 OR APPROVED EQUAL) ON UPSTREAM SIDE OF TW2 AS APPROVED BY THE ENGINEER ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
- THE STYLE "A" STAFF GAGE SHOULD BE INSTALLED FROM 41.0 TO 44.5 AND SHOULD CORRESPOND WITH ACTUAL SITE ELEVATIONS.

## PROJECT PLAQUE

THE EXISTING PLAQUE AND STONE LEFT OF THE PRIMARY SHALL BE PRESERVED AT THE START OF CONSTRUCTION AND REPLACED AT THE SAME APPROXIMATE LOCATION IN IT'S EXISTING CONDITON AT THE PROJECT FINISH.

## SEQUENCE OF WORK

- INSTALL AND MAINTAIN EROSION AND SEDIMENT CONTROLS AT THE PROJECT SITE, STAGING AREA, AND ALONG ACCESS ROADS INCLUDING SILT FENCE, STRAW BALES, SILT CURTAIN, AND STABILIZED CONSTRUCTION ENTRANCE.
- IMPROVE AND STABILIZE, AS NECESSARY, THE ACCESS ROAD FROM TOBISSET STREET TO THE STAGING AREA AND DAM TO SUPPORT PROPOSED CONSTRUCTION EQUIPMENT TRAFFIC. IMPROVEMENTS INCLUDE THE PROPOSED (TEMPORARY/PERMANENT) WIDENING OF THE ACCESS ROAD FROM THE STAGING AREA TO THE DAM SITE TO SUPPORT CONSTRUCTION TRAFFIC.
- MANAGE POND LEVEL AND DISCHARGE THROUGH THE DAM IN ACCORDANCE WITH THE APPLICABLE PERMITS AND TO ALLOW FOR CONSTRUCTION IN-THE-DRY THROUGHOUT THE DURATION OF CONSTRUCTION. THE EXISTING OUTLET STRUCTURE (AUXILIARY SPILLWAY) MAY BE USED TO MAINTAIN DISCHARGE TO THE EXTENT PRACTICABLE. ADJUST AND MAINTAIN CHANNELS AND FLOW CONTROL STRUCTURES ALONG THE EXISTING CHANNELS CARRYING FLOW BACK TO THE SANTUIT RIVER DOWNSTREAM OF THE DAM.
- CLEAR AND CRUB THE DAM EMBANKMENT WITHIN THE LIMIT-OF-WORK AS SHOWN ON THE DRAWINGS.
- INSTALL A TEMPORARY COFFERDAM SYSTEM UPSTREAM AND DOWNSTREAM OF THE EXISTING PRIMARY SPILLWAY/FISH LADDER STRUCTURE AS NECESSARY. OTHER TEMPORARY COFFERDAMS MAY BE NECESSARY ALONG PORTIONS OF THE DOWNSTREAM SIDE OF THE WORK AREA TO ALLOW EMBANKMENT CONSTRUCTION IN-THE-DRY.
- DEMOLISH THE EXISTING PRIMARY SPILLWAY AND FISH LADDER STRUCTURE.
- ESTABLISH EQUIPMENT ACCESS TO THE EMBANKMENT LEFT OF THE PRIMARY SPILLWAY. CLEAR, GRUB, AND COMPLETE IMPROVEMENTS TO THESE AREAS AS SHOWN ON THE DRAWINGS INCLUDING GRADING, SEEPAGE FILTER, TOPSOIL, SEED, STONE DUST PATH, AND EROSION CONTROL.
- PREPARE SUBGRADE FOR THE PROPOSED PRIMARY SPILLWAY/FISH PASS STRUCTURE. INSTALL STEEL SHEET PILING CUTOFF THROUGH THE ALIGNMENT OF THE PROPOSED PRIMARY SPILLWAY/FISH LADDER AS SHOWN ON THE DRAWINGS.
- FORM, PLACE REBAR, AND CAST THE BASE SLAB AND WALLS OF THE PROPOSED PRIMARY SPILLWAY/FISH LADDER STRUCTURE. FISH LADDER WEIR CONSTRUCTION MAY BE DELAYED SO POND LEVEL AND DISCHARGE MANAGEMENT CAN BE TRANSFERRED TO THE PRIMARY SPILLWAY STRUCTURE.
- PLACE DISCHARGE CHANNEL ARMORING AND BACKFILL THE WALLS OF THE PRIMARY SPILLWAY/FISH LADDER STRUCTURE.
- TRANSFER POND DISCHARGE TO THE NEW PRIMARY SPILLWAY. INSTALL TEMPORARY COFFERDAMS AND DEWATERING AS NECESSARY TO DEMOLISH THE EXISTING CONCRETE AUXILIARY SPILLWAY STRUCTURE AND BACKFILL THE RESULTING EXCAVATION IN-THE-DRY.
- COMPLETE EMBANKMENT GRADING, UPSTREAM SLOPE ARMORING, AND CONSTRUCTION OF THE SEEPAGE FILTER AT THE TOE OF THE DOWNSTREAM SLOPE.
- TERMINATE FLOW THROUGH THE PRIMARY SPILLWAY/FISH LADDER AND CONSTRUCT WEIRS. REMOVE TEMPORARY COFFERDAMS AND RESTORE FLOW ONCE THE REINFORCED CONCRETE WEIRS HAVE SUITABLY CURED.
- INSTALL PERMANENT FENCING AND THE PEDESTRIAN BRIDGE STRUCTURE SPANNING THE PROPOSED PRIMARY SPILLWAY/FISH LADDER STRUCTURE.
- FINISH EMBANKMENT IMPROVEMENTS INCLUDING TOPSOIL, SEED/MULCH, AND STONE DUST FOOTPATH ALONG THE CREST. INSTALL TEMPORARY EROSION CONTROL MEASURES AS SPECIFIED.
- INSTALL AND STABILIZE THE WETLAND REPLICATION AREA(S) AS SHOWN ON THE DRAWINGS.
- COMPLETE SITE RESTORATION ACTIVITIES INCLUDING FINISH GRADING, SURFACE RESTORATION, TEMPORARY EROSION PROTECTION, REMOVAL OF TEMPORARY HAUL ROADS, AND SEEDING TO THE LINES AND GRADES SHOWN ON THE DRAWINGS.

No.	Date	Dr. By	Ch. By	App. By	Description	DATE		
		A	P	P	O	V	E	D

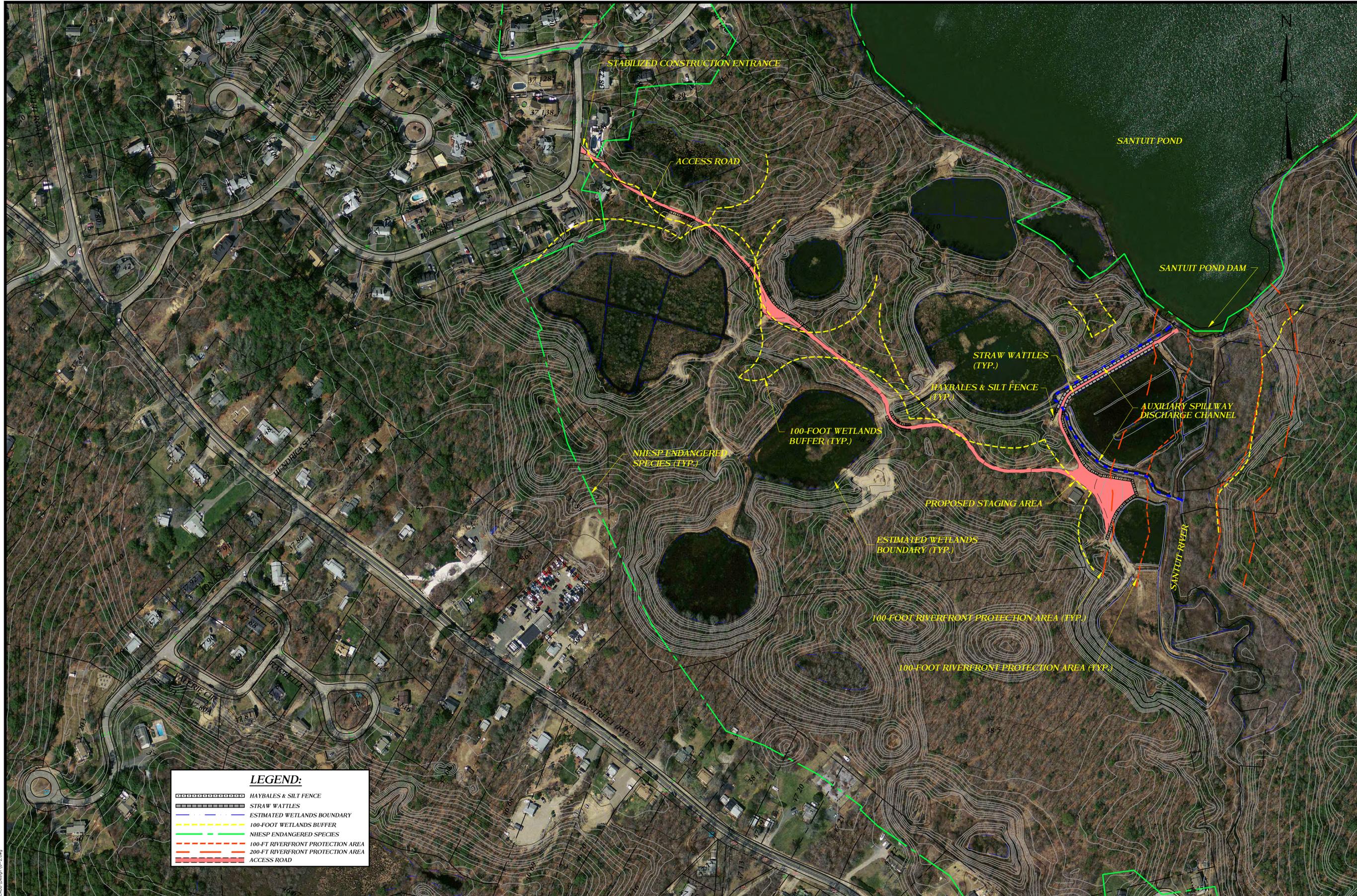
REGISTERED PROFESSIONAL ENGINEER

TOWN OF MASHPEE, MASSACHUSETTS  
 DEPARTMENT OF PUBLIC WORKS  
 SANTUIT POND DAM REHABILITATION

ABBREVIATIONS, NOTES AND LEGEND

FILE NO. \_\_\_\_\_  
 CADD NO. C-1  
 SCALE: NOTED  
 JOB NO. 2110090  
 DR. BY PJS  
 DSN. BY BTC  
 CHK. BY MPM  
 APP. BY MPM

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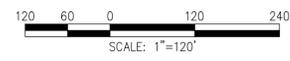
**LEGEND:**

	HAYBALES & SILT FENCE
	STRAW WATTLES
	ESTIMATED WETLANDS BOUNDARY
	100-FOOT WETLANDS BUFFER
	NHESP ENDANGERED SPECIES
	100-FT RIVERFRONT PROTECTION AREA
	200-FT RIVERFRONT PROTECTION AREA
	ACCESS ROAD

**DATA SOURCES:**

- OFFICE OF GEOGRAPHIC AND ENVIRONMENTAL INFORMATION (MassGIS), COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS: AERIAL PHOTOS.
- TOWN OF MASHPEE: GIS DATA.

**MAP COORDINATE SYSTEM:**  
 MASSACHUSETTS STATE PLANE, MAINLAND PROJECTION;  
 LAMBERT CONFORMAL CONIC, DATUM: NAD83, UNITS: FEET.



No.	Date	Dr. By	Chk. By	App. By	Description

REGISTERED PROFESSIONAL ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

TOWN OF MASHPEE, MASSACHUSETTS  
 DEPARTMENT OF PUBLIC WORKS

**SANTUIT POND DAM REHABILITATION  
 CONSTRUCTION ACCESS AND  
 ABUTTING PROPERTIES**

CADD NO.	SCALE:	CONTRACT:	DR. BY:	DIS. BY:	CHK. BY:	APP. BY:
G-2	G-2	NOTED	PUS	PUS	MPM	MPM
JOB NO.	2110090					

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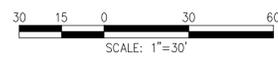
**LEGEND:**

- HAYBALES & SILT FENCE
- STRAW WATTLES
- ESTIMATED WETLANDS BOUNDARY
- 100-FOOT WETLANDS BUFFER
- NHESP ENDANGERED SPECIES
- ACCESS ROAD

**DATA SOURCES:**

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- TOWN OF MASHPEE: GIS DATA.

**MAP COORDINATE SYSTEM:**  
 MASSACHUSETTS STATE PLANE, MAINLAND PROJECTION;  
 LAMBERT CONFORMAL CONIC, DATUM: NAD83, UNITS: FEET.



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 (978) 532-1900 (800) 5AMPSON  
 www.westonandsampson.com

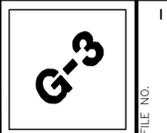
No.	Date	Dr. By	Ch. By	App. By	Description			
		A	P	R	O	V	E	D

REGISTERED PROFESSIONAL ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

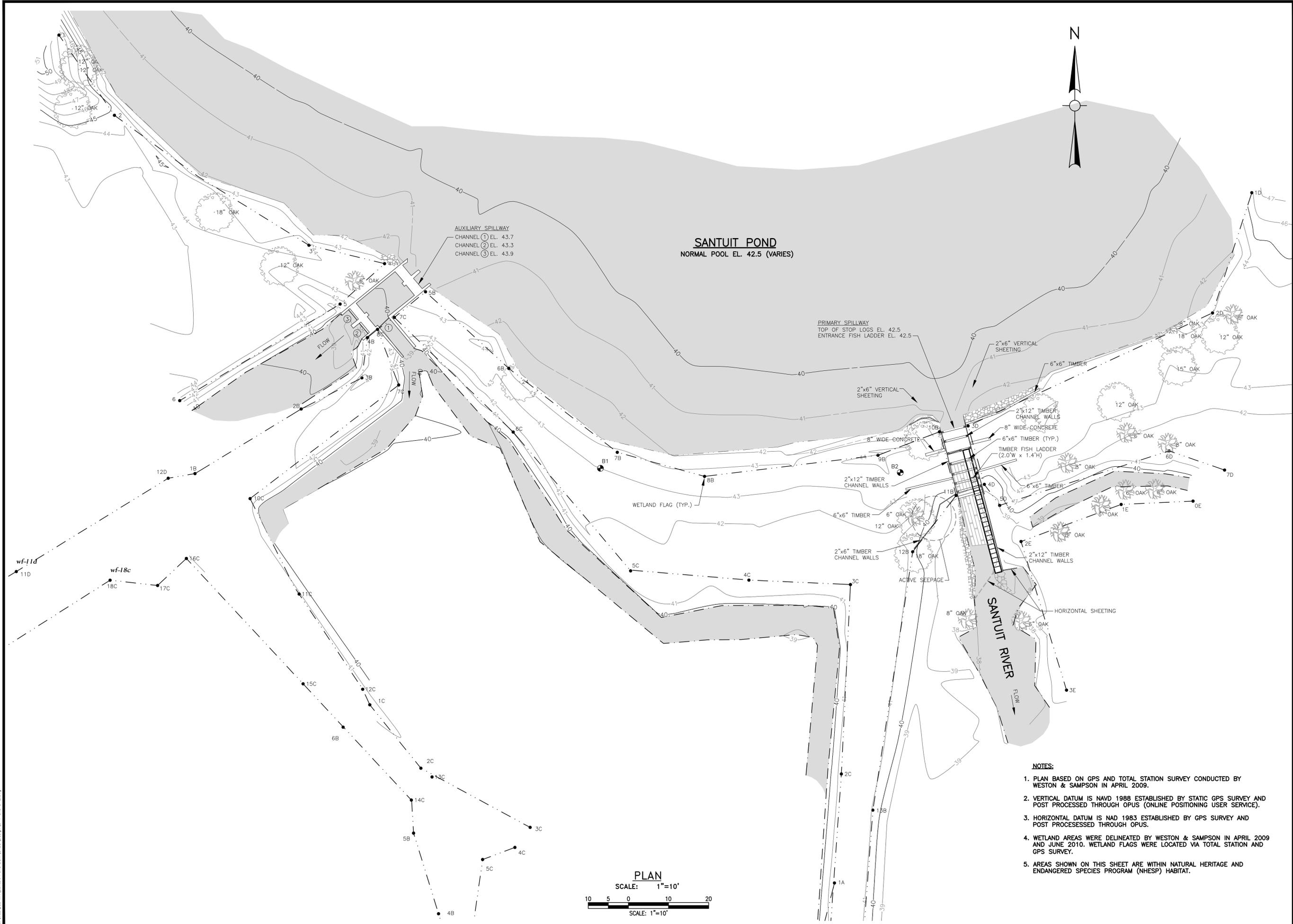
TOWN OF MASHPEE, MASSACHUSETTS  
 DEPARTMENT OF PUBLIC WORKS

SANTUIT POND DAM REHABILITATION  
**CONSTRUCTION STAGING AREA  
 AND SITE ACCESS**

CONTRACT: \_\_\_\_\_  
 SCALE: G-2  
 CADD NO.: 2110090  
 DR. BY: PJS  
 DS. BY: PJS  
 CHK. BY: MPM  
 APP. BY: MPM



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**SANTUIT POND**  
NORMAL POOL EL. 42.5 (VARIES)

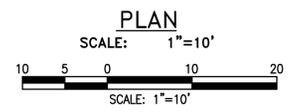
AUXILIARY SPILLWAY  
CHANNEL ① EL. 43.7  
CHANNEL ② EL. 43.3  
CHANNEL ③ EL. 43.9

PRIMARY SPILLWAY  
TOP OF STOP LOGS EL. 42.5  
ENTRANCE FISH LADDER EL. 42.5

WETLAND FLAG (TYP.)

ACTIVE SEEPAGE

HORIZONTAL SHEETING



- NOTES:**
1. PLAN BASED ON GPS AND TOTAL STATION SURVEY CONDUCTED BY WESTON & SAMPSON IN APRIL 2009.
  2. VERTICAL DATUM IS NAVD 1988 ESTABLISHED BY STATIC GPS SURVEY AND POST PROCESSED THROUGH OPUS (ONLINE POSITIONING USER SERVICE).
  3. HORIZONTAL DATUM IS NAD 1983 ESTABLISHED BY GPS SURVEY AND POST PROCESSED THROUGH OPUS.
  4. WETLAND AREAS WERE DELINEATED BY WESTON & SAMPSON IN APRIL 2009 AND JUNE 2010. WETLAND FLAGS WERE LOCATED VIA TOTAL STATION AND GPS SURVEY.
  5. AREAS SHOWN ON THIS SHEET ARE WITHIN NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM (NHESP) HABITAT.

No.	Date	Dr. By	Ck. By	App. By	Description
		A	P	P	O
					V
					E
					D

REGISTERED PROFESSIONAL ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

TOWN OF MASHPEE, MASSACHUSETTS  
DEPARTMENT OF PUBLIC WORKS

**SANTUIT POND DAM**

**EXISTING SITE CONDITIONS**

CONTRACT: - 2090010

DR. BY: PJS

DSN. BY: BTC

CHK. BY: MPM

APP. BY: MPM

SCALE: C-1 / C-2 AS SHOWN

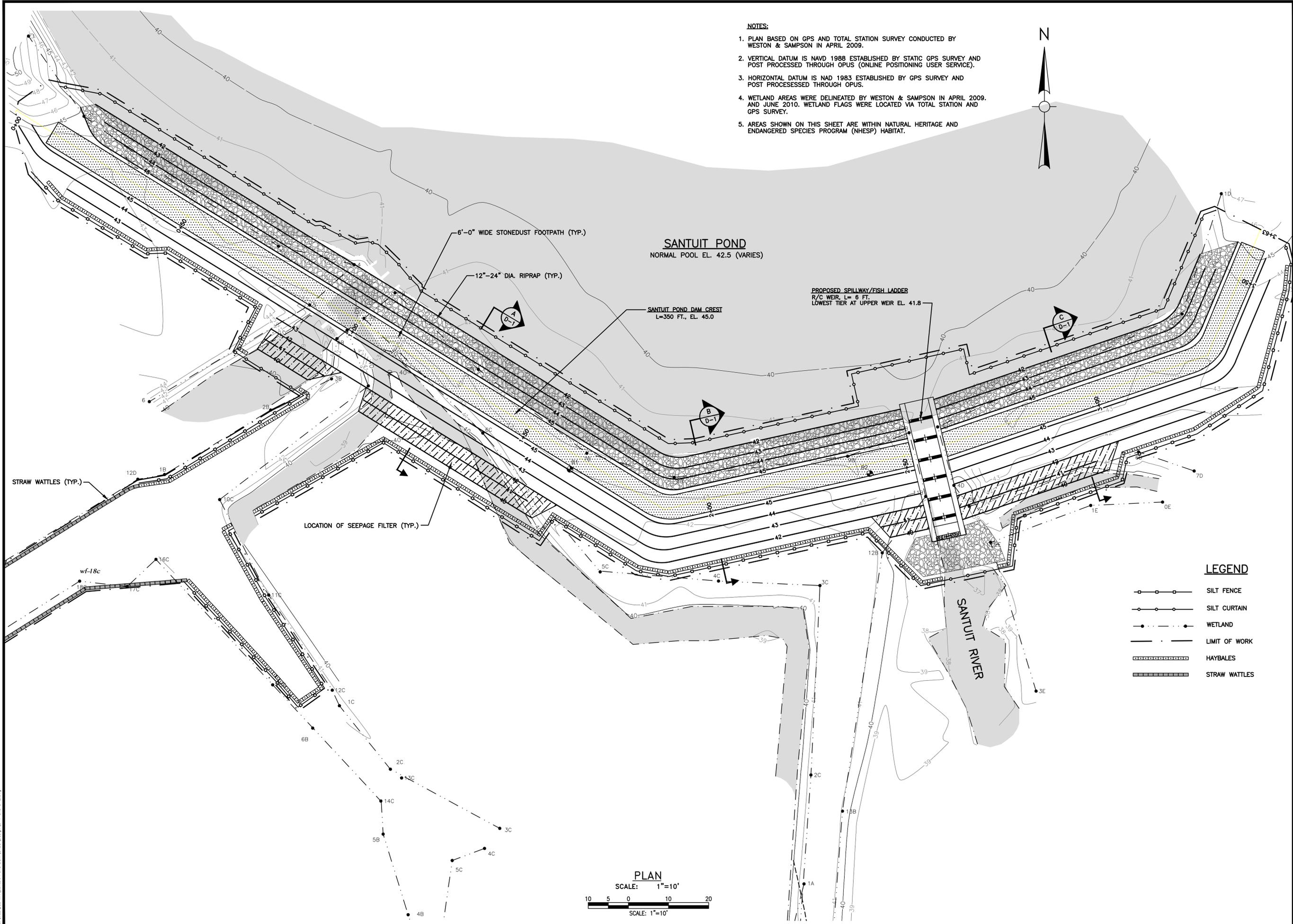
FILE NO. -

**C-1**

SHEET - OF 12

D:\Mashpee MA\Santuit Pond Dam\CADD\Design\C-1 and C-2.dwg

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- NOTES:**
1. PLAN BASED ON GPS AND TOTAL STATION SURVEY CONDUCTED BY WESTON & SAMPSON IN APRIL 2009.
  2. VERTICAL DATUM IS NAVD 1988 ESTABLISHED BY STATIC GPS SURVEY AND POST PROCESSED THROUGH OPUS (ONLINE POSITIONING USER SERVICE).
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  5. AREAS SHOWN ON THIS SHEET ARE WITHIN NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM (NHESP) HABITAT.



No.	Date	Dr. By	Chk. By	App. By	Description
		A	P	R	O
		V	E	D	
					DATE

REGISTERED PROFESSIONAL ENGINEER

TOWN OF MASHPEE, MASSACHUSETTS  
DEPARTMENT OF PUBLIC WORKS

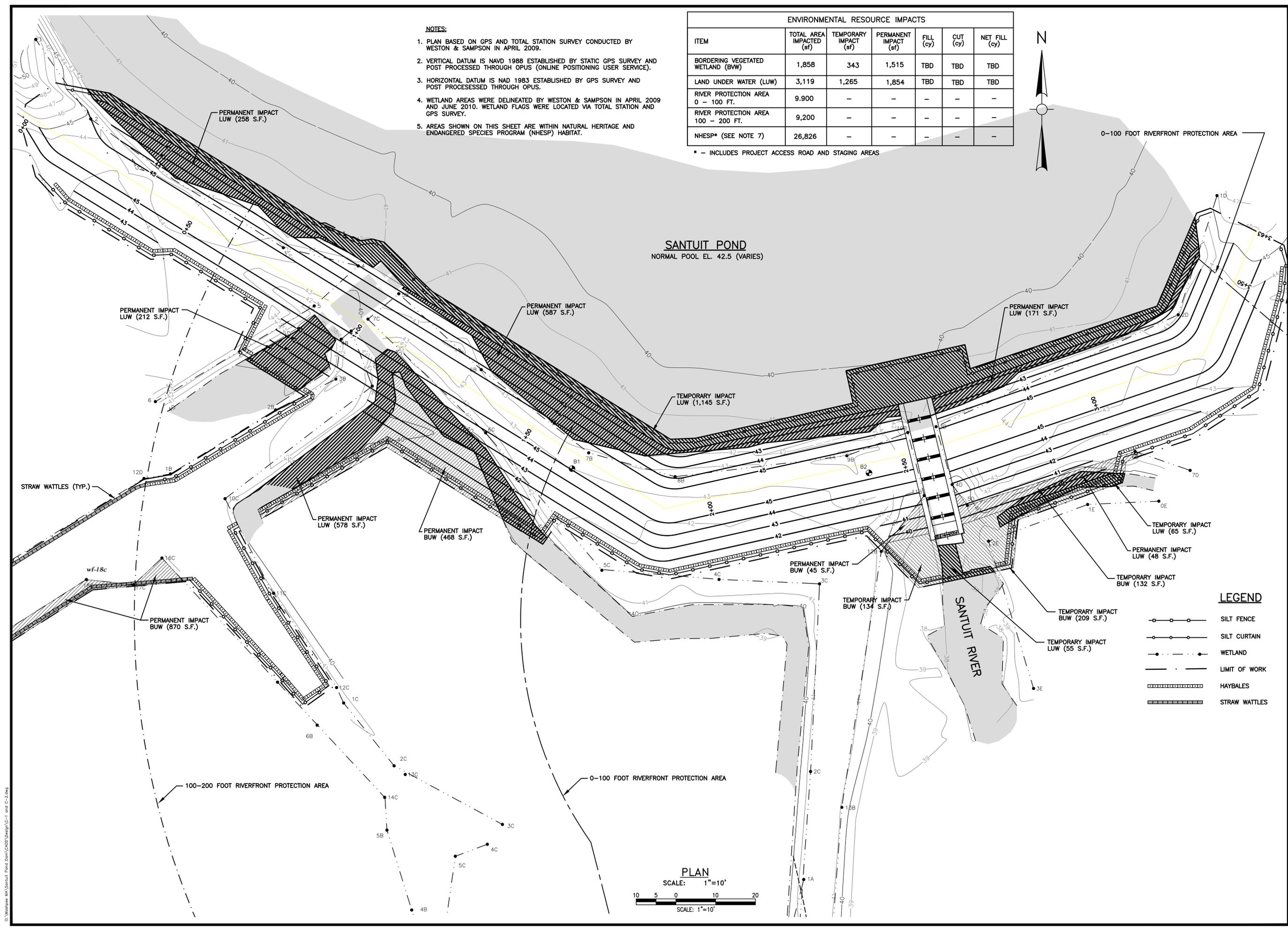
**PROPOSED SITE CONDITIONS**  
SANTUIT POND DAM

FILE NO. C-1 / C-2  
JOB NO. 2090010  
CONTRACT: AS SHOWN  
SCALE: AS SHOWN

DR. BY	DSN. BY	CHK. BY	APP. BY
PJS	BTC	MPM	MPM

D:\Mashpee MA\Santuit Pond Dam\CADD\Design\C-1 and C-2.dwg

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- NOTES:**
1. PLAN BASED ON GPS AND TOTAL STATION SURVEY CONDUCTED BY WESTON & SAMPSON IN APRIL 2009.
  2. VERTICAL DATUM IS NAVD 1988 ESTABLISHED BY STATIC GPS SURVEY AND POST PROCESSED THROUGH OPUS (ONLINE POSITIONING USER SERVICE).
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  5. AREAS SHOWN ON THIS SHEET ARE WITHIN NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM (NHESP) HABITAT.

ENVIRONMENTAL RESOURCE IMPACTS						
ITEM	TOTAL AREA IMPACTED (sf)	TEMPORARY IMPACT (sf)	PERMANENT IMPACT (sf)	FILL (cy)	CUT (cy)	NET FILL (cy)
BORDERING VEGETATED WETLAND (BVW)	1,858	343	1,515	TBD	TBD	TBD
LAND UNDER WATER (LUW)	3,119	1,265	1,854	TBD	TBD	TBD
RIVER PROTECTION AREA 0 - 100 FT.	9,900	-	-	-	-	-
RIVER PROTECTION AREA 100 - 200 FT.	9,200	-	-	-	-	-
NHESP* (SEE NOTE 7)	26,826	-	-	-	-	-

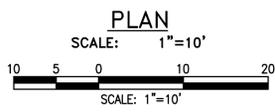
\* - INCLUDES PROJECT ACCESS ROAD AND STAGING AREAS



**SANTUIT POND**  
NORMAL POOL EL. 42.5 (VARIES)

**LEGEND**

- SILT FENCE
- SILT CURTAIN
- WETLAND
- LIMIT OF WORK
- HAYBALES
- STRAW WATTLES



D:\Massape MA\Santuit Pond Dam\CADD\Design\C-1 and C-2.dwg

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www.westonsampson.com

No.	Date	Dr. By	Ch. By	App. By	Description
		A	P	R	O
		V	E	D	

REGISTERED PROFESSIONAL ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

TOWN OF MASHPPE, MASSACHUSETTS  
DEPARTMENT OF PUBLIC WORKS  
SANTUIT POND DAM

**PROPOSED SITE CONDITIONS (PERMITTING)**

FILE NO. \_\_\_\_\_  
CADD NO. C-1 / C-2 AS SHOWN  
CONTRACT: 2090010  
DR. BY: PJS  
DSN. BY: BTC  
CHK. BY: MPM  
APP. BY: MPM

**C-2P**

SHEET - OF 12

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**GENERAL NOTES**

- ALL WORK SHALL CONFORM TO THE EIGHT EDITION OF THE COMMONWEALTH OF MASSACHUSETTS STATE BUILDING CODE (IBC 2009 W/ MASSACHUSETTS AMENDMENTS).
- THE CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND DIMENSIONS IN THE FIELD PRIOR TO THE BID. ANY VARIATIONS FROM THE CONDITIONS SHOWN, WHICH WILL IMPACT THE CONSTRUCTION COST OR METHOD, SHOULD BE BROUGHT TO THE ENGINEER'S ATTENTION IN WRITING PRIOR TO THE BID AND SHOULD BE FACTORED INTO THE BID PRICE. NO ADDITIONAL COMPENSATION WILL BE APPROVED DUE TO OBSERVABLE SITE CONDITIONS NOT SHOWN ON THE DRAWINGS.
- THE CONTRACTOR SHALL PROVIDE ALL NECESSARY BRACING & SHORING UNTIL ALL STRUCTURAL WORK IS COMPLETE.
- SHOP DRAWINGS, IN ADDITION TO THE SUBMITTALS REQUIRED BY THE PROJECT SPECIFICATIONS, SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION FOR THE FOLLOWING:  
1) REINFORCING STEEL
- ALL FOUNDATION CONSTRUCTION SHALL BE CARRIED DOWN BELOW FINISHED EXTERIOR GRADE TO A MINIMUM DEPTH OF FOUR FEET (4'-0") UNLESS OTHERWISE NOTED.
- PROVIDE SEALANT AT ALL CONTROL JOINTS AND EXPANSION JOINTS.
- THE CONTRACTOR SHALL RETAIN THE SERVICES OF AN INDEPENDENT TESTING AGENCY TO PERFORM STRUCTURAL INSPECTIONS AS INDICATED ON THE DRAWINGS AND AS REQUIRED/INDICATED BY THE SCHEDULE OF STRUCTURAL TESTS AND INSPECTIONS. ALL TEST REPORTS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER OF RECORD.
- DETAILS AND NOTES SHOWN ON STRUCTURAL DRAWINGS SHALL BE APPLICABLE TO ALL PARTS OF THE STRUCTURAL WORK WHERE SPECIFICALLY REQUIRED OTHERWISE BY CONTRACT DOCUMENTS. CONDITIONS NOT SPECIFICALLY SHOWN SHALL BE

**STRUCTURAL DESIGN NOTES:**

**ACTIVE SIDE OF WALLS:**  
 ALLOWABLE BEARING PRESSURE=1.0 T.S.F.  
 ANGLE OF INTERNAL FRICTION=30 DEGREES  
 UNIT WEIGHT OF DRY SOIL=120 PCF  
 UNIT WEIGHT OF SATURATED SOIL=125 PCF  
 UNIT WEIGHT OF WATER=62.4 PCF  
 GROUNDWATER DESIGN ELEVATION=EL.45.0  
 EARTHQUAKE LOADING=APPLIED PER MSBC  
 COEFFICIENT OF ACTIVE EARTH PRESSURE=0.3 (COULOMB)  
 ANGLE OF WALL FRICTION=17 DEGREES  
 OVERTURNING FACTOR OF SAFETY=1.5 (MSBC)  
 SLIDING FACTOR OF SAFETY=1.5 (MSBC)

**PASSIVE SIDE OF WALLS (IF APPLICABLE):**  
 ANGLE OF INTERNAL FRICTION=30 DEGREES  
 UNIT WEIGHT DRY SOIL=120 PCF  
 COEFFICIENT OF PASSIVE PRESSURE=5.4 (COULOMB)  
 ANGLE OF WALL FRICTION=17 DEGREES

SIMILAR TO THOSE SHOWN FOR LIKE CONDITIONS AS DETERMINED BY THE ENGINEER.

**CONCRETE & REINFORCING**

- CONCRETE WORK SHALL CONFORM TO "CODE REQUIREMENTS FOR ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES" (ACI-350-1) AND "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318-05:318R-05) AND "SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS" (ACI 301-99).
- ALL CONCRETE IN WALLS AND FOOTINGS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5000 PSI AT 28 DAYS. ALL CONCRETE SHALL HAVE 6% AIR ENTRAINMENT AND 4" MAXIMUM SLUMP.
- NO CONCRETE SHALL BE CAST IN WATER OR ON FROZEN GROUND.
- CONCRETE SAMPLING METHODS FREQUENCY AND TESTING SHALL BE IN ACCORDANCE WITH SPECIFICATION SECTION 03300.
- BACKFILL AGAINST WALLS SHALL BE PLACED IN ACCORDANCE WITH SPECIFICATION SECTION 02300.
- NO CHAMFERS ON CORNERS OF THE WEIRS. ALL OTHER EXPOSED CORNERS OF CONCRETE SHALL HAVE A 3/4" x 3/4" CHAMFER.
- CONSTRUCTION JOINTS IN WALLS AND THE SPILLWAY WEIR SHALL BE KEVED. USE OF CONSTRUCTION JOINTS OTHER THAN THOSE SHOWN ON THE DRAWINGS WILL REQUIRE APPROVAL OF THE ENGINEER.
- WATERSTOPS ARE NOT NECESSARILY SHOWN AT EVERY JOINT; BUT WHERE THEY ARE SHOWN, IT IS INTENDED THAT THEY BE COMPLETE AND CONTINUOUS THROUGHOUT THE PARTICULAR STRUCTURE. WATERSTOPS IN VERTICAL JOINTS SHALL EXTEND TO 3 INCHES BELOW THE TOP OF CONCRETE UNLESS OTHERWISE NOTED.
- REINFORCEMENT WORK OF DETAILING, FABRICATION, AND ERECTION SHALL CONFORM TO "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE" (ACI 318-05:318R-05), "ACI DETAILING MANUAL" (SP-66-1988), "CRSI MANUAL OF STANDARD PRACTICE" (DA4-90), AND "STRUCTURAL WELDING CODE REINFORCING STEEL" (AWS D1.4-79) AT MINIMUM OR AS SPECIFIED HEREIN.
- STEEL REINFORCEMENT, UNLESS OTHERWISE NOTED, SHALL CONFORM TO THE FOLLOWING:  
(A) BARS, TIES, AND STIRRUPS ASTM A615 GRADE 60 (FY=60,000 PSI) NON EPOXY COATED.
- PROVIDE AND SCHEDULE ON SHOP DRAWINGS THE NECESSARY ACCESSORIES TO HOLD REINFORCEMENT SECURELY IN POSITION. THESE ACCESSORIES SHALL BE PLASTIC BOOTED WHERE CONCRETE IS TO BE EXPOSED TO WEATHER OR MOISTURE. MINIMUM REQUIREMENTS SHALL BE: HIGH CHAIRS, 4'-0" O.C. WITH CONTINUOUS #5 SUPPORT BAR; SLAB BOLSTERS, CONTINUOUS AND 3'-6" O.C.; BEAM BOLSTERS, 5'-0" O.C.
- WHERE CONTINUOUS REINFORCEMENT IS CALLED FOR, IT SHALL BE EXTENDED CONTINUOUSLY AROUND CORNERS AND LAPPED AT NECESSARY SPLICES OR HOOKED AT DISCONTINUOUS ENDS.
- REINFORCEMENT SHALL NOT BE TACK WELDED.
- ALL ALUMINUM IN CONTACT WITH CONCRETE SHALL HAVE A HEAVY SHOP COAT OF BITUMASTIC PAINT.
- INSTALLATION OF REINFORCEMENT SHALL BE COMPLETED AT LEAST 24 HOURS PRIOR TO THE SCHEDULED CONCRETE PLACEMENT.
- LOWER FOOTINGS SHALL BE CONSTRUCTED PRIOR TO UPPER FOOTING AT ALL STEP LOCATIONS.
- A MINIMUM OF 72 HOURS SHALL ELAPSE BETWEEN ADJACENT CONCRETE PLACEMENTS.
- ALL CONCRETE SHALL BE WATER CURED UNLESS OTHERWISE AUTHORIZED BY THE ENGINEER.
- CONCRETE SLAB SURFACE SHALL HAVE A FLOAT FINISH.
- MINIMUM CONCRETE PROTECTIVE COVERING FOR REINFORCEMENT, UNLESS NOTED OTHERWISE, SHALL BE AS FOLLOWS:  
(A) SURFACES CAST AGAINST AND PERMANENTLY IN CONTACT WITH EARTH: .....3.0"  
(B) FORMED SURFACES BACKFILLED WITH EARTH OR EXPOSED TO WEATHER: .....2.0"  
(C) SURFACES NOT IN CONTACT WITH EARTH OR EXPOSED TO WEATHER: .....1.5"
- FOR REINFORCING STEEL SPLICE LENGTHS REFER TO THE TABLE BELOW UNLESS OTHERWISE INDICATED.
- MECHANICAL SPLICES SHALL BE PERMITTED SUBJECT TO APPROVAL BY THE ENGINEER. MECHANICAL SPLICES SHALL DEVELOP AT LEAST 125 PERCENT OF THE SPECIFIED YIELD STRENGTH OF THE BAR. NO WELDED CONNECTIONS ARE PERMITTED.

**LEGEND / ABBREVIATIONS**

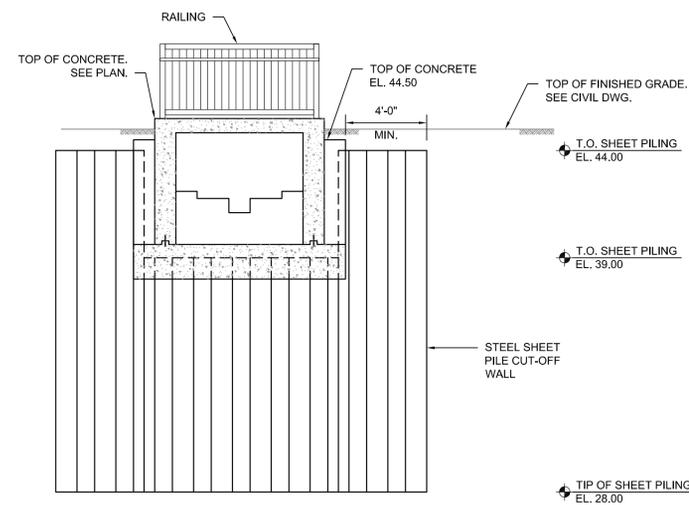
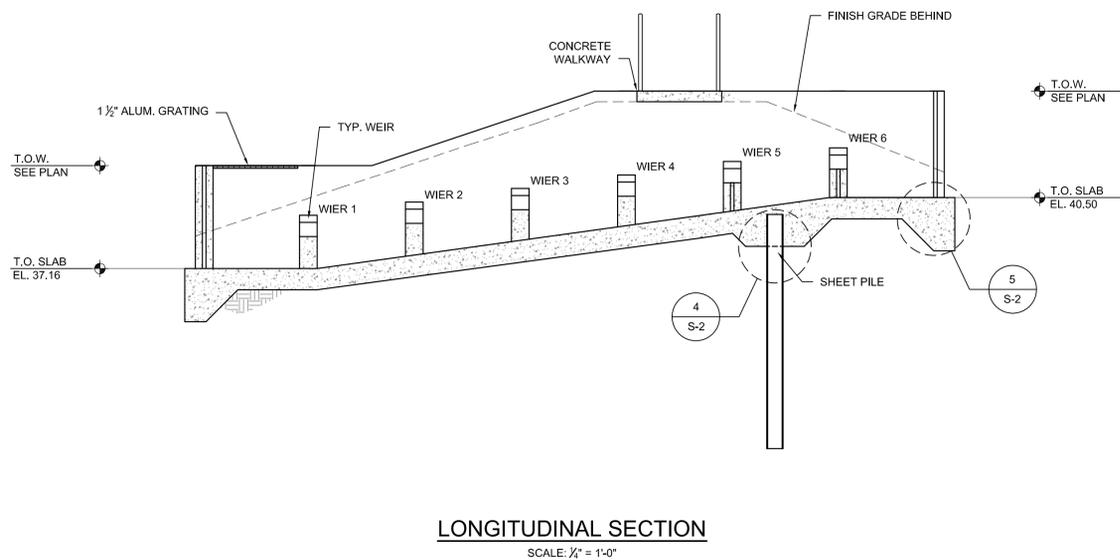
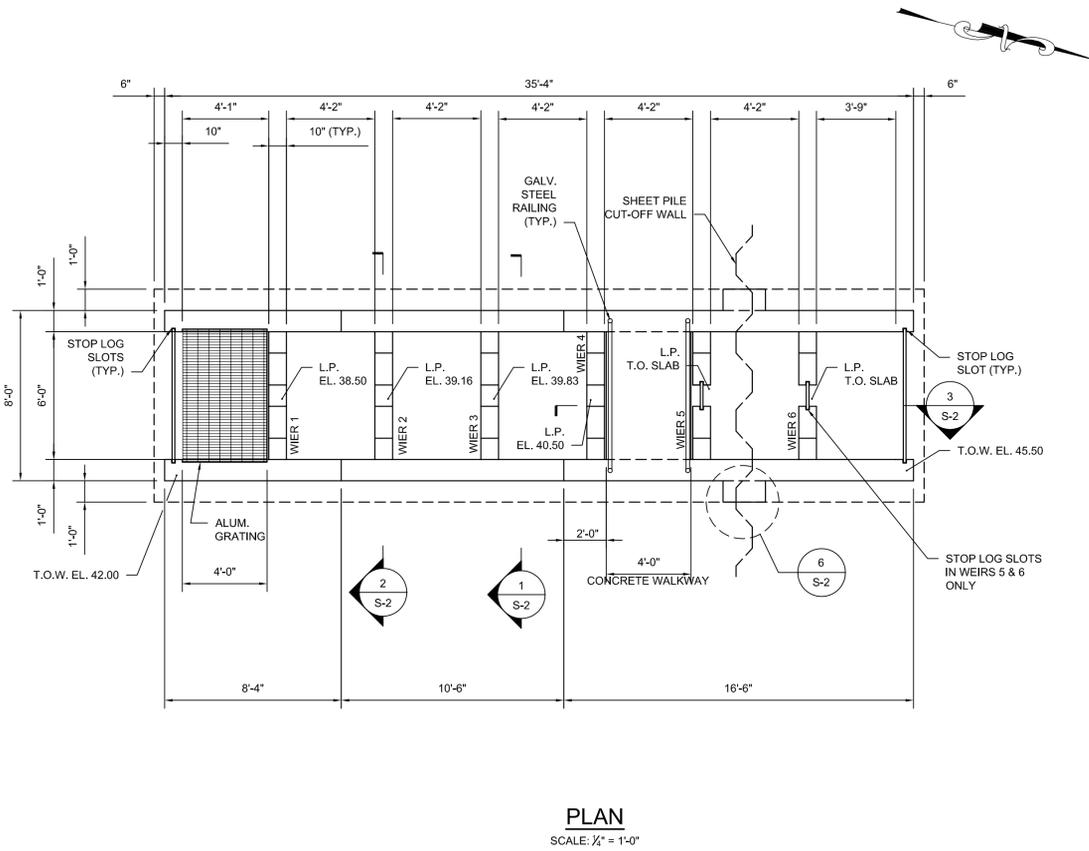
SER = STRUCTURAL ENGINEER OF RECORD  
 WWF = WELDED WIRE FABRIC  
 T.O.C. = TOP OF CONCRETE  
 T.O.S. = TOP OF STEEL  
 V.I.F. = VERIFY IN FIELD  
 U.N.O. = UNLESS NOTED OTHERWISE  
 C.J. = CONSTRUCTION JOINT, SEE DETAIL B ON SHEET S-3  
 E.J. = EXPANSION JOINT, SEE DETAIL A ON SHEET S-3  
 WP = WORKING POINT  
 L.P. = LOW POINT  
 T.O. = TOP OF

BAR SIZE	LAP LENGTH, IN.		HOOK DEVELOPMENT LENGTH, IN.
	TOP BARS**	OTHER BARS	
#3	13	12	7
#4	18	14	9
#5	22	17	11
#6	26	20	13
#7	38	29	15
#8	43	33	17
#9	54	41	19
#10	66	51	22
#11	79	61	24

\* THIS TABLE IS BASED ON NORMAL WEIGHT CONCRETE, UNCOATED BARS, AND A Cb VALUE OF 1/2IN. + 1/2 BAR DIAMETER FOR BAR SIZE #6 AND SMALLER AND A Cb VALUE OF 2IN. + 1/2 BAR DIAMETER FOR BAR SIZES #7 AND LARGER, WHERE Cb VALUES ARE DIFFERENT FROM ABOVE REFER TO ACI REQUIREMENTS.

\*\* HORIZONTAL BARS WITH MORE THAN 12" OF CONCRETE CAST BELOW THE BARS AS DEFINED BY ACI 318-05.

\*\*\* LAP SPLICE LENGTHS ARE CLASS B TENSION LAP SPLICES.



**PROGRESS PRINT**  
4-11-12

**Weston & Sampson**  
 Five Centennial Drive, Peabody, MA 01960  
 (978) 532-1900 (800) SAMPSON  
 www.westonandsampson.com

TOWN OF MASHPEE, MASSACHUSETTS  
 DEPARTMENT OF PUBLIC WORKS  
 SANTUIT POND DAM REHABILITATION

FISH LADDER PLANS, SECTIONS, & NOTES

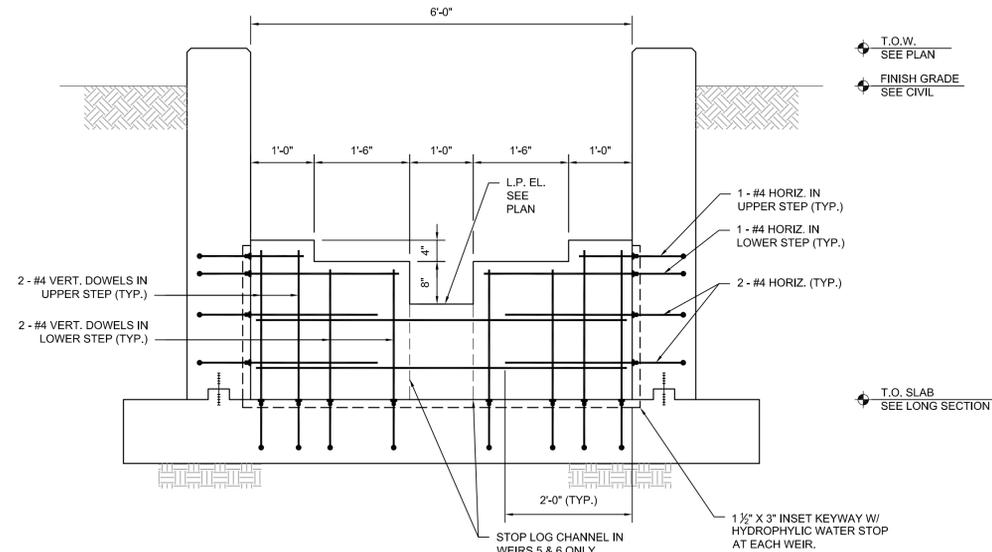
FILE NO. \_\_\_\_\_ SCALE: \_\_\_\_\_ CONTRACT: NOTED CADD NO. \_\_\_\_\_ JOB NO. 2110090 DR. BY: SAZ DSN. BY: SRB CHK. BY: RAC APP. BY: MM

REGISTERED PROFESSIONAL ENGINEER DATE \_\_\_\_\_

**S-1**

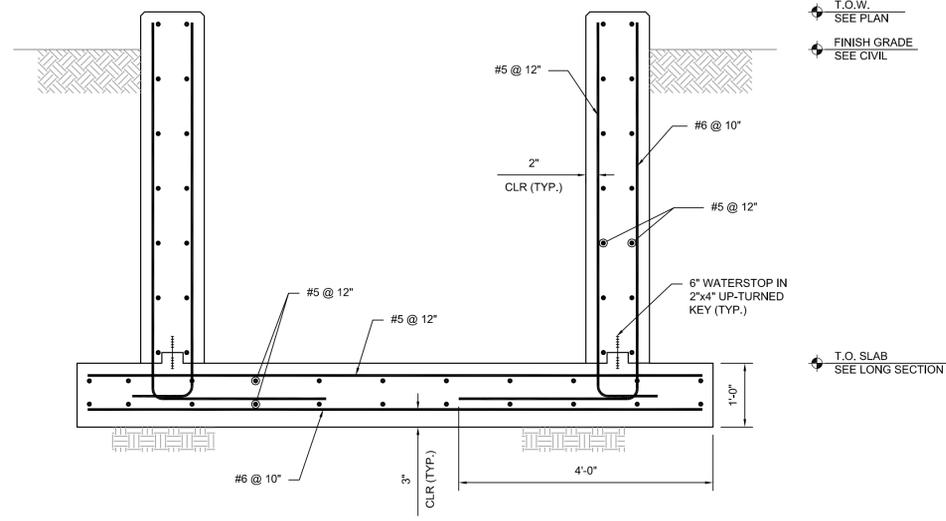
SHEET - OF 12

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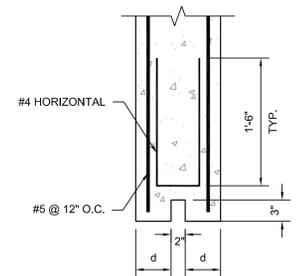


- NOTES:
1. REINFORCING BARS AT WEIRS SHALL USE MECHANICAL BAR DOWEL INSERTS.
  2. NO CHAMFERS IN WEIRS.

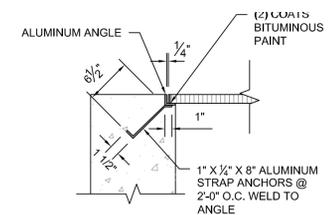
**2 SECTION (TYPICAL)**  
SCALE: 3/4" = 1'-0"



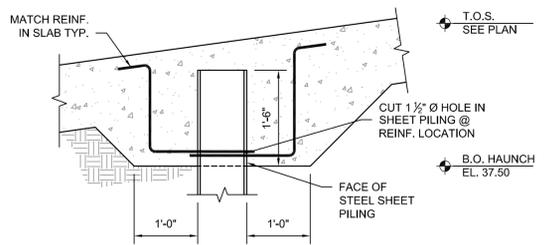
**1 SECTION**  
SCALE: 3/4" = 1'-0"



**STOP LOG CHANNEL DETAIL**  
SCALE: 1" = 1'-0"

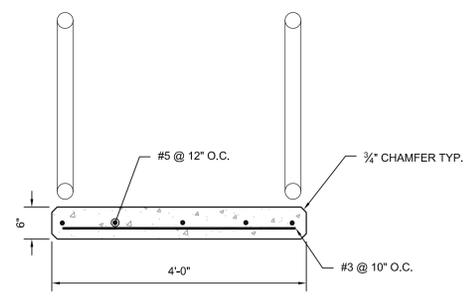


**ALUMINUM GRATING SEAT DETAIL**  
SCALE: 1" = 1'-0"

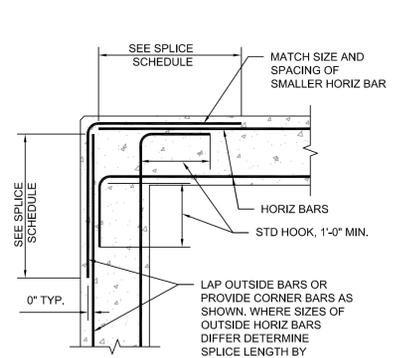


NOTE: FOR SLAB REINFORCEMENT SEE TYPICAL SECTION.

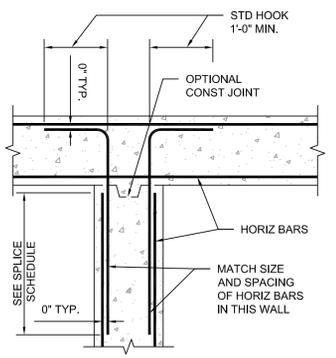
**4 SECTION**  
SCALE: 3/4" = 1'-0"



**3 SECTION**  
SCALE: 3/4" = 1'-0"

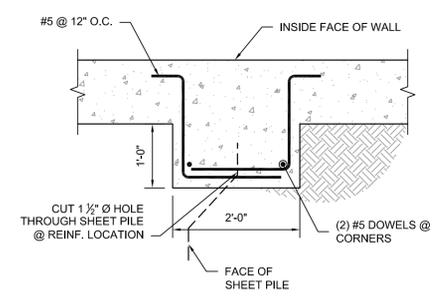


**AT CORNERS**

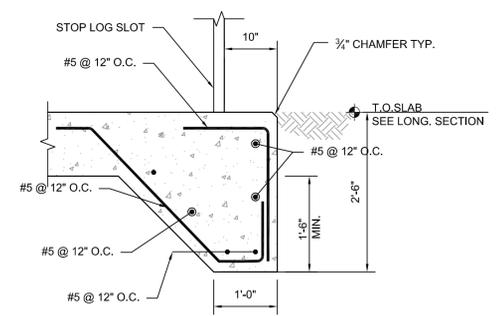


**AT INTERSECTIONS**

**HORIZONTAL WALL REINFORCEMENT PLANS**



**6 SECTION**  
SCALE: 3/4" = 1'-0"



**5 SECTION**  
SCALE: 3/4" = 1'-0"

NOTE: FOR SLAB REINFORCEMENT SEE TYPICAL SECTION.

**PROGRESS PRINT**  
4-11-12

No.	Date	Dr. By	Ch. By	App. By	Description
		A	P	R	O
					V
					E
					D

REGISTERED PROFESSIONAL ENGINEER \_\_\_\_\_ DATE \_\_\_\_\_

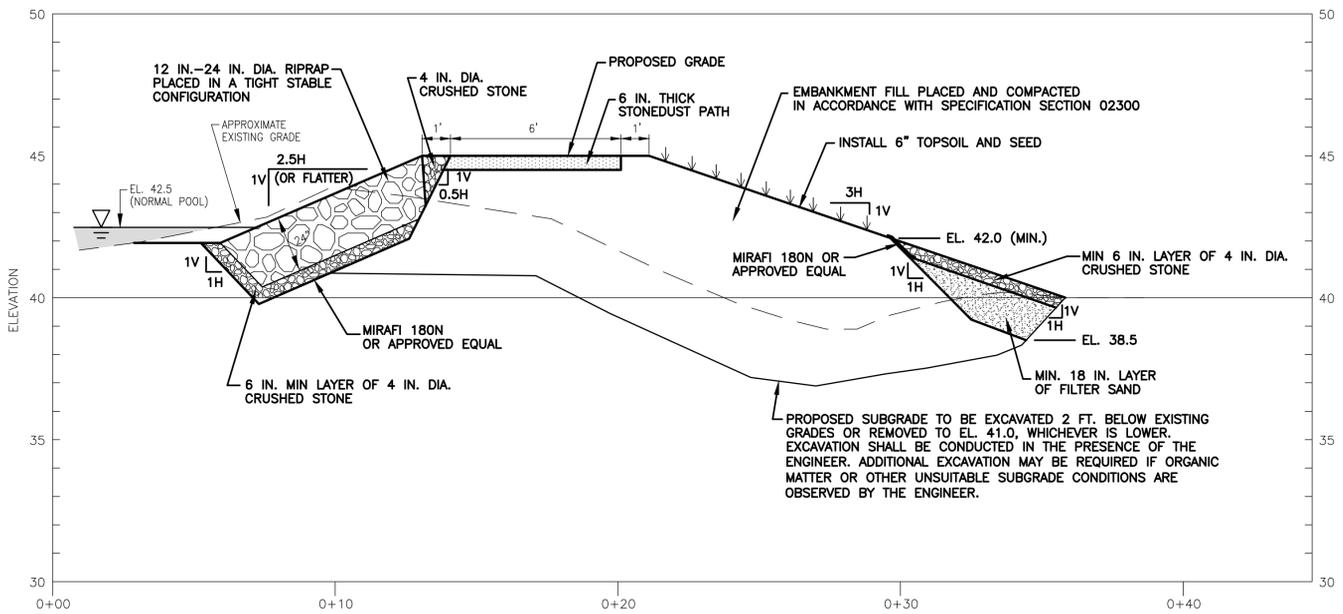
TOWN OF WASHPEE, MASSACHUSETTS  
DEPARTMENT OF PUBLIC WORKS  
SANTUIT POND DAM REHABILITATION

**FISH LADDER SECTIONS AND DETAILS**

FILE NO.	CADD NO.	SCALE:	CONTRACT:	JOB NO.	DR. BY	CHK. BY	APP. BY
		NOTED		2110090	SAZ	SRB	RAC

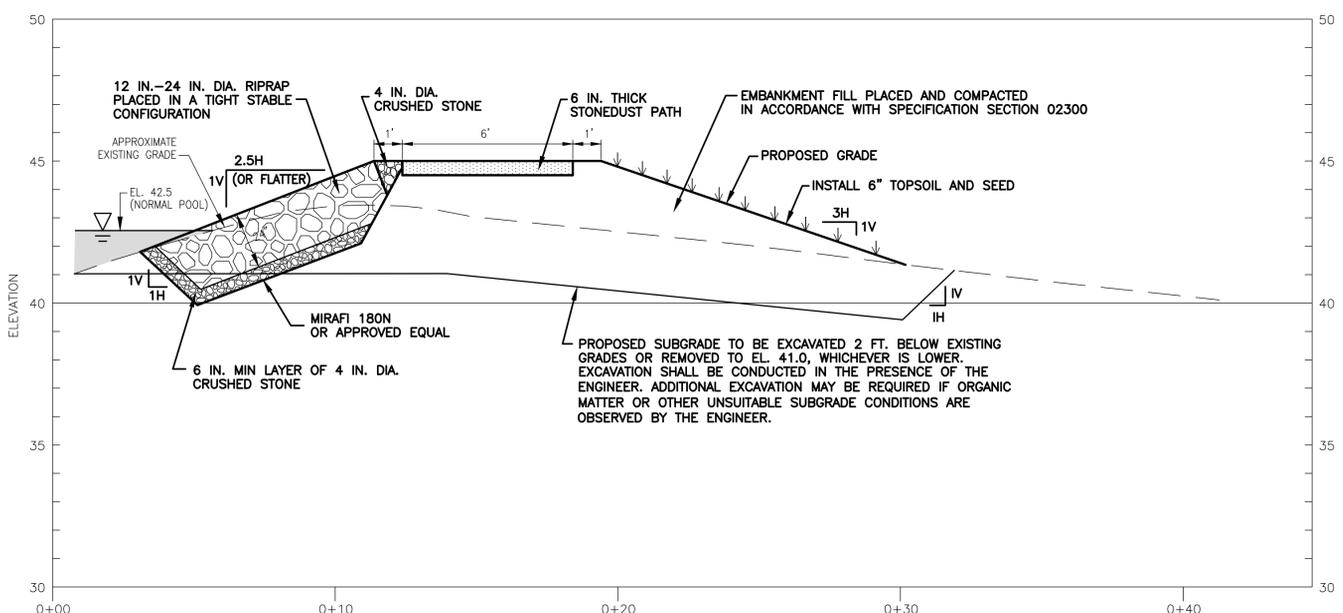
Z:\MA\Peabody-Projects\Washpee MA\Santuit Pond Dam\CADD\Design\S-1.dwg

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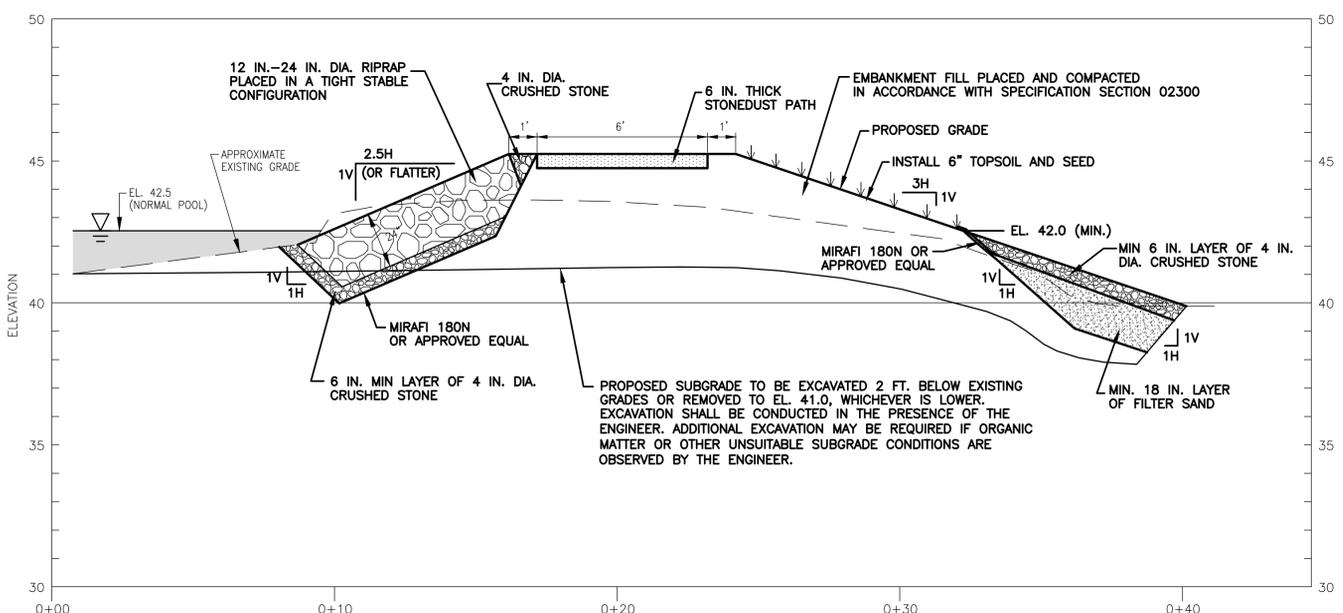
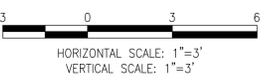
**STA 1+25 SECTION A-A**  
(LOOKING TOWARDS LEFT ABUTMENT)

SECTION **A**  
SCALE: 1"=3' HORIZ  
1"=3' VERT



**STA 2+00 SECTION B-B**  
(LOOKING TOWARDS LEFT ABUTMENT)

SECTION **B**  
SCALE: 1"=3' HORIZ  
1"=3' VERT



**STA 2+90 SECTION C-C**  
(LOOKING TOWARDS LEFT ABUTMENT)

SECTION **C**  
SCALE: 1"=3' HORIZ  
1"=3' VERT

**MATERIALS REQUIREMENTS:**

4 IN. DIA. CRUSHED STONE (6 IN. LAYER)	
PARTICLE SIZE (DIAMETER)	PERCENT FINER
4 IN.	90-100
3.5 IN.	80-100
1.0 IN.	50-80
0.75 IN.	15-40
0.5 IN.	0-5
12 IN. TO 24 IN. DIA. RIPRAP (24 IN. LAYER)	
PARTICLE SIZE (DIAMETER)	PERCENT FINER
24 IN.	100
18 IN.	75-100
12 IN.	25-70
9 IN.	15-25
6 IN.	0-5

**RIPRAP NOTES:**

1. THE FILTER FABRIC UNDERLYING THE CRUSHED STONE BEDDING LAYER SHALL BE MIRAFI 180N OR APPROVED EQUAL.
2. THE BEDDING AND RIPRAP MATERIALS SHALL MEET THE GRADATION REQUIREMENTS IN THE ABOVE TABLE.
3. RIPRAP STONE SHALL HAVE SHARP, ANGULAR EDGES AND RELATIVELY FLAT FACES. THE RIPRAP SHOULD BE BLOCKY IN SHAPE RATHER THAN ELONGATED.
4. RIPRAP SHALL BE PLACED WITH CARE TO ENSURE A TIGHT, STABLE CONFIGURATION. INTERLOCKING OF THE RIPRAP DURING PLACEMENT SHALL BE ACHIEVED TO THE EXTENT PRACTICABLE.
5. THE FILTER SAND SHALL MEET GRADATION REQUIREMENTS FOR ASTM C33 #56 SAND.

No.	Date	Dr. By	Chk. By	App. By	Description
		A	P	R	O
					V
					E
					D
					REGISTERED PROFESSIONAL ENGINEER
					DATE

TOWN OF MASHPEE, MASSACHUSETTS  
DEPARTMENT OF PUBLIC WORKS  
SANTUIT POND DAM REHABILITATION

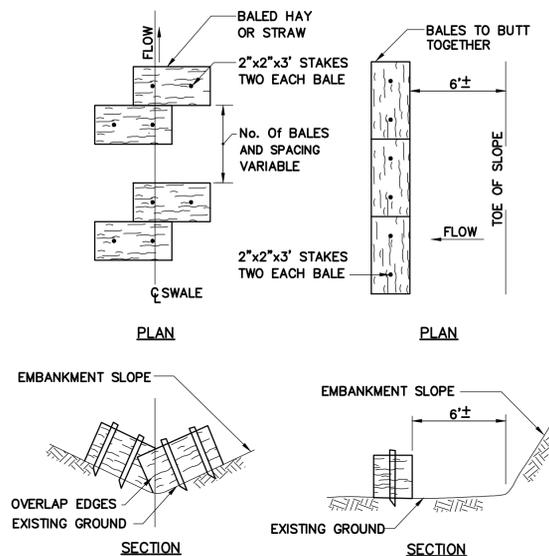
**CIVIL SECTIONS**

CONTRACT: NOTED  
JOB NO.: 2110090  
DR. BY: PJS  
DSN. BY: BTC  
CHK. BY: MPM  
APP. BY: MPM

CADD NO.: DET-1  
SCALE: NOTED  
FILE NO.: -

©: Mashpee, MA/Santuit Pond Dam/CADD/Design/Details.dwg

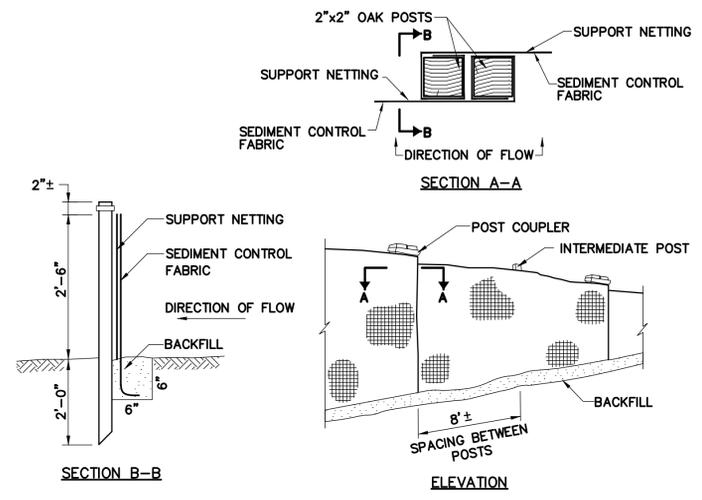
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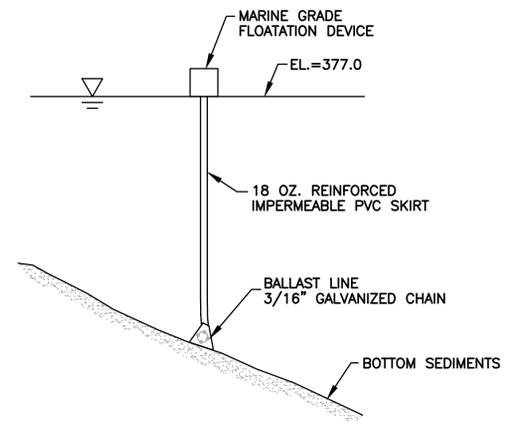
**NOTE:** TO BE USED IN LOCATIONS WHERE THE EXISTING GROUND SLOPES IN TOWARD THE TOE OF SLOPE

**NOTE:** TO BE USED IN LOCATIONS WHERE THE EXISTING GROUND SLOPES AWAY FROM THE TOE OF SLOPE

**STRAW BALES DETAIL**  
N.T.S.



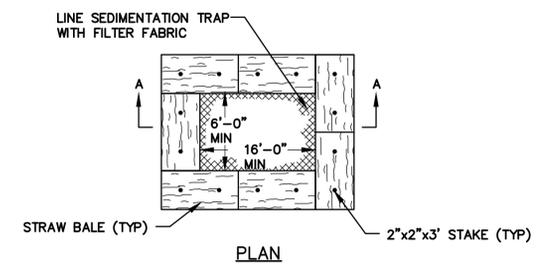
**SILT FENCE DETAIL**  
N.T.S.



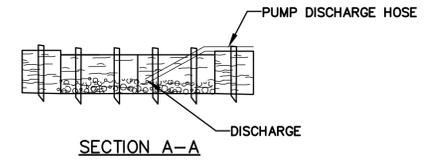
**NOTES:**

1. INSTALL THE SILT CURTAIN ALONG THE APPROXIMATE ALIGNMENT SHOWN ON SHEET C-2 PRIOR TO STARTING WORK.
2. SECURELY FASTEN THE RIGHT AND LEFT ENDS OF THE SILT CURTAIN ALONG THE SHORE LINE. PROVIDE INTERMEDIATE ANCHORING DEVICES IF NECESSARY TO KEEP THE SILT CURTAIN IN POSITION.
3. IF NECESSARY, JOIN ADJACENT ENDS OF SILT CURTAIN BY CONNECTING REINFORCING GROMMETS AND SHACKLING BALLAST LINES.

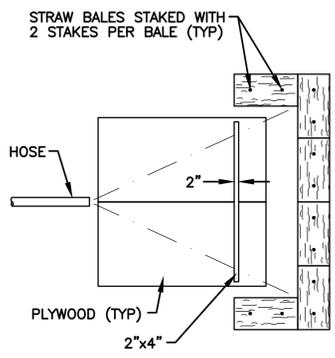
**TYPE I SILT CURTAIN**  
N.T.S. SECTION VIEW



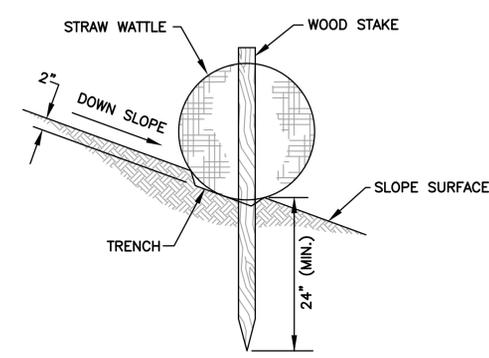
**NOTE:** ALL DEWATERING DISCHARGES SHALL BE THROUGH SEDIMENT CONTROL TRAPS, CONTRACTOR SHALL MAINTAIN AND CLEAN TRAP AS REQUIRED



**DEWATERING SEDIMENT TRAP DETAIL**  
N.T.S.



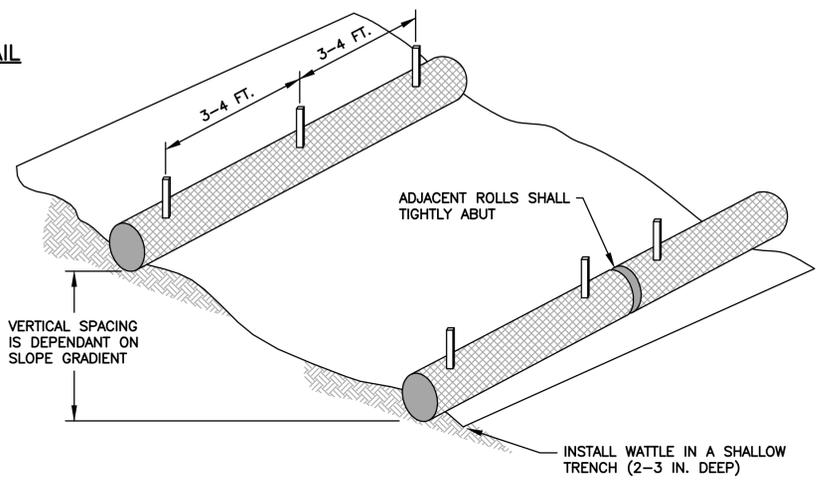
**DISCHARGE DETAIL**  
N.T.S.



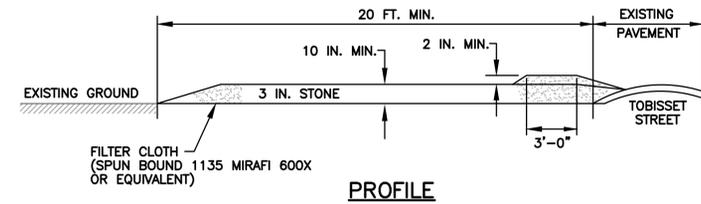
**STAKE DETAIL (ON BARE SOIL)**  
N.T.S.

**NOTES:**

1. BEGIN AT THE LOCATION WHERE THE WATTLE IS TO BE INSTALLED BY EXCAVATING A 2-3" DEEP X 9" WIDE TRENCH ALONG THE CONTOUR OF THE SLOPE. EXCAVATED SOIL SHOULD BE PLACED UP-SLOPE FROM THE ANCHOR TRENCH.
2. PLACE THE WATTLE IN THE TRENCH SO THAT IT CONTOURS TO THE SOIL SURFACE. COMPACT SOIL FROM THE EXCAVATED TRENCH AGAINST THE WATTLE ON THE UPHILL SIDE. ADJACENT WATTLES SHOULD TIGHTLY ABUT.
3. SECURE THE WATTLE WITH 18-24" STAKES EVERY 3-4' AND WITH A STAKE ON EACH END. STAKES SHOULD BE DRIVEN THROUGH THE MIDDLE OF THE WATTLE LEAVING AT LEAST 2-3" OF STAKE EXTENDING ABOVE THE WATTLE. STAKES SHOULD BE DRIVEN PERPENDICULAR TO SLOPE FACE.



**STRAW WATTLE INSTALLATION GUIDE**  
N.T.S.



**NOTES:**

1. REFER TO SHEET G-2 FOR APPROXIMATE LOCATION OF THE STABILIZED TRUCK ENTRANCE.
2. FILTER CLOTH - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
3. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
4. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC AND PRIVATE RIGHT-OF-WAY MUST BE REMOVED IMMEDIATELY.
5. WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC AND PRIVATE RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
6. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
7. STONE SHALL BE REMOVED AT THE CONCLUSION OF PROJECT AND ACCUMULATED SEDIMENT DISPOSED OF IN ACCORDANCE WITH SPEC SECTION 02282. REMOVAL OF STONE SHALL BE AT NO ADDITIONAL COST TO THE OWNER.

**STABILIZED CONSTRUCTION ENTRANCE (ANTI-TRACKING PAD)**  
N.T.S.

No.	Date	Dr. By	Ck. By	App. By	Description			
		A	P	R	O	V	E	D

REGISTERED PROFESSIONAL ENGINEER DATE

TOWN OF MASHPEE, MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS SANTUIT POND DAM REHABILITATION	CIVIL DETAILS	APP. BY MPM	CHK. BY MPM	DSN. BY BTC	DR. BY PJS	JOB NO. 2110090	CONTRACT NOTED	SCALE DET-1	CADD NO.
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**APPENDIX D**

**COORDINATION LETTERS**

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EA Engineering, Science, and Technology, Inc.

Airport Professional Park  
2374 Post Road  
Warwick, Rhode Island 02886  
Telephone: 401-736-3440  
Fax: 401-736-3423  
www.eaest.com

August 27, 2012

Mr. Don Boyce  
Regional Administrator, Region I  
Federal Emergency Management Agency  
99 High Street, 6<sup>th</sup> Floor  
Boston, MA 02110

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Boyce:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

These rehabilitation activities are necessary to restore anadromous fish passage to historic upstream spawning habitats and to bring the Santuit Dam into compliance with 302 CMR 10. As this action is being partially and/or fully funded by a Federal agency and per the National Environmental Policy Act (NEPA) of 1969, an Environmental Assessment (EA) is being prepared to evaluate environmental and public-interest concerns associated with this proposal. This document is currently being prepared and your department will have an opportunity to review the draft EA.

Some facts concerning this proposal are as follows:

- 1 According to historical research, the Santuit River and Santuit Pond supported anadromous fish, including blueback herring (*Alosa aestivalis*) and alewives (*Alosa pseudoharengus*).
- 2 Due to the failing condition of the Santuit Pond Dam, a Certificate of Non-Compliance and Dam Safety Order has been issued.
- 3 The proposed project would rehabilitate the dam, including the fish passage, to bring the dam into compliance with Massachusetts' dam safety regulations.
- 4 Rehabilitation of the fish passage would allow fish populations to return to spawning habitats upstream in Santuit Pond.



- 5 Per NEPA, all pertinent federal, state, and local agencies will be consulted during the EA process. Environmental, social, and economical impact analyses will be conducted to evaluate the impacts of the proposed project on surrounding environments.

This is an iterative process, and fish passage and/or dam removal designs are flexible as sensitive receptors are identified. Additional alternatives are being considered, including a No Action Alternative.

Information and data collected from this solicitation will be included in the EA for the project. Please forward concerns/comments to me no later than 30 days from the date of this letter so that they might be included in the DRAFT EA. If you should have any questions regarding this letter, please feel free call me at 401-736-3440, extension 228, or email me at [cbernier@eaest.com](mailto:cbernier@eaest.com). We look forward to your response.

Sincerely,

EA ENGINEERING, SCIENCE, AND  
TECHNOLOGY, INC.

A handwritten signature in black ink that reads "P. Chase Bernier". The signature is written in a cursive, flowing style.

P. Chase Bernier, AWB®  
Project Scientist

Enclosures



**EA Engineering, Science, and Technology, Inc.**

Airport Professional Park  
2374 Post Road  
Warwick, Rhode Island 02886  
Telephone: 401-736-3440  
Fax: 401-736-3423  
www.eaest.com

August 27, 2012

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

*Re: Notification and Solicitation of Comments  
Proposed Santuit River Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

To Whom It May Concern:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

These rehabilitation activities are necessary to restore anadromous fish passage to historic upstream spawning habitats and to bring the Santuit Dam into compliance with 302 CMR 10. As this action is being partially and/or fully funded by a Federal agency and per the National Environmental Policy Act (NEPA) of 1969, an Environmental Assessment (EA) is being prepared to evaluate environmental and public-interest concerns associated with this proposal. This document is currently being prepared and your department will have an opportunity to review the draft EA.

Some facts concerning this proposal are as follows:

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Sincerely,

EA ENGINEERING, SCIENCE, AND  
TECHNOLOGY, INC.

A handwritten signature in black ink that reads "P. Chase Bernier". The signature is written in a cursive, flowing style.

P. Chase Bernier, AWB®  
Project Scientist

Enclosures



**EA Engineering, Science, and Technology, Inc.**

Airport Professional Park  
2374 Post Road  
Warwick, Rhode Island 02886  
Telephone: 401-736-3440  
Fax: 401-736-3423  
www.eaest.com

August 27, 2012

Mr. H. Curtis Spalding  
Regional Administrator  
U.S. Environmental Protection Agency  
Region I, New England  
5 Post Office Square, Ste. 100  
Boston, MA 02109

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Spalding:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

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August 27, 2010

Mr. Thomas Chapman  
Supervisor  
Northeast Regional Office  
U.S. Fish and Wildlife Service  
300 Westgate Center Drive  
Hadley, MA 01035-9587

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Moriarty:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

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Mr. Thomas Chapman  
U.S. Fish and Wildlife Service  
August 27, 2010  
Page 2

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www.eaest.com

September 4, 2012

Mr. Brad Chase  
Massachusetts Division of Marine Fisheries  
Quest Campus  
1213 Purchase Street, 3<sup>rd</sup> Floor  
New Bedford, MA 02740

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Chase:

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August 27, 2012

Mr. Edward M. Lambert, Jr.  
Commissioner  
Massachusetts Department of Conservation and Recreation  
251 Causeway Street, Suite 600  
Boston, MA 02114-2104

*Re: Notification and Solicitation of Comments  
Proposed Santuit Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

November 17, 2010

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

*Re: Notification and Solicitation of Comments  
Proposed Santuit River Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Sullivan:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

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P. Chase Bernier, AWB®  
Project Scientist

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www.eaest.com

August 27, 2012

Mr. Jason Zimmer  
District Manager, Southeast Wildlife District  
Massachusetts Division of Fish and Wildlife  
195 Bournedale Road  
Buzzard's Bay, MA 02532

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Restoration and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. Zimmer:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of a fish passage structure to restore diadromous fish access to Santuit Pond.

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Mr. Jason Zimmer  
Massachusetts Division of Fish and Wildlife  
August 27, 2012  
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Warwick, Rhode Island 02886  
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www.eaest.com

March 26, 2012

Amy Coman-Hoenig  
Endangered Species Review Assistant  
Natural Heritage and Endangered Species Program  
1 Rabbit Hill Road  
Westborough, MA 01581

*Re: Endangered and Threatened Species Inquiry  
Proposed Santuit Pond Dam Restoration and Fish Passage  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Ms. Coman-Hoenig:

On behalf of the United States Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby requests information regarding federally protected floral and faunal species in the vicinity of the Santuit Pond Dam located in the Town of Mashpee, Barnstable County, Massachusetts for the proposed rehabilitation of the dam and associated fish passage activities (refer to attached Project Locus and Aerial Photographs). The dam comprises the headwaters of the Santuit River and is identified by the Massachusetts Natural Heritage and Endangered Species Program's online viewer as being with the vicinity of a Priority Habitat.

This information will be included in the Environmental Assessment being prepared per the National Environmental Policy Act (NEPA) of 1969. If you should have any questions, please feel free call me at 401-736-3440, extension 228, or email me at [cbernier@eaest.com](mailto:cbernier@eaest.com). We look forward to your response.

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Project Scientist

Enclosures



## Natural Heritage Data Release Form

**Please fill out this form if you are requesting information for conservation purposes or habitat management and you are a non-profit conservation group, government agency or are working with a government agency. Our response to this request will be a list of rare species found at your site.**

### Requestor Information

Name: P. Chase Bernier

Affiliation: EA Engineering, Science, and Technology

Address: 2374 Post Road, Suite 102

City: Warwick

State: RI

Zip Code: 02886

Daytime Phone: 401.736.3440

Ext. 228

Email address: cbernier@eaest.com

**If a private individual working with a Non-Profit or Government Agency, enter organization information below:**

Organization Name: Natural Resources Conservation Service

Contact Person: Donald Liptack

Address: PO Box 678

City: Hyannis

State: MA

Zip Code: 02630

Daytime Phone: 508.771.8757

Ext:

### **Site Information:**

Name of Landowner (if different from above): Town of Mashpee Conservation Commission

Location: Santuit Pond Dam, Mashpee, MA

USGS Quad Map: Cotuit

Description of habitat management or conservation project (If necessary, attach additional sheet):

Rehabilitation of the Santuit Pond Dam including a fish ladder to provide habitat access to river herring into Santuit Pond.

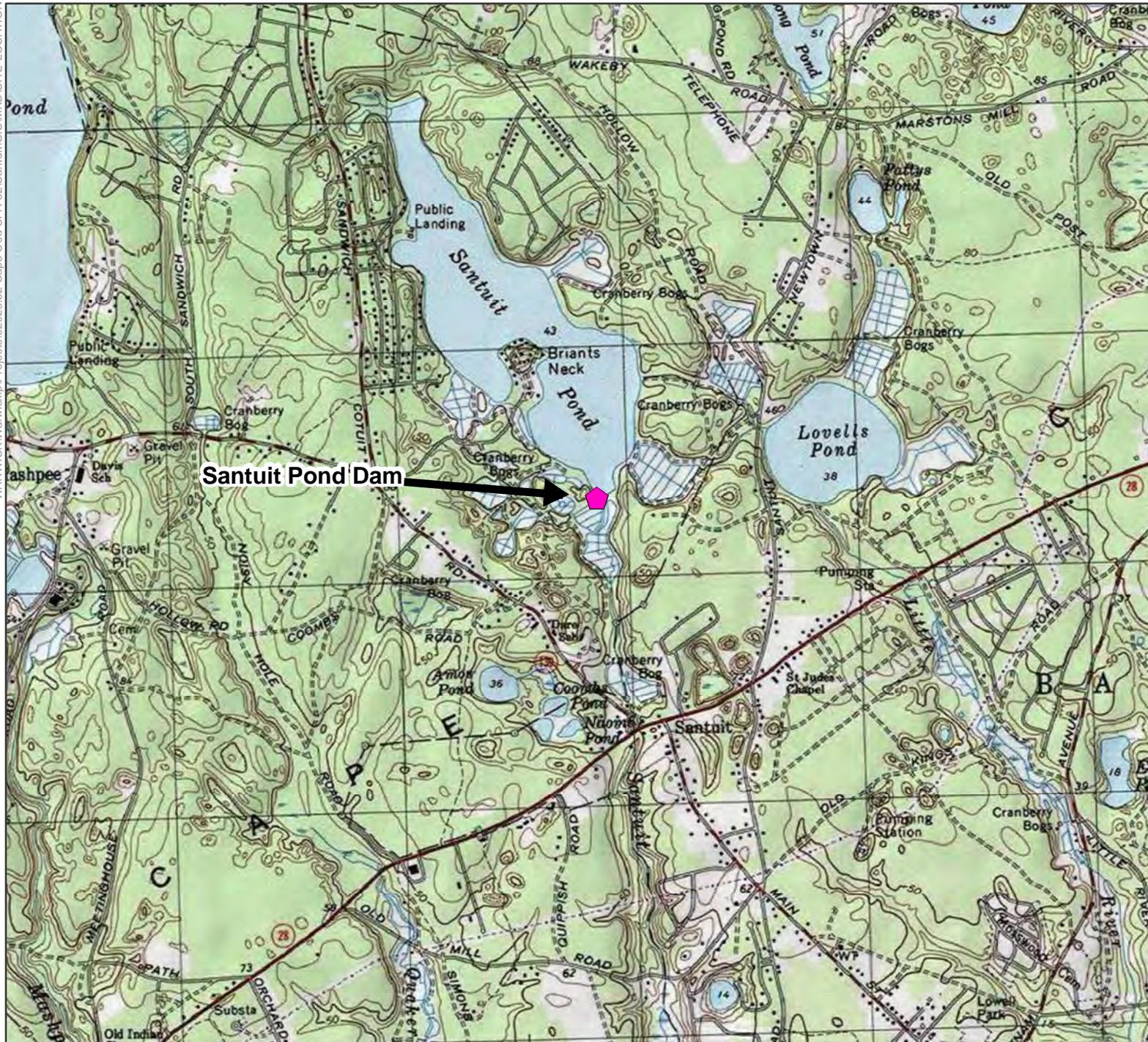
Please enclose a copy of a USGS topographic map in the scale 1:24,000 or 1:25,000 (not copy reduced) with the site location clearly marked and centered on the copy page.

Please **mail** this completed form and topographic map to:

Natural Heritage Data Release  
Natural Heritage and Endangered Species Program  
MA Division of Fisheries and Wildlife  
1 Rabbit Hill Road  
Westborough, MA 01581

Or fax to: Natural Heritage Data Release  
(508) 389-7891

**Questions regarding this form should be directed according to the county that the property is located:**  
Berkshire, Essex, Franklin, Hampshire, Hampden, Middlesex & Worcester Counties call: 508-389-6361  
Barnstable, Bristol, Dukes, Nantucket, Norfolk, Plymouth & Suffolk Counties call: 508-389-6364

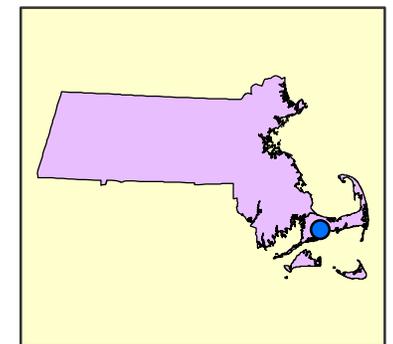
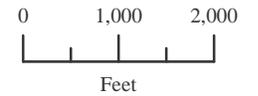


### Santuit Pond Dam Restoration

Figure 1. Site Location

Legend

◆ Dam Location

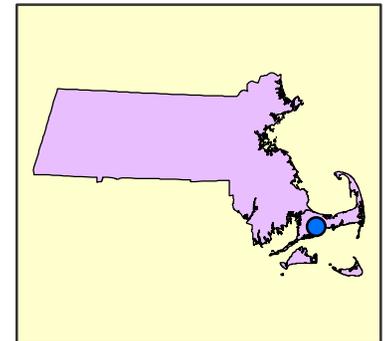
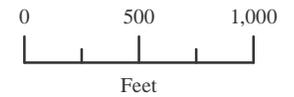


# Santuit Pond Dam Restoration

## Figure 2. Resource Map

### Legend

-  Certified Vernal Pools
-  Dam Location
-  Primary Habitat for Rare Species
-  Estimated Habitat for Rare Species





EA Engineering, Science, and Technology, Inc.

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Warwick, Rhode Island 02886  
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September 4, 2012

Mr. Andrew McManus  
Conservation Agent  
Town of Mashpee Conservation Commission  
16 Great Neck Road North  
Mashpee, MA 02649

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Mr. McManus:

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September 4, 2012

Ms. Catherine Laurent  
Director  
Town of Mashpee Dept. of Public Works  
350 Meetinghouse Road  
Mashpee, MA 02649

*Re: Notification and Solicitation of Comments  
Proposed Santuit Pond Dam Rehabilitation and Fish Passage Project  
Town of Mashpee, Barnstable County, Massachusetts*

Dear Ms. Laurent:

On behalf of the United State Department of Agriculture's Natural Resource Conservation Service (NRCS) and acting as their authorized agent, EA Engineering, Science and Technology, Inc. hereby solicits concerns and/or comments regarding the NRCS's proposed dam rehabilitation and associated fish passage activities at the Santuit Pond Dam located at the headwaters of the Santuit River in the Town of Mashpee, Barnstable County, Massachusetts (refer to attached Project Locus and Aerial Photographs). The proposed project includes the rehabilitation of the dam and fish passage structure to restore diadromous fish access to Santuit Pond.

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TECHNOLOGY, INC.

A handwritten signature in black ink that reads "P. Chase Bernier". The signature is written in a cursive, flowing style.

P. Chase Bernier, AWB®  
Project Scientist

Enclosures

**APPENDIX E**

**REGULATORY CORRESPONDENCE**

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# United States Department of the Interior



## FISH AND WILDLIFE SERVICE

New England Field Office  
70 Commercial Street, Suite 300  
Concord, NH 03301-5087  
<http://www.fws.gov/newengland>

January 17, 2012

To Whom It May Concern:

This project was reviewed for the presence of federally listed or proposed, threatened or endangered species or critical habitat per instructions provided on the U.S. Fish and Wildlife Service's New England Field Office website:

(<http://www.fws.gov/newengland/EndangeredSpec-Consultation.htm>)

Based on information currently available to us, no federally listed or proposed, threatened or endangered species or critical habitat under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area(s). Preparation of a Biological Assessment or further consultation with us under section 7 of the Endangered Species Act is not required. No further Endangered Species Act coordination is necessary for a period of one year from the date of this letter, unless additional information on listed or proposed species becomes available.

Thank you for your cooperation. Please contact Mr. Anthony Tur of this office at 603-223-2541 if we can be of further assistance.

Sincerely yours,

Thomas R. Chapman  
Supervisor  
New England Field Office

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Commonwealth of Massachusetts

# Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

April 02, 2012

P. Chase Bernier  
EA Engineering, Science and Technology  
2374 Post Road, Suite 102  
Warwick RI 02886

RE: Project Location: Mashpee - Santuit River  
Town: MASHPEE  
NHESP Tracking No.: 10-29025

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program ("NHESP") of the MA Division of Fisheries & Wildlife for information regarding state-listed rare species in the vicinity of the above referenced site. Based on the information provided, this project site, or a portion thereof, is located **within** *Priority Habitat 1375* (PH 1375) and *Estimated Habitat 31* (EH 31) as indicated in the *Massachusetts Natural Heritage Atlas* (13<sup>th</sup> Edition). Our database indicates that the following state-listed rare species have been found in the vicinity of the site:

<u>Scientific name</u>	<u>Common Name</u>	<u>Taxonomic Group</u>	<u>State Status</u>
<i>Terrapene carolina</i>	Eastern Box Turtle	Reptile	Special Concern

The species listed above is protected under the Massachusetts Endangered Species Act (MESA) (M.G.L. c. 131A) and its implementing regulations (321 CMR 10.00). State-listed wildlife are also protected under the state's Wetlands Protection Act (WPA) (M.G.L. c. 131, s. 40) and its implementing regulations (310 CMR 10.00). Fact sheets for most state-listed rare species can be found on our website ([www.nhosp.org](http://www.nhosp.org)).

This evaluation is based on the most recent information available in the NHESP database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Brent Powers, NRCS Review Biologist, at 508-389-6354.

Sincerely,

Thomas W. French, Ph.D.  
Assistant Director

[www.masswildlife.org](http://www.masswildlife.org)

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United States Department of Agriculture

Natural Resources Conservation Service  
270 Communication Way, Suite 1-G  
Hyannis, MA 02601

508-771-6476  
fax 508-771-6509  
www.ma.nrcs.usda.gov

*sent out  
Oct 18, 12*

October 18, 2012

Ms. Ramona Peters  
Mashpee Wampanoag Tribe  
Tribal Historic Preservation Authority  
483 Great Neck Rd.  
Mashpee, MA. 02649

RE: Santuit Pond and Fishway Historic Properties report

Ramona,

Enclosed is the PAL report for our watershed project in Mashpee. The town of Mashpee has an agreement with our agency for financial and technical assistance to restore the dam and repair the fishway.

Please review the report and comment as appropriate. I believe PAL and/or the town of Mashpee has sent you a copy of the plans as well.

I would be glad to meet on site if you prefer.

Thanks

A handwritten signature in black ink, appearing to read "DL", is written over a light blue horizontal line.

Donald Liptack  
USDA NRCS  
Hyannis, MA

***Helping People Help the Land***

USDA is an equal opportunity employer and provider.

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October 17, 2012

Edward L. Bell  
Deputy State Historic Preservation Officer  
Massachusetts Historical Commission  
220 Morrissey Boulevard  
Boston, Massachusetts 02125

Re: Santuit Pond Dam Fish Passage Project, Mashpee, MA  
Historic Properties Survey  
MHC#RC.50736, PAL #2697

Dear Mr. Bell:

Attached, per your October 5, 2012 request, please find an MHC Inventory Form H on #24 bond paper and a CD with the Santuit Pond Dam Fish Passage Project related form data.

PAL is in receipt of Project plans dated October 2012 and we are reviewing them pursuant to your October 5, 2012 comment letter, specific to archaeological sensitivity. Subsequent submittal of the revised Project Historic Properties Survey and Archaeological Assessment summary report, will clarify the results of the Project's archaeological reconnaissance component.

If you have any questions or require additional information please don't hesitate to contact Deborah C. Cox, President, or me at your convenience.

Sincerely,

A handwritten signature in black ink, appearing to read 'Alan Leveillee', with a long horizontal flourish extending to the right.

Alan Leveillee, RPA  
Senior Archaeologist

Enclosures

cc: Donald Liptack, USDA NRCS (w/o encl.)  
Catherine Laurent, Mashpee Dept. of Public Works (w/o encl.)

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**The Commonwealth of Massachusetts**  
William Francis Galvin, Secretary of the Commonwealth  
Massachusetts Historical Commission

October 5, 2012

Donald Liptack  
District Conservationist  
Natural Resources Conservation Service  
270 Communications Way, Unit 1G  
Hyannis, MA 02601

RE: Santuit Pond Dam Fish Passage Project, Mashpee, MA. MHC #RC.50736.

Dear Mr. Liptack:

Staff of the Massachusetts Historical Commission (MHC), have reviewed the information prepared and submitted by the PAL, reporting on a cultural resources assessment of the Mashpee Manufacturing Company Bog Landscape in the project area referenced above. Additional information is needed by the MHC to understand the project.

Please provide the MHC with full-sized, scaled project construction plans showing the complete project impact areas, including access routes, and construction equipment and materials staging, storage, and parking areas. The PAL should assess the archaeological sensitivity of the complete project impact areas, and provide the results to the MHC and other consulting parties.

Please indicate if there are any other federal, or any state, agency funding or permits required for the project.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800). Please contact me if you have any questions.

Sincerely,

A handwritten signature in blue ink, appearing to read "E. Bell".

Edward L. Bell  
Deputy State Historic Preservation Officer  
Massachusetts Historical Commission

xc:

Ramona Peters, Mashpee Wampanoag Tribe  
Catherine Laurent, Mashpee Dept. of Public Works  
Alan Leveillee, PAL

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**APPENDIX F**

**HISTORIC PROPERTIES SURVEY**

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Due to the sensitive nature of the historical properties survey, the Historical Properties Survey report (PAL 2012) has been redacted from the public publication of this Environmental Assessment. However, the following text summarizes the findings of that report:

The historic properties survey completed in May 2012, has found that the Santuit Pond Dam work practice area of potential effect (APE) contains no historic properties that are listed in, eligible for listing in, or recommended eligible for listing in the National Register. Figure F-1 depicts the location of the APE at the site. PAL recommends that the proposed work practice undertaking will have no effect on historic properties. PAL recommends that the Natural Resources Conservation Service (NRCS), together with the Town of Mashpee, consult with the Massachusetts Historical Commission (MHC) regarding the results of the current historic properties survey. If the MHC agrees with the NRCS identification effort, then PAL recommends that the NRCS issue a finding of “no effect” for the undertaking.

#### **REFERENCES:**

Public Archeology Laboratory. 2012. Historic Properties Survey, Santuit Pond Dam. 1 July 2012.

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## **APPENDIX G**

# **INVESTIGATION AND ANALYSIS REPORT**

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**Clean Air Act:** The Clean Air Act<sup>33</sup> regulates air pollutants at the national level. The 8-hour Ozone Nonattainment Area State/Area/County Report (EPA 2011) was reviewed to determine if the site was within any of the 8-hour nonattainment areas designated by the U.S. Environmental Protection Agency (EPA), which it is. Additionally, the Massachusetts 2010 Air Quality Report (DEP 2011) was reviewed to determine the existing conditions of the air quality in the vicinity of the site. Furthermore, the project was reviewed to analyze potential air quality impacts that may occur as a result of the dam rehabilitation. It was determined that only minor, temporary impacts related to construction-related activities would occur which would result in a limited decrease in air quality during construction. Once construction has been completed, it is expected that existing air quality will resume to the current existing conditions.

**Clean Water Act / Waters of the U.S.:** The Clean Water Act<sup>34</sup> (CWA) applies to waters of the U.S. which generally refers to waters (i.e., rivers, lakes, etc.) that are traditionally navigable and their adjacent and contributing waters (i.e., streams, wetlands, etc.) Typically, projects are most often affected by the CWA under Section 401 and Section 404. In summary, Section 401 prohibits the degradation of water quality by regulated activities; Section 404 regulates the discharge of dredged or fill material into waters of the U.S.

As part of the planning process for the rehabilitation of the dam and fish ladder, Massachusetts Geographic Information Systems (MassGIS) (MassGIS 2009) and National Wetlands Inventory (NWI) (FWS 2009a) wetlands data was overlain on the project area to determine if there were any mapped wetland habitats in the vicinity of the dam. An infield delineation was completed to determine the presence of any wetlands or other waters of the U.S. within the proposed project area in order to “ground truth” the wetlands mapping. As a result, several wetlands and watercourses were identified within the vicinity of the site. These potentially regulated areas were overlaid onto the proposed engineering plans to determine if there would be any significant impacts to those resources as a result of the dam rehabilitation.

It was determined that rehabilitation of the dam will result in minor temporary and permanent impacts likely less than 1 acre as a result of construction due to construction access and other construction-related activities. The water quality of Santuit Pond and the Santuit River may be affected by temporary construction-related disturbance resulting in erosion and sedimentation. Compliance with state laws, application of best management practices (BMPs), and revegetation of the disturbed area would minimize these impacts. As such, it is likely that the project will require a Section 401 Water Quality Certificate from the Massachusetts Department of Environmental Protection (DEP), a Section 404 General Permit (GP) Permit from the U.S. Army Corps of Engineers (Corps), and an Order of Conditions from the Town of Mashpee Conservation Commission.

**Coastal Zone Management:** Massachusetts’s Coastal Management Program consists of enforceable programs and management principles which govern activities within a coastal zone. The Massachusetts coastal zone is generally restricted to land within 0.5 miles of coastal waters and salt marshes as well as all islands.

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<sup>33</sup> 42 U.S.C. 7401 *et seq.*

<sup>34</sup> 33 U.S.C. §1251 *et seq.*

To evaluate the potential effects of dam rehabilitation on Coastal Zone Management areas, data from the Massachusetts Ocean Resources Information System (MORIS) was reviewed (MassGIS 2008a). The review indicated that the dam is not within any Coastal Zone Management areas.

**Coral Reefs:** The dam is located approximately 2 miles inland from the nearest coastal waters in Cape Cod. Since the dam is not in the vicinity of any coastal waters, it was determined that rehabilitation of the dam will not result in any impacts to coral reefs. Given the dam's inland locale, further consideration of impacts to coral reefs is not warranted.

**Cultural Resources:** The National Register of Historic Places (National Register) (NPS 2011) was reviewed to determine the presence of any places listed or eligible for listing on the National Register. No places listed or eligible for listing in the vicinity of the dam were identified. Additionally, the Massachusetts State Historic Preservation Office (SHPO) and the Tribal Historic Preservation Office (THPO) were both consulted regarding the presence of known historic and cultural resources at the site. Both SHPO and THPO have verbally confirmed that the project will not have an effect on cultural resources on the site. However, written concurrence from these agencies is forthcoming. Any correspondence received from SHPO/THPO will be incorporated into future versions of the EA.

**Endangered and Threatened Species:** Initial assessment of potential environmental impacts was based on review of natural resources information in MassGIS and consultations with U.S. Fish and Wildlife Service (FWS) and Massachusetts Natural Heritage and Endangered Species Program (NHESP). The FWS's list of Federally Listed Endangered and Threatened Species in Massachusetts (FWS 2009b) was reviewed to determine the potential presence of any federally-listed threatened or endangered (T&E) species in the vicinity of the site. As such, it was determined that there are no federally-protected threatened or endangered species in the project area. The NHESP's Priority Habitat for Rare Species (MassGIS 2008b) and Estimated Habitat for Rare Species (MassGIS 2008c) datasets were reviewed for the presence of rare species or their suitable habitats in the vicinity of the dam. As such, the eastern box turtle (*Terrapene carolina*), a Massachusetts species of Special Concern, is known occur in the vicinity of the dam as noted by the NHESP. As such, a field survey to identify possible suitable habitat for eastern box turtles in proximity to the dam was completed. The survey found that suitable habitat for eastern box turtles existed in the vicinity of the project area. But, the NHESP indicated that the project will likely not be considered a "take". However, the project will be required to be reviewed by the NHESP through the Massachusetts Endangered Species Act review.

**Environmental Justice:** MassGIS data (2003) depicting Environmental Justice Zones was reviewed to determine if there were any zones within close proximity to the dam. The data shows that there are no Environmental Justice Zones in the vicinity of the project site.

**Essential Fish Habitat:** To analyze whether rehabilitation of the dam will impact essential fish habitat, National Oceanic and Atmospheric Administration's (NOAA) Essential Fish Habitat Mapper<sup>35</sup> was reviewed. The mapper shows that there is no essential fish habitat within close

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<sup>35</sup> NOAA Essential Fish Habitat Mapper. Available [online]: <[http://sharpfin.nmfs.noaa.gov/website/EFH\\_Mapper/map.aspx](http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx)>. Accessed October 5, 2011.

proximity to the dam. As such, further analysis regarding potential impacts to essential fish habitat is not warranted.

**Floodplain Management:** The 100-year floodplain (MassGIS 1997) was reviewed to determine what, if any, impacts rehabilitation of the dam would have on the floodplain. As a result of the review, it was determined that rehabilitation of the dam will likely not impact the downstream floodplain. In fact, because the rehabilitation will bring the dam into state dam safety guidelines and standards, the downstream floodplain will benefit from the rehabilitation. The rehabilitation will reduce the potential of the dam from failing. Failure of the dam would result in high velocity flows through the auxiliary spillway and downstream of the dam which would likely cause heavy erosion and sedimentation of the downstream floodplain.

**Invasive Species:** During infield investigations, plant communities were identified throughout the site. In particular, the presence of invasive species was noted. As a result of the infield investigations, several invasive species including common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), and reed canary grass (*Phalaris arundinacea*). Although the presence of invasive species was noted at the site, they were observed in only sporadic clusters. In order to reduce the potential of construction activities transporting invasive species material to or from the site, best management practices will be employed to ensure that rehabilitation of dam does not spread invasive species material.

**Migratory Birds / Bald and Golden Eagle Protection Act:** The Migratory Birds Treaty Act<sup>36</sup> seeks to protect migratory birds. As such, the law makes it illegal to pursue, hunt, take, capture, kill or sell protected birds. The Bald and Golden Eagle Protection Act<sup>37</sup> prohibits the “taking” of bald and golden eagles.

During the infield investigations, numerous species of migratory birds were observed. However, it is likely that these species will not be harmed as a result of dam rehabilitation. The majority of the project impacts will occur on the dam itself (i.e., embankments, spillways, dikes, etc.). These areas are routinely mowed and do not provide suitable habitat for migratory species. It is likely that migratory species that may be affected by rehabilitation of the dam will relocate to other areas adjacent to the proposed project area during construction. Once construction has been completed, it is expected that those species will return to the area.

There is no suitable habitat for bald (*Haliaeetus leucocephalus*) or golden eagles (*Aquila chrysaetos*) at the site. Additionally, the bald eagle is a state-listed endangered species. If bald eagles were known to occur in the vicinity of the site, the NHESP would have identified such an occurrence during their project review. As such, it is highly unlikely that the project would affect any bald or golden eagles.

**Plants:** During the infield site investigation, vegetative communities were noted as they occurred throughout the site. Plant species in each vegetative community were noted. The majority of the site consists of upland forests and wetland habitats.

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<sup>36</sup> 16 U.S.C. §§703-717

<sup>37</sup> 16 U.S.C. 668-668d

Construction activity would likely result in minor impacts affecting the vegetation due to the installation of the proposed armoring of the auxiliary spillway and raising of the embankment and dikes. However, at the completion of construction, equipment would be removed and the disturbed area would be restored.

**Riparian Areas:** Riparian areas are generally described as habitats that exist in the vicinity of the interface between watercourses and land. In order to determine the extent of riparian areas in the vicinity of the dam, available watercourse mapping data (MassGIS 2000) was reviewed to identify areas on the site where riparian areas likely existed. During infield investigations, these areas were traversed to determine the condition of riparian habitat in the vicinity of the dam.

Riparian areas were identified along the banks of the Santuit River. In general, these areas consisted of forested floodplain, forested wetland, and upland forest habitat.

**Socioeconomics:** Sources for the data included in the social and economic conditions section of this supplement include the U.S. Census Bureau, Department of Commerce, 2010 Census, and interviews conducted with local contacts.

**Soil:** NRCS (2007) soil mapping data for Barnstable County, Massachusetts was reviewed to determine the soil types mapped in the vicinity of the dam. Review of the soils mapping for site shows that several major soil types are mapped in the area of dam. Richfield, Merrimac, Agawam, and Canton fine sandy loams constitute over 50 percent of the soils in the Hop Brook Dam area. The poorly drained Freetown muck represents over 20 percent of the dam area. Other soils exist in the area of the dam which are mapped in densities less than 20 percent of the land area.

**Wetlands:** A field survey was conducted by Weston & Sampson to identify and assess wetlands upstream and downstream of the dam in the potential construction area. Wetlands identified include Bordering Vegetated Wetlands, Land Under Water Bodies, Banks, and Riverfront Area.

Based on the surveys and the conceptual project design, most of the construction for dam rehabilitation would occur within the existing area previously disturbed for construction of the dam and maintained as mowed grass. However, some wetland impacts are likely occur as a result of construction, access, and minimal permanent wetland impacts may occur as result of the rehabilitation of the dam embankment and fish ladder.

**Wild and Scenic Rivers:** The Wild and Scenic Rivers Act<sup>38</sup> established the National Wild and Scenic Rivers System. To determine if any Wild and Scenic Rivers were present in the vicinity of the dam, the River Mileage Classification for Components of the National Wild and Scenic Rivers System (NPS 2011b) was reviewed. According that list, the Assabet River (of which the Hop Brook is a tributary) is listed. The section of the Assabet River is located downstream of the dam from 1,000 feet downstream of the Damon Mill Dam to its Confluence with the Concord River. This section of the river, approximately 4.4 miles, is located completely within the Town of Concord, Massachusetts.

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<sup>38</sup> 16 U.S.C. 1271-1287

## **REFERENCES:**

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