

# ***Cains Brook and Mill Creek Watershed Management Plan***

**Seabrook, New Hampshire**

**December 28, 2006 - Revised 02/18/2009**



**Submitted To:**  
Seabrook Conservation Commission  
Seabrook, New Hampshire

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# Executive Summary

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## Introduction

In 2006 the Seabrook Conservation Commission adopted the original Cains Brook/Mill Creek Watershed Management Plan in effort to better manage the activities and resources within the watershed. The Plan provided a “blueprint” for actions that were intended to achieve the vision for the watershed that provides for:

- protecting land and water resources
- appropriately managing growth and development and
- ensuring opportunities for public use and recreation.

Since the adoption of the plan, the Commission has established a watershed planning process in concert with the New Hampshire Department of Environmental Services (NH DES) consistent with EPA’s nine (9) criteria for watershed planning. This process has provided the opportunity for additional funding to help restore the natural resource and recreational values of the watershed, including the dredging of Cains and Cains Mill Pond. This plan update reflects the effort of the Conservation Commission to incorporate the EPA criteria into the plan as well as to update other activities affecting the watershed, such as NPDES Phase II stormwater management program.

## Watershed Profile

Cains Brook is a freshwater stream that flows in an easterly direction from its origin—a spring fed pond about one mile west of I-95 on the Salisbury, Massachusetts/Seabrook, New Hampshire border. At its lower reaches the brook is joined by Shepard Brook where it becomes Mill Creek, a tidal creek that discharges into the Hampton-Seabrook estuary. Along its course there are several ponds on either side of US Route 1—Secords, Cains and Mary’s Ponds to the west of Route 1 and Cains Mill Pond and Noyes Pond to the east. This stream system is approximately 3.8 miles long.

The Cains Brook Watershed has experienced significant residential and commercial growth over the past 20 years. This growth has resulted in the loss of wetlands and wildlife habitat and caused sedimentation to the watershed’s ponds streams. These impacts have led to a degradation of the quality and aquatic habitat of the waters within the brook and the Hampton-Seabrook Estuary. Prior to this urbanization, there were significant and valuable terrestrial and aquatic habitats within the watershed. Seabrook has been concerned about the negative impacts of this recent development to the watershed’s resources. A number of local and state initiatives have resulted in some progress toward restoring the quality of the watershed’s water resources and habitats. These have included structural changes such as the reconstruction of the culvert and bridge over lower Cains Brook at the Spherex site and the dredging of Secord’s Pond. These efforts have also included changes to the town’s regulations to better manage stormwater from new development or redevelopment within the watershed.

## Purpose of Watershed Plan

It is the purpose of this Watershed Plan recommends additional activities that will provide the opportunities to restore the aquatic and riverine resources to the watershed, as well as provide recreational opportunities for small boat access, fishing, walking and bird watching. The town envisions a watershed area that provides a balance of protected land and water resources, appropriately managed development and opportunities for public use. It is also the intent of this watershed management plan to be consistent with the over all objective of the *2000 NHEP Management Plan*—**to protect and enhance the environmental quality of the estuaries of the State of New Hampshire**—as well as a number of it specific action steps.

## Watershed Resources

The watershed is an area of great natural beauty and is a valuable ecosystem that contains an extensive wetland system that includes upland drainage, feeder tributaries, an estuary and tidal marsh. It has a diversity and abundance of plant and animal species, including a number that are rare, endangered or threatened, such as the Blanding's Turtle. The watershed offers recreational opportunities including fishing, boating, bird-watching and ice skating. The New Hampshire Coastal Resources Management Program (1979) and the Seabrook Master Plan (2000) have identified the watershed as a valuable coastal resource, because it provides a relatively intact east-west wildlife corridor and a rich tidal environment in its lower run into the Hampton-Seabrook estuary.

By all accounts the Cain's Brook watershed is a valuable natural system. In spite of the recognition of this resource as a high quality ecosystem, there have been, and continue to be, impacts from real estate development and inappropriate land use activities. These threats to the natural integrity of the system are particularly serious along US Route 1. In an effort to better understanding of the impact of land activities on the quality of the waters of the watershed, there have been a number of previous studies conducted in the watershed that have helped contribute. These include:

- Impact of Septic Tank Disconnections on Water Quality in Coastal Surface and Subsurface Environments—1997
- Cains Brook and Mill Creek Watershed Study—1997
- Tracking Bacterial Pollution Sources in Hampton Harbor—2003
- Total Maximum Daily Load (TMDL) Study for Bacteria for Hampton/Seabrook Harbor—2003
- Tracking Bacterial Pollution Sources in Cains Brook/Mill Creek Watersheds—2004

Since the preparation of the original Watershed Plan, there has also been additional water quality sampling during the summer of 2007. The results have been made available but no report has been issued. The results of this study are discussed in the Previous Water Quality Investigations Section of this updated plan.

## **Previous Studies**

In addition to the above water quality studies, the Town of Seabrook has undertaken two additional projects that have contributed data and information to this Watershed Plan. These are:

- The National Pollution Discharge Elimination System (NPDES)—Phase II—Stormwater Management Plan, March 2003
- Town of Seabrook Master Plan, 2000

## **Potential Threats to Watershed Resources**

The water resources of the watershed are subject to a number of threats that can degrade water quality. Such threats include commercial and industrial waste, agricultural activity, human and animal waste, underground storage tanks, septic tanks, road salting, hazardous waste, petroleum products, groundwater removal and stormwater runoff. The Bureau of Hazardous Waste in NHDES maintains a statewide inventory by community of all sites that may have hazardous waste or petroleum products associated with them that may pose a threat to water resources. There are over 40 such generators in the water shed including auto repair related businesses, gas stations, businesses and retail facilities such as Home Depot and Wal Mart. In addition to sources noted above, the NHDES also identified a number of other locations or activities that posed potential threats to the Cains Brook/Mill Creek Watershed. The NH DES also inventories major storm drains.

Other threats include the structural barriers along the Cains Brook (dams and weirs), flooding, erosion and sedimentation, and direct threats from human activities such as jet skiing in the tidal creeks, and motorized sport vehicles use along the railroad right of way that crosses the watershed and divides Cains Mill Pond and Noyes Pond.

## **Current Regulatory Programs**

Regulatory programs for watershed management including the management of stormwater runoff and water quality involve regulations at the federal, state and local level. At the federal level there is National Pollution Discharge Elimination System (NPDES)—Phase II that Seabrook is currently engaged in. There are also a number of state laws and regulations that are intended to manage growth and protect the state's water resources. The following represent those that are most frequently applied to activities that would affect the quality of the Cains Brook Watershed. These include: the Comprehensive Shoreland Protection Act (NHRSA §483-B), the Alteration of Terrain or Site Specific Program under RSA 485-A:17 and the Dredge and Fill program for wetland protection under RSA 482-A. Finally, the Town of Seabrook manages watershed activities through its Zoning Ordinance and Subdivision and Site Plan Review Regulations.

## **Alternative Management Strategies**

In order to better manage the resources of the Cains Brook/Mill Creek Watershed there are a number of strategies that could be considered for implementation. These include both regulatory and non-regulatory actions. Under regulatory approaches consideration can be given to changes

to the zoning ordinance as well as revisions to the Site Plan and Subdivision Regulations. Another option is to strengthen the wetlands protection regulations at the local level.

Alternatively there are a number of non-regulatory strategies that can be pursued.

- Acquisition in fee or by easement of critical areas
- Public education programs
- Physical strategies

Physical strategies can also be considered and include:

- Maintenance dredging of ponds
- Modification of structures to encourage free passage of fish and wildlife
- Modification of drainage structures to reduce sediment, pollutants & trash inflow
- Implementation of the NPDES Phase II Stormwater Management Plan
- Maintenance and monitoring of the municipal sewer system.

## **Watershed Action Plan**

Although much of the Cains Brook Watershed is developed, there is still substantial land available for development and many areas that could be redeveloped particularly in the Lafayette Road Corridor. There are also numerous areas in the watershed that need to be enhanced or restored to improve the quality of the watershed environment. The watershed action plan provides a “blueprint” for managing the use of the watershed in manner that allows for development that is sensitive to the natural resources of the watershed while protecting and enhancing its critical resource areas and recreational opportunities.

These actions are aimed at achieving the following goals.

- *Improve the water quality of Cains Brook/Mill Creek to meet New Hampshire water quality standards including shellfish standards for E.coli bacteria.*

To improve water quality a number of actions are proposed including protecting shoreline trees and shrubs, updating stormwater management and erosion control regulations, amending the town’s earth excavation ordinance, dredging Cains Pond and Cains Mill Pond and installing modifications to the Route 1 culvert/weir

- *Improve the management of stormwater runoff in an effort to protect storm water quality and reduce peak stormwater flows.*

To achieve this goal the following actions have been proposed: performing spot water quality testing, conducting dry weather out fall investigations of the Town’s MS4’s, attaching stainless steel embossed plates to all street storm drains with a slogan indicating where the stormwater goes and monitoring all Stormwater Operations and Maintenance Plans to ensure compliance.

- *Provide suitable recreational opportunities that are directly related to the waters of Cains Brook.*

Proposed actions include improving the public access of the small boat (canoe/kayak) launching area on Cains Mill Pond behind Home Depot and investigating the feasibility of upgrading the public access area on Lakeside Drive between Mary's and Cains Pond.

- *Build community support for the protection and enhancement of the land and water resources of the Cains Brook Watershed.*

To achieve this goal the following actions have been proposed: holding informational meetings and local access television broadcasts, developing a town web page, pursuing educational grants, preparing a long-term business outreach program and establishing a volunteer organization that will work cooperatively with the Conservation Commission.

- *Preserve, protect and restore critical anadromous and freshwater fisheries, wildlife habitat and migration corridors, and rare and endangered species.*

Proposed actions include: undertaking and implementing a Habitat Restoration Study within the watershed, updating the wetlands section of the town-zoning ordinance and undertaking a Prime Wetland Study within the watershed.

- *Provide for long-term health and environmental quality of Cains Brook and Mill Creek by ensuring that the Watershed Plan's goals are continually met.*

To provide for the long-term health of the watershed the following actions are proposed: establishing a monitoring program that meets the minimum sampling of the NH DES CALM and reviewing this Action Plan on annual basis.

# Background

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Cains Brook is a freshwater stream that flows in an easterly direction from its origin—a spring fed pond about one mile west of I-95 on the Salisbury, Massachusetts/Seabrook, New Hampshire border. It runs parallel to Walton Road in Seabrook until it reaches Centennial Street where it becomes tidal. At its lower reaches the brook is joined by Shepard Brook near Spherex, Inc. Here, Cains Brook becomes Mill Creek, a tidal creek that discharges into the Hampton-Seabrook estuary. Along its course there are several ponds on either side of US Route 1—Secords, Cains and Mary’s Ponds to the west of Route 1 and Cains Mill Pond and Noyes Pond to the east. This stream system is approximately 3.8 miles long. **See Figure 1, Aerial View of Watershed.**

The Cains Brook/Mill Creek watershed is a sub-watershed of the State of New Hampshire’s Coastal Watershed that comprises approximately 4 square miles in the Town of Seabrook in New Hampshire and the Town of Salisbury in Massachusetts. **See Figure 2.** Approximately 60% of the watershed is in Seabrook while the remaining 40% is in Salisbury. In Seabrook the watershed comprises approximately 1,554 acres or 26% of the town’s area. Immediately adjacent to the brook, it is wooded for much of its freshwater segment. The remainder of the watershed is characterized by residential, commercial and light industrial uses west of US Route 1 with a heavy concentration of commercial activity within the US Route 1 corridor. East of US Route 1 is primarily residential. Much of the recent commercial activity along US Route 1 has involved large enterprises such as Lowe’s, Home Depot, Walmart and several supermarkets, all of which require large parking areas resulting in a significant increase in impervious areas and traffic. During this rapid growth in commercial activity on US Route 1, the state DOT has also widened US Route 1. **See Map 1, Land Use.**

Over the years this brook has been altered through the creation of a series of dams that have formed several mill ponds such as Secord’s Pond, Cains Pond, Cains Mill Pond and Noyes Pond. It is reported that these ponds were historically approximately 15 feet deep and provided habitat for a variety of fresh water and anadromous fish. They also became recreational ponds for small hand-powered craft and fishing. Over time the area around these ponds became more developed and the resultant stormwater runoff discharged sediment and other debris into these ponds. At present, Cains Pond is only about 1 to 2.5 feet deep.

In 1997 under a NH Estuaries grant, the Seabrook Conservation Commission undertook a study of the Cains Brook/Mill Creek Watershed that concentrated on field observations of the condition of Cains Brook and sampling the brook for water quality parameters, in particular *E. coli*. The results of this sampling are discussed in more detail in the Water Quality Section of this study. Based on the observations of the Commission there appeared to be “considerable neglect or infringement by private landowners along Cains Brook”. Debris and garbage was noted at almost all locations. Particularly in the Lakeshore Drive, Ayer Circle and Forest Court areas, grass clippings and yard debris were dumped over the banks of the lots abutting the stream or ponds. An apartment complex off of Folly Mill Road had garbage bags falling over the stream bank because of inadequate dumpster capacity. Numerous shopping carts were noted in Cains Mill Pond. Trees had fallen in several locations, obstructing water flow. The ponds have filled with silt and organic debris, particularly Cains and Cains Mill Ponds. The report also cited the privately-owned bridge at Causeway Street across Mill Creek as being in need of repair.

Since that study Secord's Pond has been dredged and the Conservation Commission has prepared an application to the New Hampshire Wetlands Bureau for the dredging of Cains Pond.

The recent extreme flood conditions of May 2006 have had some dramatic effects on the watershed including:

- Significant sediment loading into Secord's Pond,
- Significant sediment deposition in the upper reaches of Cains Brook,
- Elimination of a beaver dam below Noyes Pond on Cains Brook, and
- Serious erosion along the emergency spillway of Noyes Pond.

In 1998 a Citizen Survey was conducted as part of the Master Plan Update. The results of that survey clearly identified three priority issues of concern to the citizens of Seabrook each of which have implications for the Cains Brook Watershed. These issues were growth, water and the chaotic appearance of US Route 1. Other studies have identified some of the environmental impacts to the watershed and Cains Brook including impacts to water quality. In the past ten years, the Town of Seabrook and the State of New Hampshire have undertaken a number of studies and programs to improve the situation.

This watershed study focuses on the Seabrook portion of the watershed and the section of Cains's Brook from Interstate 95 to the point where Centennial Avenue crosses the brook.

# Vision for the Watershed

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## Introduction

The Cains Brook Watershed has experienced significant residential and commercial growth over the past 20 years. This growth has resulted in the loss of wetlands and wildlife habitat and caused sedimentation to the watershed's ponds streams. These impacts have led to a degradation of the quality and aquatic habitat of the waters within the brook and the Hampton-Seabrook Estuary. Prior to this urbanization, there were significant and valuable terrestrial and aquatic habitats within the watershed. The community of Seabrook has been concerned about the negative impacts of this recent development to the watershed's resources. A number of local and state initiatives have resulted in some progress toward restoring the quality of the watershed's water resources and habitats. These have included structural changes such as the reconstruction of the culvert and bridge over lower Cains Brook at the Spherex site and the dredging of Secord's Pond. These efforts have also included changes to the town's regulations to better manage stormwater from new development or redevelopment within the watershed.

## Vision

The Town of Seabrook seeks to restore the quality of the watershed's resources so that the water quality of Cains Brook and Mill Creek meets applicable state and federal water quality standards. This effort will be complemented by the provision of recreational opportunities within the watershed for small boat access to the man-made ponds as well as fishing, walking and bird watching. The town envisions a watershed area that provides a balance of protected land and water resources, appropriately managed development and opportunities for public use.

To achieve this vision the town will work toward:

- Protection and enhancement of the quality of surface and ground water resources within the Cains Brook Watershed through sound land use policies and regulations, regulatory enforcement, and proper infrastructure maintenance and improvements.
- Provision of recreational opportunities that are directly related to the waters of Cains Brook which will minimize any impact to the watershed's resources.
- Education of citizens and business as to the value of the Cains Brook Watershed through a variety of programs and activities.



# Watershed Goals

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The long-term goal of this watershed management plan is to provide a blueprint for specific actions that would aid in the restoration of the Cain's/Mill Creek riverine system for water quality improvements, aquatic habitat restoration, anadromous fish passage and low intensity recreational activity.

**Goal 1.      Improve the water quality of Cains Brook/Mill Creek to meet New Hampshire water quality standards including shellfish standards for E.coli bacteria.**

Objective 1:    Ensure that Cains Brook meets Class B water quality standards for bacteria, turbidity, temperature, nutrients, pH and dissolved oxygen and its designated use by 2010.

Objective 2:    Ensure that both the natural and man-made structural portions of the Cains Brook system are functioning in a manner that contributes to the brook's overall water quality and habitat for aquatic life.

Objective 3:    Work toward having the surface waters and riparian shorelands of the Cains Brook Watershed be free of man-made debris.

**Goal 2.      Improve the management of stormwater runoff in an effort to protect storm water quality and reduce peak stormwater flows.**

Objective 1:    Identify watershed pollution sources and determine Best Management Practices for eliminating or minimizing the effects of these pollutants.

Objective 2:    Encourage Town of Seabrook DPW, NH Department of Transportation, key businesses and landowners to employ Best Management Practices to treat stormwater runoff.

**Goal 3.      Provide suitable recreational opportunities that are directly related to the waters of Cains Brook.**

Objective 1:    Maintain and, where appropriate, upgrade the existing public access points to the waters of the watershed.

Objective 2:    Identify additional suitable locations for public access to the surface waters of the watershed including its man-made ponds.

Objective 3:    Ensure that the depths of Cains Pond and Cains Mill Pond are suitable for hand-powered craft and a healthy aquatic environment.

**Goal 4. Build community support for the protection and enhancement of the land and water resources of the Cains Brook Watershed.**

Objective 1: Prepare an outreach program to citizens and businesses to promote and implement the watershed plan.

**Goal 5. Preserve, protect and restore critical anadromous and freshwater fisheries, wildlife habitat and migration corridors, and rare and endangered species.**

Objective 1: Undertake further habitat inventories and research of the watershed's aquatic and terrestrial resources to better understand the ecological dynamics of the existing watershed environment.

Objective 2: Protect and maintain the valuable functions of watershed wetlands and ponds by minimizing the impact of development and allowing appropriate multiple uses of these resources for water quality protection, recreation and wildlife habitat.

**Goal 6. Provide for long-term health and environmental quality of Cains Brook and Mill Creek by ensuring that the Watershed Plan's goals are continually met.**

Objective 1: Monitor water quality at appropriate locations in Cains Brook and Mill Creek in cooperation with personnel from NHDES on a semi-annual basis.

Objective 2: Once dredging is completed, establish a monitoring program to measure depths in Cains Brook and Cains Mill Pond on an annual basis.

# Watershed Resources

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## Introduction

The watershed is an area of great natural beauty and is a valuable ecosystem that contains an extensive wetland system that includes upland drainage, feeder tributaries, an estuary and tidal marsh. It has a diversity and abundance of plant and animal species, including a number that are rare, endangered or threatened, such as the Blanding's Turtle. The watershed offers recreational opportunities including fishing, boating, bird-watching and ice skating. The New Hampshire Coastal Resources Management Program (1979) and the Seabrook Master Plan (2000) have identified the watershed as a valuable coastal resource, because it provides a relatively intact east-west wildlife corridor and a rich tidal environment in its lower run into the Hampton-Seabrook estuary.

More specifically, it is the intent of the proposed watershed management plan to be consistent with:

1. The overall objective of the *2000 NHEP Management Plan*—**to protect and enhance the environmental quality of the estuaries of the State of New Hampshire.**
2. The nine (9) minimum elements of the EPA's Watershed Planning Process from its Handbook for Developing Watershed Plans to Restore and Protect Our Waters, October 2005. These elements are to be included in a watershed plan for impaired waters for projects funded with EPA Section 319 funds.

## 2000 NHEP Management Plan

This plan identifies a number of actions that are relevant including:

- Habitat Restoration. Action RST-4

*Identify and implement habitat restoration projects in other important non-tidal habitat areas, such as uplands and freshwater wetlands.*

- Water Quality. Action WQ-09

*Ensure that water quality impacts from new development or redevelopment are minimized at the planning board stage of development.*

- Land Use. Action LND-02

*Implement steps to limit impervious cover and protect streams at the municipal level.*

- Land Use. Action LND-25D

*Create or enhance local land conservation programs with emphasis on high value wetlands and buffers.*

## **EPA Nine Minimum Elements for Watershed Plan**

This plan has been revised to incorporate EPA's nine (9) minimum elements of watershed-based plans that are identified below:

- a. Identify sources and causes of contaminants.
- b. Estimate the load reductions from management measures.
- c. Describe management measures that will need to be implemented and identify on map.
- d. Estimate the amounts of technical and financial assistance needed.
- e. Describe information and education component.
- f. Schedule for implementing management measures.
- g. Description of interim measurable milestones for determining whether BMPs are being implemented.
- h. A set of criteria that can be used to whether loading reductions are being achieved over time.
- i. A monitoring component.

Such plans address these nine elements in an effort to:

- further determine the level of pollutant load reduction or habitat restoration required to attain or maintain designated water uses (such as shellfishing, secondary contact recreation or fish consumption),
- identify the specific locations where best management practices are needed to minimize pollutant loads, and
- determine appropriate procedures to measure water quality improvement.

How this watershed plan addresses each of these nine elements is further described in a matrix in Appendix D of this plan.

By all accounts the Cain's Brook watershed is a valuable natural system. In spite of the recognition of this resource as a high quality ecosystem, there have been and continue to be, impacts from real estate development and inappropriate land use activities. These threats to the natural integrity of the system are particularly serious along US Route 1.

## Topography and Soils

The Cains Brook Watershed is gently sloping with elevations that range from sea level to approximately 20 feet above sea level west of I-95. Batt Hill in the Salisbury portion of the watershed is approximately 40 feet. Slopes of less than 8% predominate in the watershed with the only exception being Batt Hill, which has slopes in some locations greater than 15%. Cains Brook is a low gradient brook. Between US Route 1 and the salt marsh, the brook has approximately a 0.1% slope, with a few isolated drops at beaver dams and at the Noyes Pond dam.

The watershed area is generally composed of glacial and marine geologic deposits that overlay igneous bedrock composed of Newbury diorite and Porphyritic mononite. The predominant deposits include stratified drift, unsorted glacial till, marine clays and swamp deposits. Most the watershed is composed of glacial till which is unconsolidated mix of glacial materials—rock, sand, boulders, cobbles and some clay. *Marine Deposits* predominate in the eastern portion of the watershed associated with Mill Creek and lower Cains Brook and are composed of stratified clay deposits formed in deep water which receded to leave these deposits in low lying areas of the Seacoast. *Stratified Drift* is composed of fine to medium sands and gravel. In the watershed there are two such deposits that straddle the border between Salisbury and Seabrook and are made up of coarse-grained drift that overlays fine-grained stratified drift. These materials consist of medium to coarse sand, which overlay fine sand, silt and clay.

### Soils

The soils in Seabrook and the watershed have developed over time from the interaction of climate, vegetation, topography and surficial materials. Since much of the surface materials of Seabrook are underlain by marine clays and glacial till, many of the soils tend to be moist and/or stony with areas of high water table, and shallow ledge. Where there is stratified drift, the soils tend to be sandier and gravely and better drained. Hydric soils tend to be found in low spots associated with surface water features or in areas underlain by silt and clay deposits throughout the town. Soil types are derived from the *Rockingham County Soil Survey* produced by the USDA Natural Resource Conservation Service (NRCS) in 1994.

#### *Wetland (Hydric) Soils*

These include all poorly and very poorly drained soils as well as tidal marsh often associated with marine silts and clays including muck, peat, swamps and marshes as defined by the NRCS for the State of New Hampshire. They include such soil types as the Walpole, Ridgebury, Scarborough and Ipswich groups. The water table is at or near the surface five to nine months of the year. Wetland soils are associated with low-lying areas in the watershed and along the freshwater brooks and creeks. **See Map 2, Wetlands and Water Resources.**

# Water Resources

## Surface Water

Seabrook is part of the Coastal Watershed, which comprises a number of smaller watersheds such as the Cain Brook/Mill Creek Watershed. Topographically, the watershed is generally bounded by Railroad Avenue to the north, a line parallel to and about one mile west of I-95 to the west, the Town of Salisbury to the south and the Hampton-Seabrook Estuary to the east. See **Figure 1**.

Cains Brook is the freshwater stream portion of the brook that flows in an easterly direction for approximately 3.8 miles from its source just west of I-95 on the Salisbury, Massachusetts/Seabrook, New Hampshire border. It runs parallel to Walton Road in Seabrook until it reaches Centennial Street where it becomes tidal and is referred to as Mill Creek. There are a number of unnamed tributaries to the stream and one major one known as Shepherd Brook, which joins Mill Creek in the lower part of the watershed.



**Cains Brook up stream of Centennial Street**

## Ponds

The brook has been modified by the construction of several dams that have created a series of mill ponds near US Route 1, including Secord's, Cains, Mary's, Cains Mill and Noyes. The dams that are associated with each of these ponds are discussed below. Secord's and Cains Mill Ponds are listed as state waters. When originally constructed these ponds were said to be approximately 15 feet deep and provided habitat for a number of fish species. As the area around these ponds became more developed, they became filled with sediment and other debris in large part from untreated stormwater runoff. The following table presents the approximate area and depth of each pond.



**Cains Brook down stream of Centennial Street**



**Table 1**  
**Pond Data**

Pond	Area-acres	Depth-ft
Secord's Pond	3	8-14
Cains (Brook) Pond	3	2-3
Cains Mill Pond	5	6-8 at deepest; most <4
Mary's Pond	2	6
Noyes Pond	4.5	10-12

*Source: Seabrook Conservation Commission; NH Dam Bureau, 2006*

In the fall of 2007, Waterfront Engineers conducted depth measurements in Cains Brook Pond. It was determined that the average depths were 1.5 -2.5 feet, slightly less than the 2006 NH Dam Bureau data. See Appendix D, Memorandum Documenting Cains Pond Impairment, Sheet 1 of 2, Cains Pond Water Depths.

Previous sediment sampling at Secord's Pond and Cains Pond showed surficial sediments (top couple of feet of sediment) to be primarily organic, with some silty sand layers.

Composite surficial sediment samples from these ponds were collected and tested in 1998, with findings that pesticides, PCB's and PAH's were below detection limits, but with arsenic slightly over the NH S-1 standard and slightly over the concentration reported as a background level for New Hampshire. These findings reported that the sediment tested could be removed from the ponds for land placement without restrictions.

The plant, animals and aquatic life associated with these ponds and the brook are discussed below.



**Cains Pond**



**Cains Mill Pond**

## Wetlands

Wetlands form a significant part of the watershed's surface water resources. They generally are contiguous with wetland or hydric soils discussed previously in the Soil Section. Wetlands also include vegetation and hydrologic characteristics that might not be incorporated into the definition for hydric soils.

These areas include shallow ponds, marshes (including salt marshes), swamps, bogs, and seasonally flooded lands. Wetlands are usually areas of low topography and poor drainage with standing water for all or part of the year. These areas are best suited to natural open space or limited development because wetland soils provide several natural functions that are beneficial to the community. These functions include: absorbing excess flood waters preventing downstream and coastal flooding; providing valuable habitat for fish and wildlife; providing groundwater recharge to local aquifers; and trapping sediment and other pollutants, thus acting as a surface water filter. Salt marshes are tidal wetlands that are among the most productive ecosystems in the world and are nurseries for several fisheries. It is estimated that at least 50% of the watershed is comprised of wetlands. **See Map 2, Wetlands and Water Resources.**



**Railroad Culvert—Cains Mill Pond**



The definition and mapping of wetlands varies from agency to agency within New Hampshire and the federal government. The most widely used soil definition used for community planning is employed by the US Natural Resource Conservation Service and comprises the hydric soil category or the poorly and very poorly drained soils as discussed in the Soil Section of this chapter. This classification relies only on soil and does not distinguish between wetland types.

Wetlands have also been defined and mapped statewide on the GRANIT System using the criteria of the US Fish and Wildlife Service through the National Wetland Inventory Program. In addition, for purposes of managing and permitting activities in wetlands that are of state interest, the New Hampshire Wetland Bureau has adopted the 1987 US Army Corps of Engineers publication *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1* for determination of wetland boundaries. In an attempt to assist local planning boards to determine the appropriate soil and wetland data for development review, the Office of State Planning issued in November, 1998, a guidance document, *Data Requirements for Site Review, Guidance for Planning Boards*.



**Cains Brook Becomes Mill Creek—Below Causeway Street**

## Floodplains

Floodplains are areas adjacent to rivers, streams and surface water bodies, which are susceptible to flooding during periods of excessive stormwater runoff. The Federal Emergency Management Agency (FEMA) has prepared Special Flood Hazard Area maps for Seabrook for the purpose of identifying the 100-year flood areas within the town that may be eligible for federally subsidized flood insurance. **See Map 3, FEMA Map.**

These were updated as of May 17, 2005. Cains Brook/Mill Creek for much of its length is within the Zone AE Floodway area which has a 1% chance annually of flooding. The town also has a Floodplain Regulation which regulates development in the flood hazard areas and is further discussed in the Current Regulatory Program section of this study.

## Dam Sites

There are currently five dam sites along Cains Brook and two others that are associated with recent developments and which discharge into Cains Brook or its tributaries. **See Table 2** for dam data provided by NHDES Dam Bureau. These sites are permitted and inspected by the New Hampshire Water Resources Board (the Board). The Board is responsible for regulating all structures in waterways that are four or more feet high. Consequently, some storm water detention ponds in recent developments are included within the Board's jurisdiction. The dams associated with the Home Depot and Lowes developments are for detention ponds.

The list of dams in **Table 2** identifies the dam by number, which is also located on the **Watershed Drainage Structures Map, Map 4A and 4B**. Each dam is rated by the Dam Bureau for potential hazard based upon the most recent inspection. A "Class AA structure" means that a dam failure would not threaten life or property, a "Class A structure" means a dam with low hazard potential the failure of which would not threaten life and would result in minimal property damage. All of the dams in the watershed are rated as "AA" or "A".

This table also identifies the type of dam structure, the size of the impoundment and the height of the dam. The heights range from 11.5 feet for the Salisbury Water Works dam to 2.5 feet for the Cains Pond Dam at US Route 1.

**Table 2**  
**Watershed Dams**

Dam Name	River/Brook	Haz Cl	Type	Impnd	Height	Owner
1. Noyes Pond Dam	Cains Brook	A	Concrete	4.5	8	Stanley Hamel
2. Secord Pond Dam	Branch Cains Brk	A	Earth	2.5	10	Town of Seabrook
3. Cains Brook Dam	Branch Cains Brk	AA	Stone/ Earth	0.33	11.5	Salisbury Water Co.
4. Cains Brook-Lakeshore Dr.	Trib. to Cains Brk	A	Earth	1	7	Town of Seabrook
5. Cains Brook @ US Route 1	Cains Brook	A	Concrete	3.5	2.5	Town of Seabrook
6. Home Depot Det. Pond Dam	Stormwater runoff	AA	Earth	0.57	5	Seabrook Ventures LLC
Lowes Det. Pond Dam	Stormwater runoff	AA	Earth	1.05	5	Mark Investments Inc.

*Source: New Hampshire Dam Bureau, February, 2006*

*Note: Impoundment in acre-feet; dam height in feet*

## Groundwater Resources

Groundwater occurs in openings in bedrock or pores in surficial materials. Although water can be withdrawn from bedrock, glacial till or stratified drift deposits, the most significant amounts of groundwater in the Cains Brook Watershed is in stratified drift. A report by the US Geological Survey (USGS), *Geohydrology and Water Quality of Stratified Aquifers in the Lower Merrimack and Coastal River Basins, Southeastern New Hampshire* in 1992 identifies the location of stratified drift aquifers in Seabrook and the watershed.

The only areas of the stratified drift aquifers in the primary study area of watershed are located between Cains Brook and the Salisbury municipal line. There are two small but distinct areas as shown on the **Wetland and Water Resources Map, Map 2**. These deposits have saturated thickness from 10-20 feet deep with a small area that has been determined to be approximately 40 feet deep along Washington Road between Walton Road and Blackwater Road. By contrast in western Seabrook the aquifer has saturated thicknesses greater than 20 feet in many places where at least one is reaching over 60 feet. Because the aquifer in the watershed is rather shallow and is not hydraulically connected to any major surface water, it produces a very low yield of groundwater. Groundwater yield is rated by the transmissivity of the stratified drift. Based on the USGS study, expected yields would be a maximum transmissivity of 1-2000 square feet per day whereas transmissivity of up to 4000 square feet per day can be expected in the western Seabrook aquifer which is located west of I-95 in the watershed. By contrast, large well fields in the Seacoast may yield 15-25,000 sf per day. The Seabrook portion of the watershed is serviced completely by municipal sewer limiting the potential for ground water pollution from this source. However, a portion of the Salisbury portion of the watershed still functions on septic systems, a potential source for groundwater contamination.

## Stream Water Quality Water

Understanding the extent of the Cains Brook watershed and the direction of flow is useful in determining the impact of development activity on water quality. It would appear that Cains Brook is particularly susceptible to water quality impacts from existing development as well as future development. In addition, part of the Cains Brook watershed is in the Town of Salisbury, Massachusetts and may be subject to land use change beyond Seabrook's control.

The State of New Hampshire establishes water quality classification for all rivers in the state, both freshwater and tidal. These classifications range from Class A, the highest water quality, to Class D, the lowest. Seabrook's rivers are all rated Class B. The description of Class A and Class B are as follows:

- Class A Potentially acceptable for water supply use after disinfection. No discharge of sewage, wastes or other polluting substance into waters of this classification. (Quality uniformly excellent.)
- Class B Acceptable for swimming and other recreation, fish habitat and, after adequate treatment, for use as water supplies. No disposal of sewage or wastes unless adequately treated. (High aesthetic value.)

Associated with each of these classifications are standards for chemical and biological constituents. The waters of Cains Brook do not meet all of the standards of these two classifications.

In order to determine the how well each water body compares to the standard, the NHDES has identified seven designated use categories, each of which are assessed on a periodic basis to determine if the quality of the water can support the use. These designated uses include fish consumption, recreation, and drinking water. In addition, NHDES divides the waters of a given watershed into assessment units for purposes of water quality assessment and management.

Each unit is coded with a number. Each of these assessment units can then be classified according to water quality parameters to determine if they are impaired or not impaired for a particular use. For example, Cains Pond and Cains Mill Pond do not support fish consumption. At present, NH DES is considering a second impairment that would have these water bodies not support secondary contact recreation. This category relates to such as activities as boating, but not swimming. To date, the remaining use categories for the water bodies in the Cains Brook watershed have not been assessed.

### *Assessment Units*

Each water body in the state and in the Seabrook has a number of water quality sampling stations. The area of the water body associated with this sampling station is identified as an assessment unit. For each assessment unit the NHDES assesses quality to determine how well this water body compares to the established standard. In the watershed there are three (3) assessment units—Tide Mill Creek, Cains Mill Pond and Cains Brook.

The following (**Table 3**) is a summary of the results of the general NHDES water quality assessment for each of the assessment units in the watershed area. None support fish consumption and Mill Creek does not support shell fishing. For the other use categories, such as secondary contact recreation and aquatic habitat, the data necessary to determine the assessment has not been gathered by NHDES. For further discussion of the water quality terms and definitions related to the sampling program see Appendix A. The contamination that impairs the water quality in the surface waters of Cains Brook has been attributed to fecal coliform, mercury, enterococcus, and PCB's.

### *Water Quality Sampling*

In addition to the overall water quality assessments conducted by the NHDES, there have been a number of specific efforts to undertake water quality assessments targeted to contaminants associated with shell fishing. In recent years Cains Brook and Mill Creek have been sampled for various constituents to determine water quality levels for such contaminants as fecal coliform and enterococcus. Sampling has been conducted at several stations by the NH Department of Environmental Services (NHDES) and the Great Bay Coast Watch. Much of this sampling has been related to measurement of bacteria for the state's shellfish program for Hampton-Seabrook Harbor. Cains Brook/Mill Creek and its watershed streams, as tributaries to the harbor, have been prime sampling locations for this work. The most recent water quality sampling took place in the summer of 2007 as part of the NHDES Volunteer River Assessment Program (VRAP).

**Table 3**  
**Use Assessment**

Location of Assessment Unit	Use Assessment	Contaminant Causing Impairment
<b>River (stream) Units</b>		
Cains Brook—NHRIV600031004-10	Does not support fish consumption or primary/secondary contact recreation. Other uses not assessed.	Mercury and E. coli.
Cains Brook—NHRIV600031004-11	Does not support fish consumption. Other uses not assessed.	Mercury.
Cains Brook—NHRIV600031004-12	Does not support fish consumption or primary contact recreation. Other uses not assessed.	Mercury and E. coli.
Cains Brook—NHRIV600031004-14	Does not support fish consumption. Other uses not assessed..	Mercury
Unnamed Brook to Cains Brook—NHRIV600031004-09 <sup>1</sup>  <sup>1</sup> Note: Unnamed brook is known locally as Folly Brook.	Does not support fish consumption. Other uses not assessed.	Mercury.
<b>Impoundment (pond) Units</b>		
Secord's Pond—NHIMP600031004-04	Does not support fish consumption. Other uses not assessed.	Mercury.
Cains Pond—NHIMP600031004-05	Does not support fish consumption. Other use under consideration—secondary contact recreation. See matrix that documents impairment based on EPA nine (9) criteria in Appendix D	Mercury.
Cains Mill Pond –NHIMP600031004-06	Does not support fish consumption. Other use under consideration—secondary contact recreation.	Mercury.
<b>Estuary Unit</b>		
Mill Creek-- NHEST600031004-07	Does not support fish consumption or shell fishing. Recreation was not assessed or there was insufficient information to make an assessment. Other uses not assessed	Due to mercury, PCB's and dioxin.

*Source: Final Section 305 (b) and 303(d) Surface Water Quality Report, NHDES, December, 2004*

# Previous Water Quality Investigations

## **Impact of Septic Tank Disconnections on Water Quality in Coastal Surface and Subsurface Environments—1997**

During 1996 and 1997 the Jackson Estuarine Laboratory monitored seven stations in the Cains Brook watershed for a number of water quality indicators including bacterial indicators. This study took place during and after the disconnection of many septic systems in Seabrook to determine if there were any subsequent changes in water quality. No improvement in surface water quality was detected. Bacterial indicators remained at similar levels to previous year measurements at the same sites.

## **Cains Brook and Mill Creek Watershed Study—1997**

Volunteers from the Town of Seabrook monitored 21 stations in the watershed including stream and storm drain outfalls for bacterial and other physical water quality parameters.

These stations included locations on both Cains Brook and Mill Creek starting at a point near the I-95 rest area and ending at a site where Mill Creek crosses under Causeway Street. See attached Figure 3 for monitoring locations. Each station was sampled six times during the period of July 15th to September 27th. Sampling was conducted by local Seabrook volunteers with assistance from personnel at NHDES and the Seabrook DPW. At that time the VRAP program had not been formally established, although many of the water quality parameters and procedures used in this program were also used for that sampling program. Personnel from the DPW trained the volunteers in the use of measuring equipment and sampling protocols.

During this period sampling was conducted for the following parameters:

- Dissolved oxygen (% saturation and concentration in mg/L)
- pH
- Turbidity
- Specific conductance
- Water temperature
- Air temperature
- E. Coli

The water quality results were documented by the Seabrook Conservation Commission and DPW in the Cains Brook and Mill Creek Watershed Study.

At that time the most critical concern to the town and NHDES was the high level of bacterial contamination in the Hampton-Seabrook Estuary. This study was in large part intended to define the potential source(s) of this contamination. Consequently, some of the sampling was conducted in wet-weather conditions to determine if the stormwater runoff contained E.coli bacteria. In particular, the following stations shown in Table 4 exceeded the surface water quality standard for E. coli in excess of 406 counts/100 ml on at least one occasion. Two stations exceeded the standard on four (4) or more occasions—one near the I-95 rest area (Location #1) and the other a storm drain at Cains Pond (Location #6). There were a total of twenty-nine (29) exceedances altogether.

In 2007 another round of sampling was conducted under the NHDES Volunteer River Assessment Program (VRAP). Similar to the 1997 study it also monitored Cains Brook for similar parameters including E. Coli. However, only four (4) sampling stations were similar to those in the 1997 study. A summary of the results of the sampling of these four locations is found in Table 4A below. The number code in parentheses in the first column of the table refers to the designated NHDES Station IDs used for the 2007 sampling study which is discussed later in this section. In this table only the range of maximum and minimum values from the sampling period were included. More detailed results can be found in the 1997 Cains Brook and Mill Creek Watershed Study. The table below gives a brief explanation of each parameter and the interpretation of the results.

**Table 4**  
**E. coli Exceedances**

<b>Station #</b>	<b>Location Type</b>	<b>Number of Events &gt; 406/100ml</b>
1 (09-CNS)	Cains Brook, east of I-95	4
2	Cains Brook	2
4	Secord's Pond	2
5	Storm Drain	2
6	Storm Drain, Cains Pond	5
7 (02-MRY)	Cains Pond Outlet-West	1
9 (04-CNS)	Cains Pond Outlet-East	1
10	Storm Drain/Walton@ US 1	2
11	Storm Drain, Cains Mill Pd.	2
12	Storm Drain Swale, Cains Mill Pd.	1
13	Cains Mill Pond	1
17	Cains Brook, near Centennial St.	1
19	Storm Drain, Mill Creek	1
20	Mill Creek	2
21	Mill Creek, near Causeway Street	2
<b>Total Exceedances</b>		<b>29</b>

Note: Station numbers in parentheses match those of the NH DES VRAP stations for the 2007 water quality sampling.

Table 4A  
Sampling Results—Summer 1997

Station	DO (mg/L)	pH (Units) Data Range	Turbidity (NTUs) Data Range	Specific Conductance (uS/cm) Data Range	Water Temp. (° C) Data Range	<i>E. Coli</i> (CTS/100 mL) Data Range
<b>Standard</b>	<b>&gt;5.0</b>	<b>6.5-8.0</b>	<b>As Naturally Occurring</b>	<b>NA</b>	<b>Narrative</b>	<b>&lt;406</b>
#14-Noyes Pond Outlet (02-CNS)	.5-8	7.1-8.3	1.8-6.3	312-522	12.8-21.8	1-300
#9- Cain's Pond Outlet @ Weir (04-CNS)	4.2-10	6.9-7.5	1.8-6.3	363-483	13.3-20.2	1-818
#7--Mary's Pond Above Dam (02-MRY)	1.9-6.8	6.8-7.3	1.0-3.4	330-460	12.1-22.2	9-724
#1-- Cain's Brook Downstream of I-95 (09-CNS)	6.0-7.0	6.5-7.0	1.4-12.1	230-690	11.0-19.6	10-4260

Measurements not meeting New Hampshire surface water quality standards.

#### Explanation of Parameters

- Dissolved Oxygen. An appropriate level of dissolved oxygen is important to fish, amphibians and bottom dwelling organisms. .
- pH. A measurement of the water's acidity. 6.5-8.0 is normal. A higher value is indicative of an alkaline situation; a lower value is indicative of an acidic condition. Low pH can allow certain toxic compounds to be more easily taken up by aquatic plants and animals.
- Turbidity. A measurement of suspended materials. High turbidity increases water temperature, reducing level of DO; and it reduces amount of light penetrating the water, reducing photosynthesis of aquatic plants. The standard is the naturally occurring condition.
- Specific Conductance. High specific conductance may indicate pollution from certain sources such as road salt. It is measured in microsiemens per centimeter (uS/cm). There is no specific standard although there is a correlation to chloride. A measurement of greater than 501 is considered to be a high impact on the water resource with a reading over 850 likely to exceed the chronic chloride standard. It would appear that the sampled areas have a relatively high specific conductance though none exceed 850.
- Temperature. A critical parameter for aquatic life. Water temperature that is elevated can be detrimental to fish life. NHDES has not established a standard for water temperature.
- Escherichia Coliform Bacteria (*E. coli*.) An indicator of fecal pollution and possible presence of pathogenic organisms. A sample shall not contain more than either a geometric mean of 126 *E. coli* counts/100mL based on at least 3 samples obtained over a 60-day period or greater than 406 *E. coli* cts/100mL in any one sample



For a fuller explanation of these parameters, please refer to the NH DES publication *Interpreting VRAP Water Quality Parameters*. See also Appendix X for additional information on each parameter.

#### Interpretation of 1997 Results

- Dissolved Oxygen. Three (3) of the 21 sampling stations had dissolved oxygen measurements which were below the minimum surface water quality standard of 5 mg/L. #14-Noyes Pond Outlet had two (2) measurements below the standard; #14-Noyes Pond Outlet had all five (5) measurements below the standard, and #7--Mary's Pond had three (3) measurements below the standard. At these locations it would appear that there are relatively low levels of dissolved oxygen.
- pH. Only one station had a single --Station 14 now 02-CNS-- measurement outside the surface water quality standard range of 6.5-8.0. In general it would appear that the levels of pH were relatively normal.
- Turbidity. While the sampling did not appear to indicate a significant level of turbidity there were several readings at stations #1, #9 and #14 compared to the 2007 results which had the highest measurement for the sampling period of 4.26 NTU at station #14 and the lowest measurement of 0.03 NTU at station #9.
- Specific Conductance. It would appear that the sampled areas did not have high specific conductance. Most readings were below 500 and none exceeded 850.
- Temperature. NHDES has not established surface water quality standards for water temperature. The relatively higher temperatures appear to be associated with ponds or outlets from ponds where still-water conditions prevail.
- Escherichia Coliform Bacteria (E. coli.) Fifteen (15) of the twenty-one (21) sampling stations exceeded the surface water quality standard on at least one occasion and two sampling stations exceeded the standard on four (4) or more occasions—one near the I-95 rest area (Location #1) and the storm drain at Cains Pond (Location #6). There were a total of twenty-nine (29) exceedances altogether. See Table 4.

The study resulted in a number of recommendations including the dredging of certain impounded segments of Cains Brook, such as Secord's and Cains Pond, and to conduct follow-up sampling at locations that consistently tested poor for water quality.

## **Tracking Bacterial Pollution Sources in Hampton Harbor—2003**

This study used ribotyping to examine water quality through the determination of source species for contribution of fecal coliform and *E. Coli* in various tributaries and open water stations in Hampton/Seabrook Harbor. This study indicated that humans contribute approximately 26% of the bacterial isolates, wildlife contributed 15%, and livestock contributed 8%.

## **Total Maximum Daily Load (TMDL) Study for Bacteria for Hampton/Seabrook Harbor—2003**

In May 2004 the NHDES released the above report for the purpose of establishing a TMDL for bacteria in the Hampton/Seabrook Harbor. For the past several years, NHDES has been working to restore and maintain a productive recreational soft shell clam fishery in Hampton-Seabrook Harbor. In order to minimize the impact of bacterial pollution to this resource area, NHDES is attempting to ensure that the harbor waters and its tributaries meet appropriate surface water quality standards, particularly for *Escherichia coli* (*E.coli*) bacteria and fecal coliform. NHDES has established a water quality monitoring program that includes fourteen assessment units in the harbor and the tributaries to the harbor including Mill Creek.

At present, Mill Creek is classified as prohibited and thus, closed to shell fishing. In addition, the sampling that was analyzed for this study for the mouth of Mill Creek indicates that this water body has the highest concentration of fecal coliform counts of any of the other stations in the harbor particularly during wet-weather events. The overall sampling data was from the period 1993 to 2002. To better understand the significance of the tributaries as bacteria sources, NHDES monitored the seven major tributaries to the harbor during two storm events in 2002. Loading from the two storms sampling dates ranged from 9.75 to 25.6 billion organisms per storm. Post-storm fecal concentrations were also higher at Mill Creek than at any other sampling station. This result indicates that there may be a chronic source of bacteria from the Cains Brook/Mill Creek tributary. NHDES has established a Total Maximum Daily Load (TMDL) for the entire harbor at 1891 million organisms per day. NHDES also estimated that in order for the Mill Creek to meet the TMDL water quality standard for fecal coliform, it would require a reduction of 65% from the current situation.

## **Tracking Bacterial Pollution Sources in Cains Brook/Mill Creek Watersheds—2004**

During 2004 NHDES and the Jackson Estuarine Laboratory undertook a water quality study in the Cains Brook/Mill Creek Watershed that focused on bacterial pollution and in particular *Escherichia coli* (*E.coli*). Samples were taken from eight (8) different stations in the watershed during both wet and dry-weather conditions from the beginning of June through the end of November. **See attached Figure 4** for sample locations. *E.coli* strains were isolated from the samples and ribotyped using a RiboPrinter. This type of water sample analysis provided a correlation between the sample and a particular source either human or animal. *E.coli* concentration in water samples during the whole sampling period ranged from one to 12,100 cfu/100 ml. Ribotyping identified 17 different source species, the most prevalent of which were chicken, human, horse, cow, deer, dog, and coyote. Wild animals

were the most prevalent source species identified followed by domestic animals and humans. The aim of the study was to determine the land use patterns along the shorelines of the watershed to determine if there is a correlation between land use or land use practices and bacterial pollution.

**Table 5** below summarizes the sampling for seven of the eight sample stations. Samples from MC 19 had significantly lower bacterial counts for *E. coli* (highest sampled concentration of 22 cfu/100 ml) and are not included here.

**Table 5**  
**Sampling Station Results**

Station	Maximum	Minimum	Mean	Most Common Source	Land Use
CB 9	230	0	39	Human	Commercial
CB 10	12,120	4	128	Chicken	Commercial
MC 17	180	0	56	Coyote/Cow	Residential/Wooded
MC 20	2160	70	393	Horse	Residential/Wetlands
MC 21	1480	90	444	Human	Residential/Wetlands
SB 01	1790	40	264	Chicken	Salt Marsh Edge/Wooded
FLW 01	700	<10	134	Horse/Chicken	Residential

*Source: Tracking Bacterial Pollution Sources in the Cains Brook Watershed and Mill Creek Watersheds, NH DES, December, 2005.*

### **Water Quality Sampling in Cooperation with the VRAP Program –2007**

During the period of May 23, 2007 to September 26, 2007, water quality sampling was undertaken on five (5) separate occasions at eight (8) locations in the Cains Brook watershed. These locations and their NH DES station ID #'s included:

- Noyes Pond Outlet (02-CNS)
- Cains Mill Pond Inlet (03-CNS)
- Cains Pond Outlet (at weir) (04-CNS)
- Mary's Pond Above Lakeshore Drive Dam (02-MRY)
- Cains Brook Downstream of Secord's Pond (06-CNS)
- Secord's Pond Outlet (02-FMB)
- Cains Brook Downstream of I-95 (09-CNS)
- Folly Mill Brook Upstream of Folly Mill Road (03-FMB)

These locations were roughly similar to those in the 1997 Cains Brook and Mill Creek Watershed Study. Sampling was conducted by local Seabrook volunteers with assistance from NHDES personnel and staff from the Volunteer River Assessment Program . This program provides water quality monitoring equipment, technical support and educational programs to volunteer groups throughout the state. NHDES has prepared a publication entitled Water Quality Monitoring Field Sampling Protocols for Volunteer Monitors that provides guidance to volunteers for the sampling procedures.

In order for VRAP data to be properly used in the assessment of the Cain's Brook watershed, the sampling procedures and resultant data must meet the quality assurance and quality control (QA/QC) guidelines outlined in the VRAP Quality Assurance Project Plan (QAPP). This plan addresses the proper calibration and use of hand-held meters as well as sampling procedures.

During this period sampling was conducted for the following parameters:

- Dissolved oxygen (% saturation and concentration in mg/L)
- pH
- Turbidity
- Specific conductance
- Water temperature
- Air temperature
- E. Coli
- Chlorophyll-a

Table 5A summarizes the results of this sampling. In the table there are some parameters that have two values. In order to summarize the data into one table, the highest and lowest sample values were selected to illustrate both the extremes and the range of values for each parameter for each sampling location. More detailed tables are located in Appendix F.

Unlike the 1997 study where there were numerous exceedances for *E.Coli*, there were none during the 2007 VRAP study.

Table 5A  
Results of VRAP Sampling—Summer 20071

Location	DO (mg/L) Data Range	pH (Units) Data Range	Turbidity (NTUs) Data Range	Specific Conductance (uS/cm) Data Range	Water Temp. (° C) Data Range	<i>E. Coli</i> (CTS/100mL) Data Range	<i>E. Coli</i> Geometric Mean	Chl-a
Standard\	>5.0	6.5-8.0	As Naturally Occurring	NA	Narrative	<406	<126	Narrative
02-CNS (Noyes Pond Outlet)	6.77-8.96	6.57-7.04	0.32-4.26	540-794	13.0-25.9	40-200	NA	2.091 (only one sample)
03-CNS (Cain's Mill Pond Inlet)	5.30-9.79	6.38-6.78;	0.29-2.42	532-734	13.5-24.0	5-140	30 (only one sample)	NA
04-CNS (Cain's Pond Outlet @ Weir)	2.89-8.98	6.27-6.67	0.03-2.29	548-703	13.5-24.9	5-150	37 (only one sample)	2.095 (only one sample)
02-MRY (Mary's Pond Above Dam)	5.23-8.81	6.47-6.90;	0.79-1.38	647-722	13.1-23.8	30-60	38 (only one sample)	1.44 (only one sample)
06-CNS (Cain's Brook D/S of Secord's Pond)	6.28 -9.53	6.47 - 6.75	0.80 - 2.80	462.7 - 732	12.2 - 20.8	30 - 100	62 (only one sample)	1.994 (only one sample)
02-FMB (Secord's Pond Outlet)	5.98 - 8.35	6.23 - 7.03	0.72 - 3.05	318.1 - 611	13.8 - 26.7	5 - 50	11 (only one sample)	NA
09-CNS (Cain's Brook D/S of I-95)	7.46 - 9.63	6.33 - 6.48	0.67 - 3.3	535 - 830	11.8 - 16.6	80 - 190	129 (only one sample)	NA
03-FMB (Folly Mill Brook U/S of Folly Mill Road)	5.44 - 8.66	5.82 - 6.76	0.81 - 1.19	350.7 - 669;	13.8 - 14.7	10 - 110	28 (only one sample)	NA

Note 1: Where there are two values for a specific parameter, the first one represents the highest measurement of the five (5) sampling periods and the second one represents the lowest measurement of the five (5) sampling periods.

Measurements not meeting New Hampshire surface water quality standards.

## Interpretation of 2007 Results

- Dissolved Oxygen. Only one station had one measurement which was below the surface water quality standard minimum (Station 04-CNS-Cain's Pond Outlet @ Weir). This single measurement would not indicate a problem with this parameter and would appear to be an improvement over the 1997 results where three (3) out of the four (4) locations had low dissolved oxygen measurements.
- pH. It would appear that the sampled waters may be slightly acidic where 6.5 to 8.0 is normal
- Turbidity. The standard is the naturally occurring condition. Measurements appeared to have relatively lower levels of turbidity than the 1997 results.
- Specific Conductance. It would appear that measurements for specific conductance were relatively high compared to the 1997 results when most measurements were below 500 uS though no one measurement exceed 850 uS. These measurements may indicate the presence of road salt.
- Temperature. A critical parameter for aquatic life. Water temperature that is elevated can be detrimental to fish life. At present, NHDES has not established a surface water quality standard for water temperature. The relatively higher temperatures appear to be associated with outlets from ponds where still-water conditions prevail. The 2007 water temperatures are generally higher than those in 1997. However, when compared to water resource features in similar urban/suburban areas these temperatures are not considered high.
- Escherichia Coliform Bacteria (E. coli). There were no single-sample surface water quality standard exceedances and only one exceedance for the geometric mean at station 09-CNS, Cain's Brook Downstream of I-95. In the 1997 sampling study this station had 4 exceedances over the period of sampling from July through September. The difference may reflect the fact that a portion of the 1997 sampling was conducted in wet-weather conditions whereas all of the 2007 sampling was conducted in dry weather conditions. Further sampling for this parameter may be warranted.

## Revised Water Quality Sampling and Analysis, Mary's Brook, July, 2007

As part of the mitigation plans for the development of a commercial retail facility (Kohl's Department Store) on the west side of US Route One just north of Cains Pond, a Water Quality Sampling and Analysis Plan was prepared for the developer by NHSC, Inc. The proposed development plans to discharge treated stormwater into Mary's Brook, a tributary to Cains Pond. A draft of this plan was reviewed by the Seabrook Conservation Commission and the NHDES Wetlands Bureau. It was completed in July of 2007 but since construction has not begun on this project, the plan has not yet been implemented.

This plan proposed four (4) sampling events including:

- Baseline sampling prior to construction,
- At 25% build out of the site,
- At 100% build out of the site and
- At three (3) years after 100% site development.

The plan proposes seven (7) sampling stations along the brook from just upstream of Lakeshore Drive to just downstream from the Autumn Way residential development. Field measurements will be obtained for water temperature, pH, dissolved oxygen, turbidity and specific conductance. Additional parameters will be analyzed in a laboratory including chloride, nutrients such as TKN and total phosphorous, polynuclear aromatic hydrocarbons (PAH's), polychlorinated biphenyls (PCB's) arsenic and E. coli bacteria. The plan also proposes a Quality Assurance and Quality Control Plan, although it is not completely consistent with the NHDES Watershed Management Bureau's Quality Assurance Plan. Further details of this study can be obtained from the Water Quality Sampling and Analysis Plan located in the Seabrook Town Hall.

Should this Water Quality Sampling and Analysis Plan be implemented there will be value in obtaining the results of each of the four (4) sampling events to determine what if any impacts might be the result of the proposed commercial development.

## **Fish and Wildlife Resources**

Much of the data for fish and wildlife resources in the original Watershed Plan came from both historical and primary data collection primarily related to Cain's Pond and is discussed below in Cains Pond Area Fish and Wildlife Assessment. Since the publication of the original Management Plan, the New Hampshire Fish and Game Department prepared a statewide Wildlife Action Plan that is also suitable for local use. The results of this program for Seabrook and the Cain's Brook/Mill Creek Watershed are discussed here.

### **Wildlife Habitat Plan**

In February 2007 the New Hampshire Fish and Game Department published a Wildlife Action Plan for the whole state. The data incorporated in this study can be used on a town-by-town basis for purposes of land use planning and resource management. This plan identified nineteen (19) habitat types, four of which are within the Cains Brook/Mill Creek Watershed. These include:

- **Appalachian Oak-Pine Forest**

This forest complex contains such wildlife species as the American woodcock, Blanding's turtle, common nighthawk, Cooper's hawk, Eastern box turtle, New England cottontail, ribbon snake, ruffed grouse, spotted turtle, wood thrush and wood turtle.

- **Salt Marshes**

These intertidal marshes are marked by a saline and brackish environment and contain such bird species as the American black duck, common tern, great blue heron, Northern harrier, seaside sparrow, semi-palmated sandpiper, willet and numerous migrating birds. This habitat is found in the eastern side of the watershed associated with Tide Mill Creek and the Hampton-Seabrook Estuary.

- **Marsh/Shrub Wetlands**

This freshwater complex is associated primarily with the various ponds on the watershed as well as the lower part of Cains Brook east of the Noyes Pond Dam to Centennial

Avenue. Typical wildlife includes American bittern, band sunfish, great blue heron, Northern harrier, smooth green snake, spotted turtle, Blandings turtle and New England cottontail.

- Peatlands

There is only a limiter peatland habitat area in Seabrook south of Walton Road. Similar to the marsh complex it does not sustain the as much variety of wildlife. Typical species include Blanding's turtle, Eastern towhee, ribbon snake, spotted turtle and spruce grouse.

From this data, Fish and Game then ranked the habitats based on their value statewide and their value within a subregion. In the case of the Cains Brook/Mill Creek Watershed, the subregion is the Tidal Coastal Watershed. Within both the state and sub-regional category, Saltmarsh is a Habitat of Highest Relative Rank.

In addition, Fish and Game then prepared Conservation Focus Area Maps where there were clusters of habitat in the same geographic area, referred to as areas of co-occurrence. There are no such areas in Seabrook

### **Cains Pond Area Fish and Wildlife Assessment**

Much of this data came from the documentation of Cains Pond resource as part of the application to the NHDES Wetlands Bureau for the dredging of the pond. By extrapolation it is likely that some or all of the resources can be found in or adjacent to the other ponds and freshwater resources of the watershed. Based on this assessment the following wildlife were observed: bull frog, green frog, Eastern painted turtle, wood duck, American black duck, mallard, gray catbird, cedar wax wing, re-winged blackbird, American goldfinch, willow flycatcher, tree swallow, and belted kingfisher. Examples of wildlife that could be expected to be observed include the common snapping turtle, great blue heron, common yellowthroat, Eastern phoebe, and tufted titmouse. A full list of potential and observed species can be found in **Appendix B, Plant and Wildlife Species of the Watershed**. Local sources have also indicated that spotted and painted turtles have been identified in and around the ponds of the watershed.

Within the ponds and brooks the following fish species have been observed or have been noted historically: American eel (up to Secord's Pond), bass, horn pout, kibby, perch and sea-run brown trout. Pickerel and sun fish have specifically been identified in Noyes Pond. There is also evidence of freshwater mussels in the watershed and in some locations along the brook, as well as Lamprey eels as far up as Cains Mill Pond. Silvery minnows and mummichogs have been identified in the upper reaches of Mill Creek. At present, many of these species do not inhabit the Cains Brook System, because of the deterioration of the pond's water quality, reduced depth and man-made barriers to free fish passage.

Although this study is not focused on the tidal portion of the watershed, it is a significant resource that is in large part dependent on the quality of the upstream water that discharges into Tide Mill Creek and its associated wetlands. This resource provides nutrients to a variety of fish and shellfish that inhabit the lower waters of Mill Creek and the Hampton-Seabrook Estuary.



## Plants and Vegetation

There are some remaining forested areas within the watershed as can be seen on the **Aerial View, Figure 1, Land Use Map, Map 1** and the Wildlife Habitat Map, Map 5A and 5B. These are generally categorized under the Appalachian Oak-Pine Forest discussed in the previous section. Typical species within this forest type include Appalachian oak, red maple, sugar maple, hemlock, American elm, white birch, beech, and black ash.

The larger areas of forest occur in three locations:

- west of Interstate 95
- just north of Cains Brook between I-95 and US Route 1 and
- in the lower reaches of the watershed bordered by Mill Creek, Centennial Road and Railroad Avenue/Farm Lane.

As part of the research for the Cains Pond dredging application, a number of trees and shrubs were identified in a sparsely scattered pattern along the banks of the pond. Similar species are likely to be found along other surface water features in the watershed and are referred to as the Marsh/Shrub Wetland habitat above. Tree species include Red Maple, Black Willow and American Elm. Shrubs include Speckled Alder, Northern Arrowwood, Meadow Sweet and Steeplebush. Herbaceous plants include Broad-Leaved Cattail, Purple Loosestrife, Duckweed, Jewelweed and Sensitive Fern. A full list can be found in **Appendix B**.

The peatlands can be expected to contain such plant species as speckled alder, white cedars, black spruce and red maple.

## Rare Species and Exemplary Communities

The New Hampshire Natural Heritage Bureau, a bureau in the Division of Forest and Lands, finds, tracks, and facilitates the protection of the State's rare plants and exemplary natural communities. The Bureau also tracks rare animal species in cooperation with the Nongame and Endangered Wildlife Program of the NH Fish and Game Department.

In the Cains Brook watershed there are seventeen rare species of special concern and exemplary natural communities that have been listed by the NH Natural Heritage Inventory (NHI) under the Native Plant Protection Act of 1987 (NH RSA 217-A) and the New Hampshire Endangered Species Conservation Act of 1979 (NH RSA 212-A). **See Appendix B.** Although there are no federally listed endangered species, there are seven state endangered plant species and three state threatened plant species.

These seventeen resources have been placed into three groupings of resources: natural communities, plant species and vertebrate species. The majority of these occur in the tidal portion of the watershed. Within the tidal marsh portion of the watershed there are six distinct natural communities including Brackish Marsh, High Salt Marsh and low salt marsh. There are ten plant species also associated with the tidal marsh including Dwarf Glasswort, Netted Chain Fern, and Salt Marsh Gerardia. Many of these were last reported over 100 years ago, but are still assumed to be secure according to the NHI. The only rare vertebrate species on the list is the Blandings Turtle. A full list of these resources is found in **Appendix B.**

In an effort to protect these resource areas the NHI does not identify precise locations. It does publish upon request from a local community a map of the community illustrating general locations.



Turtles sun bathing on a log -Secord's Pond

# Previous Community Studies

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In addition to the studies referred to in the previous Water Resources Section, two plans have been prepared that address issues relevant to this watershed study. They are summarized below.

## **National Pollution Discharge Elimination System (NPDES) Phase II—Stormwater Management Plan, March 2003**

As part of the EPA's Phase II stormwater management program under National Pollution Discharge Elimination System (NPDES), Seabrook is required to implement a stormwater management plan. The town prepared such a plan in cooperation with a consulting engineering firm in March of 2003. Annual monitoring reports on the plan were prepared in 2004, 2005, 2006 and 2007, and another report will be submitted in 2008. The plan is required to address six issue areas including:

1. Public Education and Outreach
2. Public Participation and Involvement
3. Illicit Discharge Detection and Elimination
4. Construction Site Runoff
5. Post-Construction Runoff Control
6. Pollution Prevention/Good Housekeeping for Municipal Operations

The original study plan inventoried the existing drainage system, identified existing stormwater management programs, identify regulated stormwater facilities that are controlled by entities other than Seabrook and prepared a five-year plan for reducing pollutants in stormwater. For each of the six issue areas the plan proposed a number of strategies for plan implementation over the five-year period 2003-2008. These are summarized below.

### Public Education and Outreach

- Distribute information such as flyers and pamphlets via the town website, direct distribution to businesses, and through schools
- Public service announcements via public access TV
- Community outreach via educational displays and poster boards
- Tours by school children
- Educational outreach via such activities as the hunter safety course

### Public Participation and Involvement

- Develop & implement plan for volunteers
- Involve volunteers in monitoring
- Volunteer clean-up—Adopt a Stream
- Community events such as storm drain stenciling and wetland plantings
- Post signs labeling outfalls

### Illicit Discharge Detection and Elimination

- Map stormwater system
- Update and revise rules and regulations affecting stormwater management
- Identify illicit discharges and develop and implement a plan for non-stormwater discharges
- Monitor impact of removal illicit discharge removal.

### Construction Site Runoff

- Develop and implement rules and regulations for management of stormwater on construction sites.
- Manage stormwater procedures through site plan review and site meetings pre-construction, during construction and post-construction.

### Post-Construction Runoff Control

- Prepare and implement regulations including Shoreland Protection Ordinance and cluster housing.
- Develop procedure for implementing Operation and Maintenance of structural BMP's on construction sites.

### Pollution Prevention/Good Housekeeping

- Train municipal employees
- Inspect maintain stormwater system
- Improve procedures for municipal equipment, e.g. vehicles; heavy equipment
- Improve procedures for municipal facilities
- Sweep town roads
- Minimize impact of fertilizers, pesticides and pets on town property.

Further detailed discussion of this implementation strategy is found in the March 2003 Stormwater Management Plan. To the extent that the actions proposed in this plan are directly relevant to the watershed plan, they will be incorporated in whole or in part into the proposed action strategies of this plan.

Each year in the spring, the town (with its consultant) is required to prepare an Annual Report for the EPA demonstrating progress in each of the six (6) issue areas. The most recent Annual Report was dated May 2007. During the period since the completion (2006, 2007) of the initial Watershed Plan the following has been accomplished.

### Public Education and Outreach

- Stormwater poster, brochure and fact sheets updated for west Nile Virus and continue to be made available at Town Hall and on the Department of Public Works website
- Businesses received letters from the Department of Public Works with respect to “illicit discharges” to the stormwater system and how these can be abated.
- Continued to educate businesses by leaving educational materials as door hangers during catch basin inspection and cleanout activities.
- Seabrook expanded its involvement with the Seacoast Stormwater Coalition to jointly plan for public education for illicit discharges, and continues to be involved with this organization.
- Develop plan to locate illicit discharges and remove from system.
- Completed activities to stencil approximately 25 catch basins in the Lakeshore Drive/ Ayer Circle/ Forest Drive area of the Town in conjunction with the Conservation Commission. Catch basin identification will continue in 2008 as the DPW and Conservation Commission install new metal catch basin markers (in lieu of painting).

#### Public Participation and Involvement

- Local church group completed backyard clean-up of many properties along Cain’s Brook and within the watershed.
- Provided educational materials as door hangers on residential properties during period of catch basin cleaning.
- Having difficulty establishing volunteer clean-up groups for such activities as Adopt a Stream because of liability issues.
- All known outfalls have been posted.

#### Illicit Discharge Detection and Elimination

- Continued to map the stormwater system; at present approximately 90% of system has been mapped.
- Board of Selectmen have adopted and implemented “Municipal Stormwater Drainage System Rules and Regulations”— prohibits illicit discharge.
- All outfalls have been inspected, with no evidence of contamination observed.
- Obtained “Guidelines and Standard Operating Procedures for Illicit Discharge Detection and Elimination and Pollution Prevention/Good Housekeeping” as part of activities with Seacoast Stormwater Coalition.
- Located, surveyed, and mapped 98 detention/retention basins located within the Town of Seabrook. This mapping project has the dual objectives of a) allowing the DPW to complete inspections of these basins to ensure that no pollution is being discharged, and b) facilitating application of materials to decrease the number of mosquito larvae, thereby reducing the potential for the spread of vector-borne diseases.
- DPW staff attended an IDDE session entitled “Illicit Discharge Detection & Elimination Workshop”, sponsored by the Seacoast Stormwater Coalition and NH DES on May 24, 2007.
- The DPW developed a mailing and distributed it to all businesses maintaining on-site stormwater facilities, such as catch basins. This mailing informed these businesses that the DPW would perform inspections of selected facilities in 2008 with the goal of ensuring that inappropriate materials are not being discharged to the stormwater system and that stormwater infrastructure is being maintained properly.

## Construction Site Runoff

- Developed and implemented “Municipal Stormwater Drainage System Rules and Regulations” that addresses construction site runoff.
- Planning Board adopted Site Maintenance Manual to address construction site runoff and erosion.
- By mutual agreement, the Planning Board and DPW share role in review and inspection of BMP’s for site work construction.
- DPW Manager continues to attend Pre-Construction meetings to ensure that contractors design appropriate BMPs for site development, and provides follow-up to determine if appropriate erosion and sedimentation control is being provided during construction.
- Completed surface water sampling at Outfalls 17 and 18 and concluded that the source of discoloration at these outfalls was likely erosion and sedimentation from up gradient residential developments.

## Post-Construction Runoff Control

- Planning Board adopted Site Maintenance Manual to address construction site runoff and erosion that included post-construction BMP’s.
- Have considered, but not adopted, additional regulation such as Shoreland Protection Ordinance similar to State of New Hampshire and cluster housing.
- Have adopted a 20-foot buffer/greenbelt along either side of Lafayette Road

## Pollution Prevention/Good Housekeeping for Municipal Operations

Many of these procedures affect operations at the Town DPW facility, which is outside the watershed. These include employee training for implementation of Nonpoint Source Pollution BMP’s. In addition, the Town has implemented a number of town-wide practices on an on-going annual basis including:

- Inspection and maintenance of the stormwater system
- Sweep town roads
- Catch basin cleaning—approximately 25-30% of town each year.
- Managing use of fertilizers and pesticides on town property in cooperation with other town departments such as recreation.
- Continued to hand-sweep all curbed areas with sidewalks.
- Implemented a program to wash DPW vehicles at an off-site, commercial car wash facility instead of at the 43 Railroad Avenue Highway Facility.
- Made several revisions to the Transfer Station Stormwater Pollution Prevention Plan (SWPPP) to reflect current activities, materials, and storage methods used at that facility, and increased the frequency of inspections at the facility.
- Developed a SWPPP for the DPW Highway Facility at 43 Railroad Avenue and implemented monthly site inspections at that location.
- Designed, put out to bid, and awarded a project to install a subsurface holding tank at the Transfer Station to capture leachate from that building and the solid waste trailer

before that leachate enters a drainage swale. Installation of this tank will be completed in Spring 2008.

- Solicited and received confirmation from several State and Federal agencies that no outfalls in the Town adversely affect eligible or currently listed Endangered Species or have an effect on eligible or currently listed National Historic Properties.
- The DPW was represented at the January 2008 MS4 Phase II Community meeting held at USEPA on January 8, 2008. Many communities were invited to this meeting to provide feedback to EPA about which stormwater program components and requirements have been the most (and least) successful, as the EPA continues to develop the new MS4 permit (anticipated in 2008).
- The Planning Board amended Article III of the Town of Seabrook's Subdivision Regulations to give the Board more authority in requiring applicants to meet requirements for impacts to stormwater (among other things) before approving the application.
- The Planning Board developed the Aquifer Protection Overlay District and added this program to the Zoning Ordinance.

Further detailed discussion of this implementation strategy is found in the May 2007 Annual Report on the Stormwater Management Plan. The Conservation Commission and the Department of Public Works have worked jointly on both the NPDES stormwater planning process and the Cains Brook/Tide mill Creek Watershed Plan in order to coordinate policies and programs directed water quality protection within the watershed. The actions adopted as part of the NPDES program have been and will continue be integrated into the Watershed Plan.

*Note: The above section prepared with the assistance of the Earth Tech, Inc. who is working with the town DPW to implement the NPDES Phase II program.*

## **Town of Seabrook Master Plan, 2000**

In 2000 the town prepared a Master Plan Update that provides a set of policies and recommendations for future growth and development in Seabrook through the year 2010. In this plan there are a number of policies and actions that are relevant to Cains Brook.

The plan policies include:

1. Control surface runoff
2. Ensure a clean, safe and secure environment
3. Increase recreational facilities and opportunities
4. Protect wetlands and forests
5. Protect ponds and streams
6. Acquire open space
7. Protect estuarine fish and wildlife habitats

In order to implement these policies that plan proposes over 140 recommendations. Of these approximately 20 are relevant to the watershed management plan. These relevant recommendations range from strengthening the town's wetland protection regulations to



discouraging development in floodplains to pond management to groundwater resource protection to improving surface water quality.

As with the NPDES Stormwater Management Plan the appropriate proposed recommendations will be incorporated in whole or in part into the proposed action strategies of this plan.



Secord's Pond



# Existing and Potential Threats to Watershed Resources

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The water resources of the watershed are subject to a number of threats that can degrade water quality. Such threats include commercial and industrial waste, agricultural activity, human and animal waste, road salting, hazardous waste, petroleum products, groundwater removal and stormwater runoff.

The sources of contamination generally fall into two categories: point source pollution and non-point source pollution. Point sources usually have just one point of discharge such as an industrial outfall or a wastewater treatment discharge pipe. Non-point source pollution does not have a specific point of discharge such as stormwater runoff from a parking area or fertilizer from residential lawns or agricultural activities. Since there are no defined point sources of pollution in the watershed, the following discussion focuses on non-point source pollution.

## Point Source Pollution

Typically point source pollution has been defined as a single stationary source of discharge into a water body such as a municipal wastewater treatment plant or an industrial discharge. Further these types of discharges are usually regulated by the EPA under the NPDES permit program. Data from the NH Department of Environmental Services indicates that there are no permitted NPDES discharges into the waters of the Cains Brook Watershed, other than the brook culvert under I-95. It was noted during the inventory field investigations, that the



**Folly Mill Brook**

Town of Salisbury does have a discharge of water from a previously closed municipal well into Folly's Brook, just to the south of Folly Mill Road. This discharge was sampled in May 2006 and compared to the receiving brook with tests for iron and arsenic. The test results indicated an arsenic concentration about six times higher in the discharge water, compared to the receiving brook, and an iron concentration about seven times higher in the discharge water, compared to the brook. The test results are currently being reviewed by NHDES Water Division and they have been asked to comment on the findings.

## Non-Point Source Pollution

There are numerous non-point source threats within the Cains Brook Watershed. These include underground storage tanks, septic tanks, road salt runoff, petroleum-related contaminants and heavy metals from roadways and parking areas, sediment from impervious surfaces and construction sites, road salt runoff and other stormwater runoff that may contain fertilizer contaminants from residential and agricultural/ farm activities.



**US Route 1 as a Nonpoint Source for Pollutants**

## Sedimentation and Erosion

Cains Pond and Cains Mill Pond have both become impaired waters for secondary contact recreation due to obstructions to navigation because sedimentation in the ponds is resulting in extremely shallow conditions. Both of these water bodies have experienced significant sedimentation from man-made impacts. This situation creates suspended solids that block sunlight to aquatic habitats and smothers habitat as the solids settle out of the water column and become deposited on the pond and stream bottoms.

Of particular concern is the flow of stormwater from US Route 1 that discharges untreated stormwater into the Cains Brook System. A portion of this stormwater near Cains Pond is discharged into a manhole just to the west of Route 1 and just north of the pond in a Town of Seabrook easement. From that point it discharges directly into Cain's Pond. As a result of the continual discharge there has been significant sediment loading into Cains Pond. In February of 2008 a Memorandum was prepared for NHDES documenting this sedimentation into Cains Pond. This memorandum provided the basis for identifying Cains Pond as impaired for secondary contact recreation. A summary of the key section of this memorandum is found below. See Appendix E for the full memorandum and Appendix D for the EPA nine watershed criteria matrix that documents the impairment for secondary contact recreation.

Comparisons of pond bathymetric surveys performed in 2003 and 2007 show rapid shoaling of the pond near US Route 1 and Lakeshore Drive, with as much as 2.0 feet of sediment accumulation (near Route 1). Remaining water depths have been reduced 1 to 2.2 feet in the last 4 years. The pond basin near Route 1 has a present rate sedimentation rate averaging 0.3 feet per year and at this rate it is expected that this basin will be filled within 4-8 years. From other observations in Cains Pond, it appears that Purple Loosestrife covers pond areas less than a foot deep, therefore boat navigation will be impossible within 4 years if the shoaling near Route 1 is not halted and depths restored. The cause is primarily attributed to stormwater runoff and development. US Route 1, recently widened to 6 lanes in this area, currently has no stormwater treatment or grit separation. Route 1 to the south of Cains Pond also drains to the pond and with no curbing, no storm drainage system and with road shoulder erosion. Tributaries associated with the pond do not contribute significant amounts of sediment. The tributary to the north is Mary's Brook and Mary's Pond, thus sediments from Mary's Brook are trapped in Mary's Pond. The tributary to the west is Cains Brook, which has Secord's Pond on one branch (trapping sediment) and the western end of Cains Pond where this tributary enters, is a large wetland, further trapping inflow sediment.

Another situation of concern is the erosion of the railroad embankment near the culvert under the railroad right of way between Cains Mill Pond and Noyes Pond. This erosion is exacerbated by active use of an access road next to an adjacent rail line by ATV's and dirt bikes. They cross the tracks in this area at a spot where an individual has actually unbolted the rail and dragged it to the side (photo) and there is severe wheel erosion. At present, the slopes are no longer vegetated and are slumping into the ponds.

The town-owned land at the pond, adjacent to the track is behind Home Depot, has to be kept gated and locked due to the ATV problem. NHDES has also indicated that the railroad used to spray lead arsenate along this ROW as a defoliant. DES has recently discovered elevated arsenic levels in the top 2 feet of soil on a culvert project they did at the rail ROW near Seabrook Power Station. At present, the only way to control the use of the ROW by motorized vehicles is by the Seabrook Police.

### ***Hazardous Waste and Petroleum Product Contamination***

The Bureau of Hazardous Waste in NHDES maintains a statewide inventory by community of all sites that may have hazardous waste or petroleum products associated with them that may pose a threat to water resources. This inventory of non-point pollution sources was identified and graphically depicted in the town's 2000 Master Plan. In addition to sources noted above, the NHDES also identified a number of other locations or activities that posed potential threats to the Cains Brook/Mill Creek Watershed. The most recent update of the location of these potential threats is depicted on **Figure 5**.

The DES has also identified all uses that have underground storage tanks with a capacity of greater than 1100 gallons, which are regulated in the NH Code of Administrative Regulation Part Ws 411. Many of these are associated with gasoline stations and convenience stores on Lafayette Avenue (US Route 1). **See Table 6 and Map 6, NHDES AST/UST Facilities.** Tanks of less than 1100 gallons are not regulated at either the state or local level.

**Table 6**  
**Storage Tanks Within the Watershed**

MAP ID #	Name	Active Tanks	Type	Location
113892	Mobil 16476	10000 gal gasoline	fiberglass	underground
		10000 gal gasoline	fiberglass	underground
		10000 gal gasoline	fiberglass	underground
114180	North of the Border Fuel	10000 gal gasoline	fiberglass	underground
		10000 gal gasoline	fiberglass	underground
110771	Elementary School	5000 gal No. 2 oil	fiberglass	underground
		5000 gal No. 2 oil	fiberglass	underground
257	Fire Department	6000 gal gasoline	galv. steel	above ground
115441	Route 1 Irving	15000 gal gasoline	fiberglass	underground
		14000 gal gasoline	fiberglass	underground
940763A	Jiffy Lube	1000 gal used oil	unknown	above ground
		1000 gal motor oil	unknown	above ground
		1000 gal motor oil	unknown	above ground
		275 gal motor oil	unknown	above ground
		275 gal motor oil	unknown	above ground
110509	Richdale Convenience	12000 gal gasoline	fiberglass	underground
		8000 gal gasoline	fiberglass	underground

Source: NH DES, OneStop Program, WEB GIS, 2006

The NH DES also inventories major storm drains that are not part of the roadway system as can be seen in **Table 7** below and **Map 7, NHDES Non-Point Sources**. The **Drainage Structures Map, Maps 4A and 4B**, also identifies numerous other storm drains or catch basins.

**Table 7**  
**Other Nonpoint Sources**

MAP ID #	Owner	Type
Storm Drains		
185-09	Morton International	SD*
186-28	Seabrook Town Hall	SD
186-27	Timbermart Lumber Center	SD
202-01	Old Town Fire Station	SD
186-05	Walmart	SD
186-07	Walmart	SD
186-04	Demoulas	SD
Auto Salvage Yards		
	Walter E Knowles Auto Salvage	WSPS
	Circle Motor Sales	

Source: NH DES, OneStop Program, WEB GIS, 2006

\*Note: SD = Storm Drain



The NH DES tracks hazardous waste generators. There are over 40 such generators in the watershed including auto repair related businesses, gas stations, businesses and retail facilities such as Home Depot and Wal Mart. These are documented in **Appendix C** with a table and accompanying map showing the location of each generator. Finally DES inventories potential contamination sites and remediation sites. There are over 20 such sites in the watershed and these are also documented in **Appendix C** with a table and accompanying map. Many of these sites are related to petroleum product sales or storage and, while on the list, are currently closed in terms of any NH DES action.



**Cains Pond spillway at Rt. 1**

## **Pet Waste**

In November of 2007 the Seabrook Conservation Commission was awarded a Pet Waste Control Grant to educate the citizens of Seabrook about the potential pollution to waterways in Seabrook from pet waste and how this waste can be controlled to prevent such pollution. Pet waste can be source of bacterial contamination which is a significant problem in New Hampshire's coastal waters. Through this project the Conservation Commission will design an awareness campaign to communicate the nature of the pet waste problem and encourage pet owners to take responsibility for disposing of pet waste. This project will include the development of a webpage on the town's website and the development and distribution of brochures and posters. The project will also install catch basin markers in neighborhoods along Cains Brook, Mary's Brook, Cains Pond, Mary's Pond and Secords Pond, including areas along Pine Street, Whittier Drive, John Drive, Greenleaf Drive, Autumn Way, Timber Court, Pine Cone Drive, Ayer Circle, Evergreen Way, Forest Court, Forest Drive, Lakeshore Drive, Folly Mill Road, Folly Mill Terrace, Doris Lane, Raymond Drive, Virginia Lane, Walton Road, Troy Way, Violette Lane, Quaker Lane, Shaker Terrace, Belgian Drive, Nicholas Way, Centennial Road, Causeway Street, and Beckman Landing. The markers shall be stainless steel disks embossed with "No dumping, drains to river" and a fish image.

## **Structural Barriers**

There are four dams along Cains Brook—the Secord's Pond Dam, the Mary's Pond Dam (Lakeshore Drive), Cains Pond Dam and Noyes Pond Dam. Each of these present barriers to movement by aquatic species that inhabit this watershed. In addition to the dams there are two spillways that also provide significant barriers to fish movement, including an approximately 4-foot spillway at Cains Pond approximately 6-foot spillway at Noyes Pond as shown in the photographs.



The Noyes Pond spillway experienced significant erosion damage during the recent May 2006 extreme flood condition. This situation is currently under investigation by the dam owner, NH Dam Bureau and NHDES to determine the best approach to repairing this structure.

**Noyes Pond spillway**

## Debris

Much of the watershed area near the ponds is adjacent to Route One and the associated commercial use along this corridor. These ponds, the nearby streams and their associated riparian shorelands are subject to build up of debris which has a negative impact on the visual quality and the fish and wildlife of the watershed.



**Trash Along Route 1**



**Debris in Cains Mill Pond**

As part of the 2007 NH DES/EPA 319 grant the Conservation Commission undertook an outreach and education program for the reduction of trash and debris along the Route 1 Corridor. This involved establishing a Clean Up Action Committee that included local businesses and interested residents. This committee met several times and spoke with numerous businesses along Route 1 in an effort to establish a Trash Reduction Action Pilot Program. This involved commitments to provide plastic bag bins at the larger retailers and frequent parking area clean-up. The Committee established a base line monitoring study in the front of Home Depot involving the collection and



documenting of all trash. The intention was to establish a representative sample for trash reduction. Subsequent monitoring counts will be undertaken to determine if there has been any change in the level of trash collected. The Committee has also established a corridor clean-up day on April 29th, 2008.

## Flooding

There have been several recent flooding events that have had a negative impact on the watershed resources. These flooding events have also exacerbated the sedimentation problems in Cains Brook and the various ponds along the brook.

The recent extreme flood conditions of the “Mother’s Day” Storm of May, 2006 and the “Patriots Day” Storm of 2007 have had dramatic effects on the watershed including:

- Significant sediment loading into Secord’s Pond,
- Significant sediment deposition in the upper reaches of Cains Brook,
- Elimination of a beaver dam below Noyes Pond on Cains Brook, and
- Serious erosion along the emergency spillway of Noyes Pond.

This flooding event also forced Route One at the location of Cains and Cains Mill Pond down to one lane as shown in the photo. A similar event also occurred in the Spring of 2007.



**Sedimentation up stream of Secord’s Pond**



**Breach of Noyes Pond Spillway**



**Flooding of Route 1 from Cains Pond**

## **Invasive Species**

One the main exotic or non-native species to invade the watershed is purple loosestrife, particularly in the upper reaches of what was Cains Pond that has now become a wet meadow. This plant prefers the type of environment that has now been created in this area of the watershed--moist organic soils, fluctuating water levels, and full sunlight; all conditions that can stress many native plants, and since it has no natural predators it can outcompete native plant species. Purple loosestrife is a prolific reproducer. One adult purple loosestrife plant can produce 2.5 million to 2.7 million seeds annually. These seeds can easily be transported by water, wind, bird feathers, animal fur, footwear, boats, boat trailers, and car tires. It can also resprout from broken stems, underground roots, and plant fragments.

Because of these characteristics, this exotic plant can displace native flora and fauna, eliminating food, nesting, and shelter for wildlife. It provides no natural value as food or habitat for birds, mammals, or fish depends. By reducing habitat size, purple loosestrife has a negative impact of fish spawning and waterfowl habitat. The plant also diminishes wetland recreational values such as boating, fishing, and hunting (Environmental Fact Sheet WD-DB-45, NH DES, 2007). This plant invader has a negative impact on the wildlife and recreational of Cains Pond.

## **Direct Impacts from Human Activity**

### ***Jet Skis***

During the summer season motorized water craft such as jet skis venture into the tidal creeks of Seabrook Harbor. Some of these craft travel at high speed within Mill Creek. The wake from this activity causes bank erosion and sediment re-suspension in the creek with a detrimental impact on the tidal marsh habitat and water quality. More consistent regulatory enforcement of the jet ski speeds in the creek and an outreach program to jet ski owners would be appropriate for dealing with this issue.



### ***Motorized Sport Vehicles***

Motorized sport vehicles such as ATV's and motorbikes use the railroad right of way that crosses the watershed and divides Cains Mill Pond and Noyes Pond. These vehicles also travel onto Home Depot property and the Town of Seabrook land adjacent to Cains Mill Pond that was donated by Home Depot. This activity contributes to the erosion of the bank area around the ponds causing sedimentation to the pond bottoms. These vehicles also create a nuisance to Home Depot, which has now gated off the public access from its property to the town property.



# Current Regulatory Programs for Watershed Protection

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## Introduction

Regulatory programs for the management of stormwater runoff and water quality involve regulations at the federal, state and local level.

## Federal

### National Pollution Discharge Elimination System (NPDES)—Phase II

The Town of Seabrook is required to comply with Phase II of the NPDES stormwater program under the requirements of the Clean Water Act as administered by the EPA. This program is intended to reduce pollution in stormwater discharge and protect water quality. As noted earlier in this study, the town is required to address six areas of stormwater management. In conjunction with an engineering consultant, the town prepared a stormwater management plan in March of 2003 and has had two annual reviews to determine progress toward implementing the plan. The purpose of this plan is to establish a work program to improve water quality and stormwater management within a five-year period. Many of the strategies will include action at the local level through changes in Seabrook's land use regulations.

### National Pollution Discharge Elimination System (NPDES)—Phase II Stormwater Regulations

Construction sites including road construction that disturb one or more acres must obtain a NPDES general permit. This permit requires the preparation of pollution prevention plans to reduce pollution at construction sites. The entity responsible for the construction activity needs to submit the application. The pollution prevention plan usually employ Best Management Practices that are also required with the NPDES.

## State

There are a number of state laws and regulations that are intended to manage growth and protect the state's water resources. The following represent those that are most frequently applied to activities that would affect the quality of the Cains Brook Watershed.

### Shoreline Protection

The Comprehensive Shoreland Protection Act (NHRSA §483-B) provides minimum shoreline standards for subdivision, use and development of the shorelands within 250 feet of the state's public waters. Public waters include all fourth order or higher water courses, water bodies greater than 10 acres, estuaries and coastal waters. This act prohibits certain uses within the 250 foot setback and establishes standards for other uses within this setback.

In addition, it establishes setbacks for buildings and septic systems. Under the original Act there was minimal state enforcement of the Act and it was generally left to local officials to ensure compliance. As of July 1, 2008 new rules have been implemented which provide for stricter standards and a requirement that work within the shoreland area will be subject to a state permit. Additional personnel will also be added to DES to ensure more thorough enforcement of the law.

Within the watershed, the shorelands within 250 feet of tidal waters will be subject to this act. In the original watershed plan it was noted that Cains Mill Pond was subject to the act. Since that time NHDES has de-listed this water body since it is not a natural pond.

#### Alteration of Terrain or Site Specific Program

Site excavation and road construction are governed under RSA 485-A:17. Under this program individuals are required to obtain an individual permit from NHDES for any earth disturbance greater than 100,000 sf or 50,000 sf within a protected shoreland area as covered by the Shoreland Protection Act. Staff at NHDES have indicated that the rules implementing this law are under revision and will be promulgated by September of 2008. As written these rules will be much more stringent than the current rules.

#### Wetlands

Wetlands are regulated under the Clean Water Act primarily by the state under RSA 482-A to protect the natural functions of wetlands. Any activity that involves dredging or filling of a wetland resource requires a permit from the NHDES Wetlands Bureau. Under agreement with the Army Corps of Engineers (ACOE) which manages the federal wetlands program, the state administers the program for wetland impacts up to one acre. Impacts greater than this require further review by the ACOE.

## **Local**

### **Stormwater Regulations**

With the assistance of the Town's NPDES Phase II consultant, a stormwater regulation was prepared and adopted in 2005. The "Municipal Stormwater Drainage System Rules and Regulations" are incorporated in Seabrook's Code as Chapter 218A. These regulations specifically address construction site stormwater runoff and erosion control including post construction stormwater management.

### **Land Use Regulations**

The Town of Seabrook's Zoning Ordinance and Land Use Regulations, amended to March 2006, have been reviewed for compliance with current planning standards and practices relative to natural resource protection and watershed management, including surface and subsurface water quality and quantity, aquifer protection, wetland regulation, and floodplain protection.

## Zoning—Chapter 263 of the Seabrook Code

The purpose of the Seabrook Zoning Ordinance is to protect and conserve the value of property, to promote economic development of the town's resources and to encourage the most appropriate use of land throughout the Town of Seabrook. The ordinance has 20 articles, two of which are applicable to the protection of Cains Brook/Mill Creek.

### *Article III. Zoning Districts*

Under this article the Town of Seabrook has adopted the Conservation District that contributes to natural resource protection in the watershed. The Conservation District is coterminous with the town's tidal wetland areas. The only permitted use is non-commercial passive recreation. Although there are no dimensional standards identified, the whole zone must be 100% Open Space which is defined in the ordinance as "land area not covered by pavement or buildings".

### *Article XV. Surface Water Protection*

This article has been updated as of the 2008 Town Meeting with new provisions for buffer setbacks for wetlands and water bodies. In addition, there are specific guidelines with respect to removal of vegetation from wetlands.

### *Article XVI. Aquifer Protection*

In 2007, the Planning Board developed an Aquifer Protection Overlay District which was approved by the 2008 Town Meeting. This district extends over all the land within Seabrook west of I-95. It prohibits a number of uses such as activities involved in hazardous or toxic materials, storage of road salt, and automotive repair, filling stations, car washes and salvage yards.

### *ArticleXXI. Floodplain Regulations*

The purpose of this regulation is to protect the public health, safety and welfare in areas that may be subject to flooding as designated on FIRM Maps as prepared by the Federal Emergency Management Agency. Having this regulation in the zoning ordinance is appropriate rather than in a separate section of the town codes. The ordinance appears to address the necessary considerations that might arise during a flooding situation. There are specific standards for construction in the A and AE flood zones, which comprise most of the flood hazard area of Cains Brook/Mill Creek as shown on **Map 3**.

At the March 2006 Town Meeting, definitions were added to Article 2 that better define buffer areas and in the dimensional requirements Article VI, minimum buffers of 25 feet were added to all ponds and streams.

Consideration should be given to having structures at least one foot or more above the 100-year elevation rather elevated to or above such elevation as stated in Paragraphs K and L to ensure proper flood protection.

## Shoreline Protection

NHRSA §483-B provides minimum shoreline standards that prohibit certain uses within 250 feet of a shoreline and establishes standards for other uses within this setback. In addition, it establishes setbacks for buildings and septic systems. The standards of this Act can be enforced at the local level. NHRSA §483-B:8 authorizes municipalities to adopt land use controls which are more stringent than those contained in the referenced statute. As of March 2006, the zoning ordinance was amended to include a 25-foot buffer adjacent to ponds and streams. The town may also consider whether or not the current standards are stringent enough especially in the Cains Brook watershed.

## Subdivision Regulations—Chapter 224 of the Seabrook Code

In accordance with the provisions of RSA 672-677, Seabrook has adopted Subdivision Regulations for the purpose of promoting an economically sound and stable community and to provide for uniform procedures and standards for land development.

There are several provisions that regulate activities that encourage the protection of the watershed resources. Under Article V, *Exhibits & Data Required for Final Review*, *Subsection L* requires delineation of wetlands, *Subsection M* requires a Stormwater Pollution Plan and *Subsection N* requires an Erosion and Sediment Control Plan. In addition, under Article VI there are standards for protection of the environment and water resources in the following subsections:

- F. Drainage ways—designed to accommodate the 50 year storm
- G. Stormwater Discharge—post development stormwater discharge will not exceed predevelopment and will be calculated for the 25-year storm event.
- H. Natural Features—Planning Board may require protection of natural features such as trees and streams.
- O. Flood Hazard Areas—require developers to adhere to floodplain regulations in the Zoning Ordinance.
- Q. Streams—Limits re-routing of streams and provides for a 15-foot stream buffer.
- T. Detention Pond Vegetation—lists acceptable vegetation that is native to this area.

The Seabrook Planning Board amended the Subdivision Regulations in December of 2007 by adding a new Section N to Article V that requires any development with a stormwater management system to prepare an operation and maintenance manual to ensure that the system functions as designed. The manual must include a schedule for inspection and maintenance and the inspection reports shall be submitted to the Code Enforcement Officer and the Department of Public Works.

In addition, the Planning Board amended the Subdivision Regulations by adding a new Section U to Article VI – Shoreland Vegetation requiring that shoreland vegetation be consistent with the recommendations specified in the NH DES document Native Shoreland/Riparian Buffer Plantings for New Hampshire.

The Seabrook Code of Land Use Regulations is cross-referenced so that provisions of the Subdivision Regulations are incorporated by reference in the Site Plan Regulations. Thus, the above amendments would also apply to multi-family and non-residential development.

## Site Plan Regulations—Chapter 225 of the Seabrook Code

In accordance with RSA 674:43-44, Seabrook has adopted site plan regulations for the purpose of protecting the health, public safety and welfare, promoting balanced growth and to ensure positive environmental development in accordance with the Seabrook Master Plan.

There are several provisions that regulate activities that encourage the protection of the watershed resources. In Article V, *Site Plan Review Procedures*, a developer is required to provide the same exhibits as are required in the Subdivision Regulations, Article V, *Exhibits & Data Required for Final Review* as discussed above (delineation of wetlands, a Stormwater Pollution Plan and Erosion and Sediment Control Plan). Under Article IX, Site Plan Review Standards, there are standards related to the following subsections:

- A. Detrimental Effects to be Minimized—erosion and to the environment.
- B. Storm Water Discharge—drainage structures designed to the 50-year storm and the post-development stormwater discharge shall not exceed pre-development discharge.
- C. Erosion Control—site work activity and structures to be installed in a manner that prevent erosion and sedimentation of streams.
- D. Pollution Control—requires oil/water separators when deemed necessary by the Planning Board.

## Conservation Easements

The Seabrook Conservation Commission currently holds an easement on property adjacent to Secord's Pond that prohibits any further development on this property. In December of 2008 they obtained a conservation easement and dam maintenance agreement with Mr. Stanley Hamel, the owner of Noyes Pond and associated dam.

## **Town of Salisbury**

The Town of Salisbury has adopted a set of land use regulations including a zoning by-law as well as subdivision and site plan review regulations. There is no municipal sewer in the watershed area, but there is municipal water. Based on a review of these regulations, it would appear that the potentially biggest threat to Cains Brook would be from improperly functioning septic systems.

## **Zoning By-Laws**

The zoning by-law designates the various use districts in the Cains Brook watershed which include low and medium density residential development, commercial development and watershed protection district that includes an area around Folly Brook that extends from the Seabrook town line west to just beyond I-95. Most of the area west of I-95 is rural residential which requires two-acre lots. The area east of I-95 is composed of rural and medium density residential which requires a one acre lot and commercial along US Route One and Main Street both of extend into Seabrook.

## **Site Plan Review Requirements**

The by-law also contains a site plan review procedure for almost all development except for single and two family dwellings. The planning board has adopted a set of Site Plan Review Requirements that address a number of parameters related to impact on water resources including drainage, landscaping in parking areas, stormwater runoff, water quality, and erosion control. There is also a provision that allows the board to require an environmental impact report that requires an assessment and proposed mitigation for soil runoff, earthy removal, and tree removal.

More specifically the standards require:

- A storm water system that is designed to have no net increase in peak stormwater flows during the 2-, 10-, and 100 year storm events and the system will be designed in accordance with the Massachusetts DEP Stormwater Management Volumes I and II.
- A stormwater runoff plan that is consistent with the Massachusetts Stormwater Management Policy (SWMP) that requires adherence to nine standards for stormwater management including the preparation of a long term operations and maintenance plan for the stormwater system.
- Maximizing groundwater recharge and groundwater protection.
- Design of parking areas to reduce impervious areas.

## **Water Resource District Regulations**

The zoning by-law also includes separate provisions for an approximately 70-acre Water Resource District that encompasses an area of the watershed that is generally defined by the northern boundary with Seabrook to the north; I-95 to the west, and a residential commercial area on the west side of Main Street. These regulations define permitted uses, prohibited uses and limited activities under a special permit provisions. Permitted uses include conservation-type activities and low density residential. Prohibited uses include such activities as landfills, junkyards, gasoline stations, and uses that involve the manufacture, storage, use, transport or disposal of toxic or hazardous materials.

# Alternative Management Strategies

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In order to manage the resources of the Cains Brook/Mill Creek Watershed there are a number of strategies that could be considered for implementation. Based on the resource area assessment there appears to be several issues of concern that should be addressed. These included:

- Accumulating sediment, organic debris and contaminants in the ponds,
- Non-point source pollution particularly on the form of bacterial contamination,
- Lack of fish and wildlife diversity, and
- Human generated debris, including plastic bags and shopping carts that end up in or around the shoreline of the ponds and brook from the retail shopping centers along Route One.

## Regulatory Strategies

### *Zoning*

Zoning regulates the use and density of land development by establishing minimum building lot sizes, maximum lot coverages, and setback distances from property boundaries, streets, and sensitive resource areas (i.e., estuaries, wetlands, streams, or other water bodies). Controlling future land use is clearly an important element of protecting the watershed's sensitive natural resources and the quality of Cains Brook.

In the past communities have relied on large lots, i.e., greater than one acre, as a means to protect natural resources. A more suitable approach is to ensure that the overall density within a given area be compatible with the ability of the environment to sustain given types of development. This approach can usually be accomplished through more flexible zoning techniques, such as open space zoning. This option allows higher density on land within a large parcel that can accommodate such an increase, while providing areas of open space where the land is more sensitive. The overall density of the parcel remains the same as the underlying zone.

In addition, any such changes to the zoning density should be accompanied by appropriate coverage and setback/buffer requirements to ensure protection of any adjacent sensitive resources areas. When zoning regulations are designed in a manner which considers the land's capacity to attenuate nutrients and other pollutants, flexible zoning can be one of the most effective tools available to a community to preserve critical natural resources.

In addition, there are a number of options for protection of specific natural resources through the use of overlay districts that in effect overlay the existing underlying zone while affording additional protection to a particular resource. Commonly adopted overlay zones include: watersheds, wetlands, slopes, and shoreland buffers. For example, the New Hampshire Office of State Planning has prepared a *Model Shoreland Protection Ordinance* for use by local communities.

## ***Site Plan and Subdivision Regulations***

Subdivision regulations constitute an important means of local control over the layout of residential development whereas site plan review regulations control the layout and quality of multi-family residential and commercial/industrial developments in. These regulations establish:

- provisions for the local review of preliminary and final plans; and
- design standards for site layout and performance standards to minimize impacts to surrounding land areas.

Within these regulations, standards for erosion and sediment control, stormwater management, open space set asides may be established to protect sensitive watershed resources. Seabrook has adopted some of these provisions in its subdivision regulations with a cross-reference in its site plan review regulations.

## ***Wetlands***

Wetlands, both tidal and fresh water, are valuable resources that provide many valuable functions, including the removal of sediments, nutrients, and other potential pollutants from stormwater runoff and other overland flows to Cains Brook. Past development in certain areas of the watershed, particularly along Lafayette Road, have had a negative impact on the watershed's wetland resources. The protection of wetlands within the Cains Brook Watershed is critical to protecting the Brook and other sensitive resources within the watershed.

Wetlands are currently regulated at both the federal level (Section 404 of the Clean Water Act) and the state level through RSA 482-A. The Conservation Commission is empowered through the state statute to comment on, and set conditions on, development proposals, which may significantly impair critical wetlands functions. Seabrook does not have a wetland overlay district. The subdivision and site plan review regulations have language to encourage protection of this resource.

As part of the New Hampshire wetlands law there is also a local option that provides for the identification of Prime Wetlands (RSA 483-A:7). The aim of this provision is establish criteria for municipalities to select wetlands of significant value that are worthy of extra protection because of their uniqueness, quality, fragility and/or unspoiled character. The law also provides guidance as to the special consideration that needs to be taken by the local Conservation Commission and the state Wetlands Bureau.

## ***Shorelands***

In New Hampshire the state has defined jurisdictional shorelands as those within 250 feet of state's public waters through RSA NHRSA §483-B. Public waters include all fourth order or higher water courses, water bodies greater than 10 acres, estuaries and coastal waters. This act prohibits certain uses within the 250 feet setback and establishes standards for



other uses within this setback. In addition, it establishes setbacks for buildings and septic systems. At present, the only areas in Seabrook under this jurisdiction are tidelands.

While the town has recently updated the guidelines for activities within setbacks and buffer areas within the Zoning Ordinance, there may be additional buffer guidelines that could be adopted.

## ***Stormwater Management and Erosion Control Regulations***

### Stormwater

Stormwater discharges to Cain's Brook contribute suspended sediments, nutrients, bacteria, heavy metals, petroleum hydrocarbons, and other pollutants which may degrade water quality, and impair wildlife, fisheries, and human uses. There are a number of drains and discharge points in the watershed that may be contributing contaminated discharge to the Brook. The management or control of stormwater runoff may include source control (reducing the generation and transport of pollutants) as well as treatment (the removal of pollutants prior to discharge to the receiving resource).

The Seabrook subdivision regulations require a stormwater pollution plan through this regulation. The site plan regulations do not specifically contain this regulation, but it is cross-referenced, thus such a plan is also required for developments subject to this regulation. Additional standards for maintenance and inspection of stormwater systems, construction scheduling, etc. should be considered.

At present, the NH DES is re-writing the rules for construction site stormwater management under its Alteration of Terrain Permit program. These are due to be codified by the end of the summer 2008. The proposed regulations will continue to address projects that disturb sites greater than 100,000 SF or 50,000 SF in the state comprehensive shoreland area. The Planning Board may want to review these regulations and at a minimum reference them in the subdivision and site plan regulations or consider implementing similar standards for areas where there is less disturbance.

### Erosion and Sedimentation

Sedimentation associated with the off-site transport of sediment during construction activities, as well as from existing uses with large impervious surfaces, may be one of many principal threats to water quality in Cains Brook.

In general, the goals of erosion and sediment controls during construction and development are to:

- keep disturbed areas small,
- stabilize and protect disturbed areas as soon as possible,
- keep stormwater runoff velocities low,
- protect disturbed areas from stormwater runoff, and
- retain sediments within the corridor or site area

The Seabrook subdivision regulations require a sediment and erosion control plan. There may be additional standards that could be incorporated to strengthen this regulation to be more reflective of the proposed state Alteration of Terrain standards. The site plan regulations do not specifically contain this regulation, but it is cross-referenced, thus such a plan is also required for developments subject to this regulation.

### ***Local Regulation of UST's***

At present, storage tanks are regulated by the state if they are greater than 1100 gallons. The Town of Seabrook may want to consider whether or not it wants to regulate tanks less than 1100 gallons particularly adjacent to watershed resources such as the ponds and Cains Brook/Mill Creek.

## **Non-Regulatory Strategies**

### ***Acquisition in fee or by easement of critical areas***

Funding options for natural resource protection include employing locally raised funds, the use of grants, working with non-profit organizations such as land trusts, and issuing bonds to purchase open space. Potential funding sources are discussed below.

#### **Seabrook Conservation Fund**

New Hampshire RSA, Title 3, Chapter 36A establishes the responsibilities and authority of Conservation Commissions. Section 36-A:4 of the statute states that the Conservation Commission may receive gifts of money and property in the name of the town and the town may appropriate money as deemed necessary for the purposes of open space protection. Money may be placed in a conservation fund and allowed to accumulate from year to year. The municipal treasurer has custody of the money in the conservation fund and can disperse funds upon order of a majority of the Conservation Commission. The Conservation Commission is required to hold a public hearing prior to the use of the funds for the purchase of any interest in property.

The Seabrook Conservation Commission has established a conservation fund in an effort to mitigate the impacts of large development projects. At present, these funds are being used to fund this study as well as to undertake projects such as the dredging of Cains Pond.

#### **The Society for the Protection of New Hampshire Forests**

The Society for the Protection of New Hampshire Forests (SPNHF) helps private landowners conserve land through two primary methods. The first is through easements and the second is through land donations. Easements leave the land in private hands for forest management and other conservation purposes while permanently prohibiting mining, subdivision, and development. Land donations become part of the Society's reservation system and are managed for recreation, timber, wildlife habitat, watershed protection, and scenery. Most of

the reservations are open to the public. The Town of Seabrook could work with SPNHF to identify key properties within the watershed to protect.

### The Nature Conservancy

The Nature Conservancy was founded to preserve plant, animal, and natural communities by protecting the habitats. The Conservancy accomplishes this by purchasing the threatened land and supporting the fragile ecosystems and endangered species. It is funded by individuals, foundations and grants, and corporate partners. In New Hampshire, the Nature Conservancy has often partnered with the SPNHF and local land trusts to acquire critical land parcels.

### New Hampshire Land and Community Heritage Commission

The New Hampshire Land and Community Heritage Commission (LCHC) manages a program that provides matching grants to municipalities and non-profit organizations to help save locally determined open spaces and historic sites. The LCHIP can assist the town of Seabrook in purchasing land for conservation purposes, protect land with conservation easements, or support the stewardship of already protected resources.

One of the criteria used to judge projects is the imminence of threat to the land or property such that the preservation of endangered structures and land conservation projects that are in densely developed or rapidly developing areas of the state. These types of areas shall receive a higher ranking.

The private sector role in the partnership would include providing at least a forty percent match for all project funding; identification of potential projects; preparation of project applications and supporting materials; volunteer time on the public board through providing staffing to the effort; stewardship of resources and contributions to private endowment created for the program, among other responsibilities.

### Southeast Land Trust *(Formerly Rockingham Land Trust)*

The Southeast Land Trust is a membership-based, non-profit organization dedicated to permanently protecting the Rockingham region's open spaces, including farmland, forestland, water resources, and wildlife habitat.

The trust serves the 39 communities of greater Rockingham County. Established in 1980, the Trust has helped landowners and communities protect more than 3,300 acres of land through land acquisition and easements. The trust also works in conjunction with other land protection entities such as the Nature Conservancy and the SPNHF.

### River and Trails Conservation Assistance Program

The National Park Service provides this program and twenty percent to thirty-three percent of a staff person's time for one year in order to assist a community in developing a trail. The

application for funding consists of a letter which describes how the project will meet the following five criteria:

1. Resource significance
2. Tangible conservation
3. Public support
4. Project goals
5. Broad cooperation

### Public-Private Partnerships and Other Creative Funding Mechanisms

Creative funding approaches, such as coordinating efforts with school PTA organizations for fundraising and selling small portions of existing property can provide some resources for improvements in Seabrook.

The difference between tax-based revenue and total needed revenue has generated many new fund raising techniques such as corporate promotions, donations, and an increased reliance on user fees.

### Donations

Gifts and donations are additional methods of receiving funding that may not be associated with the town, public recognition, or advertising. Many individuals and some corporations are willing to make contributions to public agencies and programs simply to improve the community in which they live or operate. Non-profit and volunteer organizations can provide assistance in generating funds by seeking gifts and donations from individuals and corporations, and organizing fund raising events.

## ***Public Education Programs***

Land use regulations or public health strategies may be effective at controlling sources of water pollution on a large scale throughout the watershed, but do little to influence the habits of each resident or business owner within the watershed. Informing residents and business owners of the role they can play in protecting Cains Brook and critical watershed resources will complement regulatory strategies by addressing watershed protection on a lot by lot basis.

Public education and participation may take many forms, including:

- public meetings, Awareness Days or workshops;
- newsletters or fliers;
- posting of the watershed boundaries and stream crossings;
- forming neighborhood groups;
- developing and/or encouraging educational programs and curricula in public schools that relate to natural resources protection watershed management;
- developing community educational programs for adults; and
- providing information through the media.

The most effective form of public education depends upon the target group and the objectives of the public education program. The target group for this Plan is all of the watershed's residents and businesses as well as state and local land use regulatory boards. The objectives should be:

- to notify the public and governmental decision-makers of the need for protection of the Watershed;
- to identify and explain the issues that threaten the Watershed;
- to explain ways in which the target group can participate in watershed protection on an individual basis;
- to instill a sense of responsibility for, and interest in, protecting the watershed; and
- to establish institutions which will sustain and build on the initial efforts to protect the watershed.

The Town is currently implementing NPDES Phase II Stormwater Management Plan consistent with EPA guidelines. Part of this program is public outreach and involvement as discussed in more detail in the **Previous Studies** Section of this Plan.

## **Physical Strategies**

### Maintenance Dredging of Ponds

Cains Pond and Cain Mill Pond have been losing open water aquatic habitat essential to fish and waterfowl because of the extremely shallow conditions and the invasion of purple loosestrife at the western end of Cains Pond. The shallow conditions have also contributed to the impaired water body designation for secondary contact recreation due to obstructions to navigation. In addition, the eutrophic condition of both ponds adversely affects water quality in the ponds and the downstream waters. Maintenance dredging of these ponds is a means to remove recently accumulated sedimentation, including siltation and decayed vegetation build-up, to restore these ponds to their previous depths. See Appendix D, EPA Nine Criteria Matrix, that outlines how this strategy is consistent with the EPA's approach to watershed management and address the impairment for secondary contact recreation.

Physical dredging methods can be accomplished by mechanical or hydraulic dredging equipment. The sediments have previously been tested as part of the Wetlands Bureau application for pond dredging in 2005 and were found to be acceptable for upland disposal and reuse.

### Modification of Structures to Encourage Free Passage of Fish and Wildlife

Existing structures along the Cains Brook watershed can be modified to encourage the free passage of fish and wildlife. These measures may include the modification of Noyes Pond dam to provide a fish ladder, or "natural" overflow bypass channel around the dam structure. The concrete box culverts at US Route 1 and Lakeshore Drive could be modified to accommodate additional flow. There are also weir structures at the outlets of each of these

ponds that could be modified by lowering the height to improve fish passage into Cains Pond and Mary's Pond.

#### Modification of Drainage Structures To Reduce Sediment, Pollutants and Trash Inflow

Runoff from developed areas and roads, including US Route 1, contributes sedimentation, pollutants and trash inflow to the watershed. The quality of the runoff from these areas may be improved through the modification of existing drainage systems to more effectively trap sediments, trash, oil and other pollutants, before they discharge into the watershed. In particular there is one catch basin on Route 1 near Cains Pond that discharges untreated runoff into a manhole in a town easement on the west side of Route 1. This manhole provides not treatment and the runoff continues untreated into Cains Pond adding sediment, pollutants and trash to the pond. By introducing a water quality structure to either replace the manhole or treat stormwater discharged from the manhole, cleaner runoff would be discharged into the pond.

#### Implementation of the NPDES Phase II Stormwater Management Plan

The Town of Seabrook is currently implementing the Municipal Phase II Stormwater Management Plan. This Plan addresses six areas of concern for the effective management of stormwater in the town and in the Cains Brook Watershed. These areas of concern included:

- Public Outreach and Education
- Public Involvement and Participation
- Illicit Discharge Detection and Elimination
- Pollution Prevention and Good Housekeeping for Municipal Operations
- Construction Stormwater Runoff Control
- Post-Construction Stormwater Management in New Development and Redevelopment.
- The plan annually establishes work program to address each of these areas and monitors the work program each year in order to determine how well the plan is being implemented. The five-year Phase II program will conclude in the Spring of 2008. It is fully expected that will EPA develop the new MS4 permit (anticipated in 2008) for future years.

#### Maintenance and Monitoring of the Municipal Sewer System.

The Seabrook sewer system is almost ten years old and should be inspected and maintained continually to minimize leaks to surface water bodies. Where sewer pipes cross the Cains Brook or Mill Creek or their tributaries, more frequent inspections should be carried out such as on an annual basis.

# Watershed Action Plan

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Although much of the Cains Brook Watershed is developed, there is still substantial land available for development and many areas that could be redeveloped particularly in the Lafayette Road Corridor. There are also numerous areas in the watershed that need to be enhanced or restored to improve the quality of the watershed environment. The watershed action plan presented below provides a “blueprint” for managing the use of the watershed in manner that allows for development that is sensitive to the natural resources of the watershed while protecting and enhancing its critical resource areas and recreational opportunities.

Common to most of these goals, objectives and action items is the opportunity to seek grants from the state and federal governments and conservation organizations. The goals in this plan meet many of the objectives of various funding agencies and organizations to protect and improve water quality, restore aquatic and riparian wildlife habitat and enhance recreational opportunities. By pursuing available grant funding, the existing town funds can be more effectively used to provide maximum return.

It is not anticipated that all of these action items will be undertaken immediately. The Seabrook Conservation Commission can select which action items should be most actively pursued, in part depending on opportunities that may arise with land owners/developers in the watershed, erosion and storm events, and available grant funding.

**Goal 1.**     ***Improve the water quality of Cains Brook/Mill Creek to meet New Hampshire water quality standards including shellfish standards for *E.coli* bacteria.***

**Objective 1:** Ensure that Cains Brook meets Class B water quality standards for bacteria, turbidity, temperature, nutrients, pH and dissolved oxygen and its designated use by 2010.

**Action 1:**

Protect shoreline trees and shrubs where they provide shade and erosion control for the brook and tributaries through non-regulatory means such as conservation easements and land purchase.

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1a. The Conservation Commission should establish a list of key properties and areas that would be suitable for purchase or easement to protect shoreline areas. When funds become available (such as the Seabrook Conservation Fund), the priority properties could be acquired or easements obtained.  
*(Consistent with 2000 Seabrook Master Plan Recommendations #'s 56 & 57).*

1b. The Conservation Commission should encourage riparian property owners along the Brook and Creek to maintain vegetative buffers through such activities as demonstration projects on town-owned land and direct outreach to property owners.

### **Action 2:**

Review and update stormwater management and erosion control regulations in the town's subdivision and site plan review regulations.

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The Town has adopted a provision in its Subdivision Regulations requiring any development with a stormwater management system to prepare an operation and maintenance manual. In addition, the Planning Board amended the Subdivision Regulations by adding a new Section U to Article VI – Shoreland Vegetation requiring that shoreland vegetation be consistent with the recommendations specified in the NH DES document Native Shoreland/Riparian Buffer Plantings for New Hampshire. It has adopted more stringent standards for setbacks and buffers to wetlands and water bodies in the Zoning Ordinance.

The state has revised the Comprehensive Shoreland Protection Act (CSPA) and its implementing regulations are due to go into effect on July 1, 2008. The Conservation Commission should review the revised act and regulations to determine if there any portions of the law that affect shorelands within the watershed. At a minimum, the Zoning Ordinance should make reference to this law.

In addition, the town is currently implementing an NPDES Phase II Stormwater Management Plan in cooperation with a consulting engineer. Amendments to the Town's Land Use Regulations have been enacted to better manage stormwater runoff. The Conservation Commission should work closely with the Seabrook DPW and Planning Board to implement any additional regulatory changes to the Seabrook land use regulations that may be required under this Phase II plan or may be required to meet the minimum standards for pre- and post construction measures in the Town's MS4 Notice of Intent and Construction General Permit.

### **Action 3:**

Address the riparian shoreline erosion along the banks of Cains Mill Pond and Noyes Pond near the railroad crossing.

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There is erosion along approximately 150-200 feet of shoreline on both the east and west sides of this embankment. The erosion along the banks of these ponds causes increased turbidity, resulting in sediment accumulation in the ponds. These sediments can be a source of pollutants. There is a report from NHDES that lead arsenate was formerly sprayed along the railroad right of way and that recent testing in Seabrook showed elevated arsenic concentration in the surface soils of the railroad right of way. In addition, it appears that motorized vehicles are contributing to this erosion.

A program could be initiated to minimize the use of motorized vehicles within sensitive areas of the watershed. This erosion problem can be addressed through joint actions with the Town and NH DOT to limit access by ATV's and other motorized vehicles as well as direct bank stabilization in the most effected areas.

#### **Action 4:**

Reduce the impact of small motor craft on the erosion of tidal marsh banks and the re-suspension of sediment in Mill Creek.

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At present, there are numerous small motor craft such as jet skis that travel at high speed within Mill Creek during the summer season. The wake from this activity causes bank erosion and sediment re-suspension in the creek with a detrimental impact on the tidal marsh habitat and water quality. More consistent regulatory enforcement of the jet ski speeds in the creek and an outreach program to jet ski owners would be appropriate for dealing with this issue, however this will likely need action at the state level. The Conservation Commission could also work with the Hampton-Seabrook Harbor master and the state's Marine Patrol to better enforce speed limits in this "No Wake Area". If necessary, local legislators could be contacted to work with the Town to address this issue.

The Seabrook, Hampton Falls, and Hampton Conservation Commissions submitted a petition to the Department of Safety requesting a hearing to restrict jet-ski travel in the Hampton /Seabrook Estuary. The Hearing was held on June 11, 2007. A ruling was issued on June 25, 2007 that effective October 1, 2007 all ski craft are banned from the salt marshes of the Hampton/ Seabrook estuary with operation prohibited within three hundred feet of any salt marsh bank, berm, salt pond, creek or river that flows through the salt marshes of Hampton, Hampton Falls and Seabrook NH.

#### **Action 5:**

Amend the town's earth excavation ordinance to be consistent with the NH Earth Materials Removal law (RSA 155-E).

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RSA 155-E provides specific regulations and procedures for the removal of earth materials. These regulations provide guidelines for operations that will minimize the impact of the activity and minimize erosion and sedimentation into the waters of the watershed. The Town should adopt a specific regulation in its Zoning Ordinance with a reference to the state RSA.

*(Consistent with 2000 Seabrook Master Plan Recommendation # 45.)*

#### **Action 6:**

Monitor and maintain the Town of Seabrook sanitary sewer system by undertaking the following:

- Regular inspections of the manholes and sewer pipes;
  - Annual inspection of the sewer pipes that cross surface waters in the watershed particularly at Causeway Street and Centennial Avenue.
  - Inspect storm sewers for illicit discharges
- 

The Seabrook municipal sewer system is approximately ten years old and requires monitoring and maintenance to keep it efficient and free of leaks. These practices are also part of the town's Phase II stormwater management plan. Inspection of the system is ongoing through the Department of Public Works.

**Objective 2:** Ensure that both the natural and man-made structural portions of the Cains Brook system are functioning in a manner that contributes to the brook's overall water quality and habitat for aquatic life through reduction of sediment loading, hydrocarbons and trash.

#### **Action 7:**

Dredge Cains Pond and Cains Mill Pond to remove recently accumulated sediments (and excess nutrients).

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This project should incorporate low impact dredge procedures to restore these ponds to historical depths. The Conservation Commission has prepared and filed a Dredge and Fill Application with NH Wetlands Bureau to dredge Cains Pond. This activity is being funded through an EPA 319 grant and is scheduled to take place in the spring of 2009. Such action would result in removal of

approximately 7,500 cubic yards of accumulated sediment as well as reduced water temperatures and increased dissolved oxygen levels.

The Conservation Commission is applying for additional 319 funds to dredge Cains Mill Pond in 2009 - 2010.  
(Consistent with 2000 Seabrook Master Plan Recommendation # 43.)  
(Consistent with EPA Minimum Elements c, d, g, f and h.  
See Appendix D, EPA Nine Criteria Matrix)

**Action 7a:**

Design and install a water quality treatment device in the town utility easement on the west side of Route 1.

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The purpose of installing a water quality treatment unit in this location is to capture and treat stormwater runoff from Route 1 before it discharges into Cains Pond. At present, there is no treatment of the stormwater and consequently sediment-laden runoff discharges directly into the pond. This will reduce sediment loading into the pond. This action is scheduled to be implemented in 2009.  
(Consistent with EPA Minimum Elements b, c, d, f, g, h)

**Action 8:**

Install modifications to the Route 1 culvert and weir to improve fish passage, while maintaining the existing Cains Pond water level and scenic view.

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Replace the existing weir structure with a natural looking stone riffle slope (short rocky stream bed) to allow fish passage, but also maintain the Cains Pond water level to preserve aquatic habitat, recreational uses and scenic views. To prevent adverse impacts on aquatic pond life, this action should not be performed until Cains Pond dredging has been completed. A secondary benefit of this action is a reduction in Route 1 storm flooding and possible elimination of town dam ownership responsibilities.

This project is scheduled to be combined with the dredging of Cains Pond in 2009 subject available funding.  
(Consistent with EPA Minimum Elements c, d, f, g, h.)

**Action 9:**

Work with the Noyes Pond dam owner to fund and install a nature-friendly fishway and pursue a conservation easement to control water levels and stream flows to benefit fish passage and aquatic wildlife.

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Damage to this dam from the May 2006 floods has presented an opportunity to work with the Noyes Pond dam owner to add a nature-friendly fishway as part of the dam repairs.

In 2008 the Town and the landowner executed an agreement in favor of the town allowing access to the dam for purposes of repair and maintenance and a conservation easement for Noyes Pond and 2 acres of wildflower field adjacent to the pond.

**Objective 3:** Work toward having the surface waters and riparian shorelands of the Cains Brook Watershed be free of man-made debris.

**Action 10:**

Coordinate a public outreach program with the NPDES public outreach program aimed at watershed residents and businesses to maintain a debris-free stream corridor.

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1a. At present, there is significant debris along the brook that is a result of business operations in the US Route 1 corridor. Some homeowners also add to the debris problem by discarding cuttings along the stream. Options for keeping the stream corridor clean include: 1) conducting a semi-annual stream walk to collect man-made trash and debris from the brook and riparian areas; 2) conducting an annual clean up of the Route 1 corridor; 3) encouraging riparian landowners and businesses to adopt cleanups along their portions of the watershed; 4) recruit businesses to join an “Adopt-A-Spot” program to keep certain roadway areas of the watershed clean and well-maintained; and 5) installing signage to encourage the control of trash and debris and 6) establishing programs for local cable access programming. This effort could also include the enlistment of community groups, such as scouting groups, or partnering with such groups as the Blue Ocean Society to clean up public areas, such as Mary’s Brook at the Seabrook Recreation Center. These projects will be most effective if reported by the press, and documented on the town web site.

Possible grant sources to fund such activities include the “Small Outreach and Education Grants For Nonpoint Source Pollution” and the “New Hampshire Coastal Program Restoration Grants” for habitat restoration.

As part of the 2007 Section 319 grant from NH DES the Conservation Commission has established a Clean Up Action Committee to work with businesses along Route 1 to reduce trash and debris that was ending up in the ponds and shorelands of Cains Brook, Cains Pond and Cains Mill Pond. The Committee and other volunteers conducted a clean-up of the Route Corridor in May of 2008.

*(Consistent with EPA Minimum Element e)*

**Action 10a:**

Undertake a trash reduction pilot project within the Route 1 corridor.

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In an effort to establish a baseline for trash density reduction, a location will be selected along Route 1 to that will serve as a baseline area for trash density. This site will be documented with photographs and field sheets for trash density by the Conservation Commission and the Clean Up Action Committee. The site will then be monitored on a periodic basis to determine the amount of trash reduction based on the outreach and clean-up efforts.

*(Consistent with EPA Minimum Element e and i.)*

**Action 11:**

Enact a provision in the site plan review standards to require measures for the control of wind blown trash.

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At present, there is significant trash—plastic bags, shopping carts—found in and along the brook corridor as well as in the ponds that is directly attributable to businesses within the watershed. This procedure should be coordinated with the town litter ordinance.

**Action 12:**

Improve the Route 1 drainage system to reduce the inflow of pollutants, sediments and trash into Cains Pond, Cains Mill Pond and Cains Brook.

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While the Cains Brook/Cains Pond portion of Route 1 was recently widened and reconstructed, the associated NHDOT drainage system was not brought up to modern stormwater management standards and is adversely impacting the watershed.

The following steps should be taken:

- a. Identify stormwater discharges along Route 1 that discharge into watershed streams and water bodies. Determine if any of these waters are impaired.
- b. Request that NH DES and the EPA review the NH DOT stormwater system for Route 1 in Seabrook to determine if it is in compliance with federal Phase II stormwater regulations.
- c. Discuss any inadequacies with NH DOT and request modifications to the drainage system that will bring NH DOT into compliance.

The Conservation Commission with the assistance Waterfront Engineers has identified the location of stormwater discharges along Route 1.  
(Consistent with EPA Minimum Element a, b.)

**Goal 2.**     *Improve the management of stormwater runoff in an effort to protect storm water quality and reduce peak stormwater flows.*

**Objective 1:** Identify watershed pollution sources and determine Best Management Practices for eliminating or minimizing the effects of these pollutants.

**Action 13:**

Perform spot testing of observed discharges and actively pursue enforcement investigations through the appropriate state agencies.

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The Conservation Commission or its representatives could do this testing by using a portion of the Seabrook Conservation Fund.

**Action 14:**

Conduct dry/wet weather out fall investigations of the Town's MS4's as required under the Phase II Notice of Intent.

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Work with the Seabrook DPW to monitor stormwater outfalls in the watershed by monitoring each site both above and below the stormwater discharge outfall during or just after storm event for key stormwater pollutants to determine if pollutants are causing contamination in Cains Brook.

**Objective 2:** Encourage Town of Seabrook DPW, NH Department of Transportation, key businesses and landowners to employ Best Management Practices to treat stormwater runoff.

**Action 15:**

Attach stainless steel embossed plates to all street storm drains with a slogan indicating where the stormwater goes.

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The Conservation Commission in coordination with the Seabrook DPW could install these plates for a very small investment of monies.

Through a NH DES grant, the Conservation Commission is designing an awareness campaign to communicate the nature of the pet waste problem and encourage pet

owners to take responsibility for disposing of pet waste. The DPW with cooperation from the Conservation Commission will install catch basin markers in neighborhoods along Cains Brook, Mary's Brook, Cains Pond, Mary's Pond and Secords Pond as well as other areas in the watershed  
(Consistent with EPA Minimum Element e.)

**Action 16:**

Monitor all Stormwater Operations and Maintenance Plans to ensure compliance.

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Any development disturbing more than one (1) acre requiring site plan review should prepare a Stormwater Operations and Maintenance Plan. To ensure compliance, the land owner/operator should submit periodic monitoring reports to the Conservation Commission as a condition of approval. The Conservation Commission would have the option of inspecting such facilities.

(Consistent with 2000 Seabrook Master Plan Recommendation # 59.)

**Goal 3.     *Provide suitable recreational opportunities that are directly related to the waters of Cains Brook.***

**Objective 1:** Maintain and, where appropriate, upgrade the existing public access points to the waters of the watershed.

**Action 17:**

Improve the public access of the small boat (canoe/kayak) launching area on Cains Mill Pond behind Home Depot.

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Install barriers to ATV's along the railroad ROW such that the gate at Home Depot can be opened to resident access to the town land on Cains Mill Pond. Provide a pea stone "beach" on Cains Mill Pond to allow a mud free launching area for canoes and kayaks.

**Action 18:**

Investigate the feasibility of upgrading the public access area on Lakeside Drive between Mary's and Cains Pond.

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Evaluate the feasibility of providing a public access area for recreation, including small non-motorized boats in the vicinity of Lakeshore Drive at the Mary's Pond culvert. This area is needed for pond dredging access and could remain to provide public access to these ponds. This may involve acquisition in fee or through an easement with an adjacent landowner.

As part of the approved work program for the EPA 319 grant received by the Conservation Commission, public access improvements will be made near the Lakeshore Drive Dam including: a) the construction of an overlook with a grass paver pathway and b) a small grass paver parking area including spaces for ADA accessibility.

**Objective 2:** Identify additional suitable locations for public access to the surface waters of the watershed including its man-made ponds.

**Action 19:**

Investigate and develop a public access small boat (canoe/kayak) launching area on Mill Creek.

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There are several locations where a right-of-way crosses Mill Creek such as the Spherex access road and Causeway Street. A suitable small boat access (non-motorized carry type boats) may be possible at one of these locations.

**Objective 3:** Ensure that the depths of Cains Pond and Cains Mill Pond are suitable for hand-powered craft and a healthy aquatic environment.

**Action 19A:**

See Action 7 to dredge Cains Pond and Cains Mill Pond and Action 7a to install a water quality treatment device in the town utility easement on the west side of Route 1. See also Appendix E, Memo to NH DES detailing sedimentation issue as impairment to secondary contact recreation.)  
(Consistent with EPA Minimum Elements c, d, f, g, h)

**Goal 4.      *Build community support for the protection and enhancement of the land and water resources of the Cains Brook Watershed.***

**Objective 1:** Prepare an outreach program to citizens and businesses to promote and implement the watershed plan.

**Action 20:**

Hold informational meetings and local access television broadcasts to develop local interest and support for the plan.

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These presentations can be presented through the Seabrook Cable Channel 22, the Board of Selectmen and Planning Board, businesses and citizen groups.  
(Consistent with EPA Minimum Element e.)



**Action 21:**

Develop a town web page to promote: the long-term environmental value of the watershed, low impact recreational and sporting uses within the watershed and show public access points to Cains Brook, the ponds and Mill Creek.

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As part of pet waste grant a webpage will be developed for the Town website that will bring attention to the new catch basin markers and provide information on pet waste disposal issues and benefits of improved water quality related to recreational and other uses. Partial fulfillment of this action.

*(Consistent with EPA Minimum Element e.)*

**Action 22:**

Pursue grants to fund Seabrook student awareness, education and field trips/studies along the brook, ponds and creek.

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In 2009 the Science club at Winnacunnet Regional High School will initiate a streamside clean-up campaign similar to the Coastal Clean-ups. Marine Science teacher and science club advisor Cathy Silver will insure continuity from year to year.

**Action 23:**

Prepare and implement a long-term business outreach program.

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In the past the Conservation Commission has worked cooperatively with the NH Coastal Program to make direct contact with businesses in Seabrook with respect to protecting water resources. A similar program could be undertaken with businesses in the watershed, especially those along Lafayette Road. For example, a Business of the Year Plaque for Protecting the Cains Brook Watershed could be awarded in a public forum. The winning business could also be listed on a plaque with other annual winners in town hall.

As part of the 2007 Section 319 grant from NH DES the Conservation Commission has established a Clean Up Action Committee to work with businesses along Route 1 to reduce trash and debris that was ending up in the ponds and shorelands of Cains Brook, Cains Pond and Cains Mill Pond.

*(Consistent with EPA Minimum Element e.)*

See also Action 10.

**Action 24:**

Adopt by reference the Cains Brook/Mill Creek Watershed Plan into the Town of Seabrook's 2000 Master Plan.

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A final Watershed Management Plan will be submitted to the Seabrook Planning Board for its approval and adoption by reference into the town's Master Plan.

In 2007 the Planning Board voted to incorporate the Cains Brook/Mill Creek Watershed Plan into the 2000 Master Plan.

**Action 25:**

Establish a volunteer organization that will work cooperatively with the Conservation Commission to implement this Watershed Management Plan.

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Consider establishing a group like "The Friends of Cains Brook/Mill Creek Watershed" which could build stewardship of the watershed and provide the volunteer hours need to implement this plan. Capacity-building grants could be obtained to help establish such an organization and it could become eligible to directly receive other grants for plan implementation.

**Action 26:**

Establish a long-term outreach program to residents within the watershed.

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There are a number of "hobby" farmers in the watershed that keep poultry and horses. It is important to work with these individuals to raise awareness of the impact of animal waste on water quality and to take measures to minimize this impact by properly managing the animals and implementing Best Management Practices to minimize waste discharge into the streams and waters of the watershed.

*(Consistent with EPA Minimum Element e)*

See also Actions 10 and 23.

**Goal 5.**     *Preserve, protect and restore critical anadromous and freshwater fisheries, wildlife habitat and migration corridors, and rare and endangered species.*

**Objective 1:** Undertake habitat inventories and research of the watershed's aquatic and terrestrial resources to better understand the ecological dynamics of the existing watershed environment.

**Action 27:**

Undertake a Habitat Restoration Study within the watershed.

Such a project would evaluate the watershed, particularly the in-stream and riparian resources to determine the feasibility of restoring habitat areas for fish and wildlife and water quality improvement. If funding allows, it is recommended that a full habitat study be undertaken. Specific species under consideration for restoration include sea run brown trout, bass, horn pout, pickerel, silvery minnows and mummichogs.

If funding is limited, then more targeted aquatic and terrestrial habitat studies could be undertaken. Such studies would expand the database of the watershed and identify sensitive areas for future protection. Such studies could be undertaken through the Conservation Commission or in cooperation with such agencies as New Hampshire Fish & Game.

**Action 28:**

Assist with matching funding and research study suggestions for Seabrook student studies along the brook, ponds and creek. Provide a public forum for students to present and discuss their study findings.

These studies will expand the watershed inventory database, increase community awareness of the watershed resources, while assisting in student development. Such studies could also be incorporated into the Habitat Restoration Plan. Winnacunnet High School, for example, has a marine science program with a history of "hands-on" projects. Students involved in this program could be tapped to undertake such studies with.

**Action 29:**

Implement the Habitat Restoration Plan.

Based on the recommendations of the plan, seek grants and funds to carry out habitat restoration and protection of migration corridors. Where the recommended actions may involve private property, monitor landowner activity and interest in land preservation. Working with landowners and various agencies and non-profit organizations to purchase or otherwise protect the highest value habitat areas and critical migration corridors.

**Objective 2:** Preserve, protect and maintain the valuable functions of watershed wetlands, streams and ponds by minimizing the impact of development and allowing appropriate multiple uses of these resources for water quality protection, recreation and wildlife habitat.

**Action 30:**

Update and strengthen wetlands section (Article XV ) of the town-zoning ordinance.

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The wetland regulation could be updated and strengthened in a number of ways. Preferably this section of the zoning ordinance would include a statement of purpose, uses permitted within wetland resource areas, uses not permitted in such areas and provisions for special exceptions that might incorporate mitigation for wetland or wetland buffer impacts. The ordinance does not distinguish the value of different types of wetlands so the setbacks are the same for all wetlands.

Consideration might be given to distinguishing the types of structures that are allowable in wetland buffer areas. Consideration should also be given to adopting a wetland overlay district based on hydric soils with the edge of wetland further defined on a project-by-project basis using the 1987 Army Corps of Engineers definition. (*Consistent with 2000 Seabrook Master Plan Recommendations numbers 41, 67 and 68.*)

At the March, 2008 Town Meeting there were several provisions of the Zoning Ordinance that were updated including the Wetland Section. The approved changes strengthened the restrictions on vegetative cutting and updated provisions to the buffer/setback language. Wetlands now greater than 5,000 square feet (SF) will have a minimum buffer and setback of 25 feet.

**Action 31:**

Undertake a Prime Wetland Study within the watershed to determine the highest value wetlands.

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As part of the New Hampshire wetlands law there is a local option that provides for identification of Prime Wetlands (RSA 482-A:15). The aim of this provision is to establish criteria for municipalities to select wetlands of significant value that are worthy of additional protection because of their uniqueness, quality, fragility and/or unspoiled character. These wetlands can be afforded great protection by restricting their use and increasing buffer areas around them.

**Goal 6. *Provide for long-term health and environmental quality of Cains Brook and Mill Creek by ensuring that the Watershed Plan's goals are continually met.***

**Objective 1:** Once dredging is completed, maintain water depths at levels adequate to maintain a healthy aquatic habitat.

Action 32:

Establish a monitoring program to measure depths in Cains Brook and Cains Mill Pond on an annual basis.

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In order to assure that the initial monitoring is successful, a monitoring program to determine long term depths of the pond will be necessary. . *(Consistent with EPA Minimum Element i)*

**Objective 2:** Establish a monitoring program for water quality to insure water quality goals are met and a monitoring program for the Watershed Plan to determine if the goals of the plan are being met.

Action 33:

Establish a water quality monitoring program in cooperation with personnel from NHDES on a semi-annual basis that meets the minimum sampling of the NH DES Consolidated Assessment and Listing Methodology (CALM) for each use of concern.

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The Seabrook Conservation Commission and staff from the NH DES have conducted water quality sampling studies in Cains Brook and the Hampton-Seabrook Estuary over the past 15 years. These efforts have provided a base line of data to determine the success of future water quality enhancement efforts. Future monitoring could be done at the same locations to ensure consistency of data and to evaluate changes, variability and improvement in water quality.

The CALM provides for the number of samples needed during the year, the time of year and the types of samples needed to assess a water body for Primary and Secondary Recreation Use, Aquatic Life Use and Shellfish Consumption Use.  
*(Consistent with 2000 Seabrook Master Plan Recommendation # 64.)*

During the summer of 2007 and 2008 volunteers from the Conservation Commission conducted dry weather monitoring at 14 stations along Cains Brook. There are

plans to continue this monitoring during the future summers. It is recommended that some wet weather sampling be done for bacterial pollutants (e.coli) so that the results can be compared to previous NH DES monitoring studies. Consideration should also be given to biomonitoring in the brook to determine the health of the aquatic habitat.

*(Consistent with EPA Minimum Element i.)*

**Action 34:**

Establish a bio- monitoring program in cooperation with NH DES.

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Under such a program, it may be possible to determine base line information with respect to the aquatic habitat. This data can be used as a basis for habitat restoration within the watershed.

September 2008 Waterfront Engineering and Seabrook Conservation Commission assisted employees of NHDES Watershed Assistance Section in a Biological Assessment of Cains Brook.

**Action 35:**

Review and monitor the Action Plan on annual basis to determine how well the Plan is being implemented.

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The Seabrook Conservation Commission and relevant town staff should annually review progress on the Watershed Plan. It should determine which actions have been accomplished, which are ongoing and which ones have yet to be completed.

# Implementation Program

The following program has been prepared to assist the Town in the process of implementing the watershed management plan recommendations. The implementation program organizes the recommendations by each of the five goals and identifies the local department and entities that will be most responsible for carrying out the actions. The program also identifies a time period for implementation. The following are the time periods for implementation:

Ongoing	Actions which are continuous or are already being carried out
Immediate	Actions which should be undertaken in 1-2 years
Short	Actions which should be undertaken within 3-5 years
Long	Actions which will take more than 5 years to be initiated or completed.

## ***Goal 1. Improve the water quality of Cains Brook/Mill Creek to meet New Hampshire water quality standards***

**Objective 1:** Ensure that Cains Brook meets Class B water quality standards.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
1. Protect shoreline trees and shrubs.	Ongoing, Long	Con. Comm., Rockingham Land Trust	Minimal; Seabrook Conservation Fund or other acquisition funds as available.	No Action
2. Review/ update stormwater management and erosion control regulations.	Ongoing	Board of Selectmen; Planning Board	No cost.	Stormwater Management Regulations Adopted; Stormwater Manual for developers adopted by Planning Board.
3. Address the riparian shoreline erosion.	Short	NH DOT; Con. Comm.	Unknown. Cost should be borne by NH DOT.	No Action
4. Reducing the impact of small motor craft on the erosion of tidal marsh banks in Mill Creek.	Ongoing	NH Marine Patrol, Hampton/Seabrook Harbor Master	No cost.	NH Dept. of Safety effective 10/1/07 all ski craft banned from salt marshes of the Hampton/ Seabrook estuary.
5. Amend the town's earth excavation ordinance.	Short	Planning Board, Selectmen	No cost.	No Action
6. Monitor/maintain sanitary sewer system.	Ongoing	DPW	As part of maintenance program	Ongoing

**Objective 2:** Ensure that natural and man-made portions of the Cains Brook system contribute to water quality and habitat for aquatic life.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
7. Dredge Cains Pond and Cains Mill.	Immediate	Con. Comm.	\$315,000 plus permitting (\$20,000)	To be completed in 2009
7a. Design and install a water quality treatment device in the town utility easement on the west side of Route 1.	Immediate	Con. Comm.	\$90,000	To be completed in 2009
8. Install modifications to the Route 1 culvert and weir.	Immediate Short	Con. Comm., Selectmen, NHDOT	\$80,000	To be completed in 2009
9. Fund/install a nature-friendly spillway & pursue a conservation easement at Noyes Pond.	Short	Con. Comm.	To be determined.	To be completed no later than 2010.

**Objective 3:** Work toward having the surface waters and riparian shorelands of the Cains Brook Watershed be free of man-made debris.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
10. Establish outreach program to watershed residents and businesses to maintain a debris-free stream corridor.	Immediate	Con. Comm., NH DOT, NH DES	Minimal. Volunteer time.	Con. Comm. established Clean Up Action Committee to work with businesses along Route 1.
10a. Undertake a trash reduction pilot project within the Route 1 corridor.	Immediate	Conservation Commission	Minimal	To be initiated in 2008
11. Enact a provision to control wind-blown trash.	Short	Con. Comm.	Minimal; to be grant funded.	No Action
12. Improve the Route 1 drainage system.	Long	Con. Comm.	To be determined, should be minimal. Grants may be available.	Identified the location of stormwater discharges along Route 1.

**Goal 2.** *Improve the management of stormwater runoff in an effort to protect storm water quality and reduce peak stormwater flows.*

**Objective 1:** Determine Best Management Practices for eliminating or minimizing the effects of watershed pollutants.



Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
13. Perform spot testing of observed discharges and pursue enforcement.	Ongoing	Con. Comm., BOS	NH DES in cooperation with Seabrook; \$10,000	No Action
14. Conduct dry/wet weather outfall investigations of the Town's MS4's.	Short	Con. Comm., DPW	No Cost	No Action

**Objective 2:** Encourage Town of Seabrook DPW, NH Department of Transportation, key businesses and landowners to employ Best Management Practices to treat stormwater runoff.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
15. Attach stainless steel embossed plates to all street storm drains.	Short	DPW	\$2,500	To be completed in 2008
16. Monitor all Stormwater Operations and Maintenance Plans to ensure compliance.	Ongoing	Con. Comm., Building Inspector	No Cost	O & M Manual prepared and approved by PB.

**Goal 3. Provide suitable recreational opportunities that are directly related to the waters of Cains Brook.**

**Objective 1:** Maintain and, where appropriate, upgrade the existing public access points to the waters of the watershed.

**Objective 2:** Identify additional suitable locations for public access.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
17. Improve the public access of the small boat launching area on Cains Mill Pond.	Short	Con. Comm., DPW	Minimal--\$10-15,000	No Action
18. Investigate upgrading the public access area on Lakeside Drive.	Short	Con. Comm., DPW	Minimal--\$10,000	To be complete in 2009
19. Investigate/develop small boat launch area on Mill Creek.	Ongoing	Con. Comm.	\$50,000	No Action

**Objective 3:** Ensure that the depths of Cains Pond and Cains Mill Pond are suitable for hand-powered craft and a healthy aquatic environment.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
19a. See Actions 7 and &7a above	Immediate	Con. Comm.	See Actions 7 and &7a above	To be completed in 2009

***Goal 4. Build community support for the protection and enhancement of the land and water resources of the Cains Brook Watershed.***

**Objective 1:** Prepare an outreach program to citizens and businesses to promote and implement the watershed plan.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
20. Hold informational meetings and local access television broadcasts.	Ongoing	Con. Comm.	Minimal	No specific action.
21. Develop a town web page to promote: the long-term environmental value of the watershed, etc.	Short	Con. Comm., DPW	Minimal	Web page as part of NH DES grant for pet waste. Partial fulfillment of action.
22. Pursue grants to fund Seabrook student awareness, education and field trips.	Ongoing	Con. Comm.	\$5,000 annually	No Action
23. Prepare and implement a long-term business outreach program.	Short	Con. Comm.	Minimal	Con. Comm. has established a Clean Up Action Committee to work with businesses along Route 1.
24. Adopt Watershed Plan by reference.	Short	Planning Board	No Cost	Completed.
25. Establish a volunteer organization to help implement Watershed Management Plan.	Short	Con. Comm.; BOS	Minimal	No Action
26. Establish long-term outreach program.	Short	Con Comm.	Minimal--\$5,000 start up; \$1,000 annually	Partially fulfilled. See Action #23 above

***Goal 5. Preserve, protect and restore critical anadromous and freshwater fisheries, wildlife habitat and migration corridors, and rare and endangered species.***

**Objective 1:** Undertake habitat inventories and research of the watershed's aquatic and terrestrial resources.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
27. Undertake a Habitat Restoration Study within the watershed.	Ongoing	Con. Comm.	\$25,000	NH DES will work with the town to conduct an initial

				physical and biological assessment to gather some baseline information that will be used to inform future work.
28. Assist with matching funding and research study suggestions for Seabrook student studies along the brook, ponds and creek.	Short	Con. Comm., DPW	Minimal	No Action
29. Implement the Habitat Restoration Plan.	Ongoing	Con. Comm.	Determined at completion of Restoration Plan	No Action

**Objective 2:** Protect and maintain the valuable functions of watershed wetlands, streams and ponds.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
30. Update and strengthen wetlands section of the town-zoning ordinance.	Ongoing	Con. Comm.	No cost	2008 revisions to wetland regulations strengthened the restrictions on vegetative cutting and updated provisions for buffer/setback.
31. Undertake a Prime Wetland Study to determine the highest value wetlands.	Short	Con. Comm., DPW	Match to Estuaries Grant. Up to \$10,000	No Action

**Goal 6.** *Provide for long-term health and environmental quality of Cains Brook and Mill Creek by ensuring that the Watershed Plan's goals are continually met.*

**Objective 1:** Monitor water quality at appropriate locations in Cains Brook and Mill Creek in cooperation with personnel from NHDES on a semi-annual basis.

Action	Priority	Responsible Party	Estimated Cost to Seabrook	2008 Update
32. Establish a monitoring program to measure depths in Cains Brook and Cains Mill Pond on an annual basis.	Ongoing	Con. Comm.	Mimimal.	To start in 2009 subsequent to initial pond dredging.

33. Establish a water quality monitoring program in cooperation with personnel from	Immediate/ On going	Con. Comm.	NH DES in cooperation with Seabrook \$5-10,000	Con. Comm. conducted monitoring in 2007 at 14 stations along Cains Brook. Monitoring to continue in summer of 2008
34. Establish a bio- monitoring program in cooperation with NH DES.	Immediate	Con. Comm.	NH DES in cooperation with Seabrook. Minimal—\$500	To be initiated in 2008.
35. Review and monitor Watershed Action Plan on annual basis	Short	Con. Comm., DPW	Minimal	Ongoing

# **Appendix A**

## **Water Quality**

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# Water Quality Terminology & Definitions

## Designated Uses

Designated uses are the desirable uses that surface waters should support such as swimming (i.e., primary contact recreation) and fishing (i.e., aquatic life). The NHDES includes seven specific designated uses shown in Table B1. Each of these designated uses, with the exception of wildlife, were assessed for the most recent reporting cycle. For the most of the Portsmouth area assessment unit's aquatic life was either not assessed or there was insufficient information.

**Table A1: Designated Uses for New Hampshire Surface Waters**

Designated Use	DES Definition	Applicability
Aquatic Life	Waters that provide suitable chemical and physical conditions for supporting a balanced, integrated and adaptive community of aquatic organisms.	All surface waters
Fish Consumption	Waters that support fish free from contamination at levels that pose a human health risk to consumers.	All surface waters
Shellfish Consumption	Waters that support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.	All tidal surface waters
Drinking Water Supply	Waters that with conventional treatment will be suitable for human intake and meet state/federal drinking water regulations.	All fresh surface waters
Primary Contact Recreation (i.e. swimming)	Waters suitable for recreational uses that are likely to result in full body contact and/or incidental ingestion of water.	All surface waters
Secondary Contact Recreation	Waters that support recreational uses that involve minor contact with the water.	All surface waters
Wildlife	Waters that provide suitable physical and chemical conditions in the water and the riparian corridor to support wildlife as well as aquatic life.	All surface waters

*Source: Section 305 (b) and 303(d) Consolidated Assessment and Listing Methodology, NHDES, December 2002*

## Use Support Attainment Options

Each designated use for each assessment unit is assigned one of the following four use support attainment options:

*Fully Supporting:* A use is fully supporting if there is sufficient data or evidence to determine that the use is fully supporting and, there is no other data or evidence indicating an impaired or threatened status.

*Not Supporting:* A use is not supporting (i.e., impaired) if there is sufficient data or evidence to indicate impairment.

*Insufficient Information:* This option is assigned to any use associated with any Assessment Unit, which, in accordance with this document, has some useable data or information but not enough to make a final assessment decision.

*Not Assessed:* This option is assigned to any use associated with any Assessment Unit, which does not have any useable data or information to make an assessment decision.

*Threatened:* For this assessment a use was defined as threatened when there were no measured in-stream violations but other data indicate the potential for water quality violations.

## **Appendix B**

# **Plant and Wildlife Species of the Watershed**

## Potential and Observed Wildlife Species List

Common Name	Scientific Name	Status	Wetland
Red-spotted newt	<i>Notophthalmus v. viridescens</i>		
Eastern American toad	<i>Bufo a. americanus</i>		
Northern spring peeper	<i>Pseudacris c. Crucifer</i>		
Bullfrog	<i>Rana catesbeiana</i>		XXX
Green frog	<i>Rana clamitans melanota</i>		XXX
Common snapping turtle	<i>Chelydra s. serpentina</i>		
Eastern painted turtle	<i>Chrysemys p. picta</i>		XXX
Northern water snake	<i>Nerodia s. sipedon</i>		
Eastern ribbon snake	<i>Thamnophis s. sauritus</i>		
Great blue heron	<i>Arde herodias</i>		
Green heron	<i>Butorides virescens</i>		
Canada goose	<i>Branta canadensis</i>		
Wood duck	<i>Aix sponsa</i>		XXX
American black duck	<i>Anas rubripe</i>		XXX
Mallard	<i>Anas platyrhynchos</i>		XXX
American robin	<i>Turdus migratorius</i>		
Gray catbird	<i>Dumatella carolinensis</i>		XXX
Northern mockingbird	<i>Mimus polyglottos</i>		
Cedar waxwing	<i>Bombycilla cedrorum</i>		XXX
Blue-winged warbler	<i>Vermivora pinus</i>		
Yellow warbler	<i>Dendroica petchia</i>		
Common yellowthroat	<i>Geothlypis trichas</i>		
Song sparrow	<i>Melospiza melodia</i>		
Dark-eyed junco	<i>Junco hyemalis</i>		
Northern cardinal	<i>Cardinalis cardinalis</i>		
Red-winged blackbird	<i>Agelaius phoeniceus</i>		XXX
Common grackle	<i>Quiscalus quiscula</i>		
American goldfinch	<i>Carduelis tristis</i>		XXX
Willow flycatcher	<i>Empidonax traillii</i>		XXX
Eastern kingbird	<i>Tyrannus tyrannus</i>		
Tree swallow	<i>Tachycineta bicolor</i>		XXX
Black-capped chickadee	<i>Poecile atricapillus</i>		
Belted kingfisher	<i>Cerylinae alcyon</i>		XXX
Mourning dove	<i>Zenaida macroura</i>		
Eastern phoebe	<i>Sayornis phoebe</i>		
Blue jay	<i>Cyanocitta cristata</i>		
American crow	<i>Corvus branchyrhynchos</i>		
Tufted titmouse	<i>Baeolophus bicolor</i>		

A species is considered observed when an animal is seen or presence is verified by tracks, scat, or song. Observed species are indicated by an 'X' and potential species (ie. Those that may use the property based on available habitat types) are indicated by listing

\*Species that are listed as State Threatened, Endangered, or Species of Concern are indicated by a "T", "E", and "S" respectively

Source: Dredge & Fill Application for dredging of Cains Pond Seabrook, as prepared by NH Soil Consultants for the Town of Seabrook, NH\



# Cains Pond Plant List

August 2003, updated March 2006

<u>Layer:</u>	<u>Common name:</u>	<u>Scientific name:</u>
<b>Tree</b>	Red maple	<i>Acer rubrum</i>
	Black willow	<i>Salix nigra</i>
	Black locust	<i>Robinia pseudoacacia</i>
	American elm	<i>Ulmus americana</i>
	Black cherry	<i>Prunus serotina</i>
	White pine	<i>Pinus strobus</i>
<b>Shrub:</b>	Speckled alder	<i>Alnus rugosa</i>
	Glossy buckthorn	<i>Rhamnus frangula</i>
	Northern arrowwood	<i>Viburnum dentatum</i>
	Silky dogwood	<i>Cornus amomum</i>
	Meadow sweet	<i>Spirea latifolia</i>
	Steeplebush	<i>Spirea tomentosa</i>
<b>Herbaceous:</b>	Broad-leaved cattail	<i>Typha latifolia</i>
	Purple loosestrife	<i>Lythrum salicaria</i>
	Common reed	<i>Phragmites australis</i>
	White water lily	<i>Nymphaea odorata</i>
	Duckweed	<i>Spirodela polyrhiza</i>
	Jewelweed	<i>Impatiens capensis</i>
	Pennsylvania smartweed	<i>Polygonum pennsylvanicum</i>
	Soft rush	<i>Juncus effusus</i>
	Sensitive fern	<i>Onoclea sensibilis</i>

*Source: Dredge & Fill Application for dredging of Cains Pond Seabrook, as prepared by NH Soil Consultants for the Town of Seabrook, NH*

# New Hampshire Natural Heritage Bureau

Known occurrences of rare species and exemplary natural communities  
occurring wholly or in part in the Mill Creek Watershed, Seabrook, NH

Name	Local pop'n	Listing Status		Conservation Rank	
	Last reported	Federal	State	Global	State
<b><u>Natural Community</u></b>					
Brackish marsh	1997	--	--		Imperiled (S2)
High salt marsh	1997	--	--		Rare or uncommon (S3)
Low salt marsh	1997	--	--		Rare or uncommon (S3)
Saline/brackish intertidal flat	1997	--	--		Rare or uncommon (S3)
Saline/brackish subtidal channel/bay bottom	1997	--	--		Rare or uncommon (S3)
Tidal creek bottom	1997	--	--		Rare or uncommon (S3)
<b><u>Plant species</u></b>					
Arethusa (Arethusa bulbosa)	1903	--	Threatened	Apparently secure (G4)	Imperiled (S2)
Bulbous Bitter Cress (Cardamine bulbosa)	1896	--	Endangered	Secure (G5)	Critically imperiled (S1)
Cross Polygala (Polygala cruciata var. aquilonia)	1898	--	Endangered	Apparently secure (T4)	Critically imperiled (S1)
Dwarf Glasswort (Salicornia bigelovii)	1982	--	Endangered	Secure (G5)	Critically imperiled (S1)
Engelmann's Quillwort (Isoetes engelmannii)	1896	--	Endangered	Apparently secure (G4)	Critically imperiled (S1)
Netted Chain Fern (Woodwardia areolata)	1897	--	Endangered	Secure (G5)	Critically imperiled (S1)
Nuttall's Reedgrass (Calamagrostis cinnoides)	?	--	Endangered	Secure (G5)	Critically imperiled (S1)
Salt-marsh Gerardia (Agalinis maritima)	1982	--	Threatened	Secure (G5)	Imperiled (S2)
Small Spike-rush (Eleocharis parvula)	1896	--	Threatened	Secure (G5)	Imperiled (S2)
Tubular Thoroughwort (Eupatorium fistulosum)	1972	--	Endangered	Secure (G5)	Critically imperiled (S1)
<b><u>Vertebrate species</u></b>					
Blanding's Turtle (Emydoidea blandingii)	1990	--	--	Apparently secure (G4)	Rare or uncommon (S3)

December 2005

## **Appendix C**

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# **NHDES Hazardous Waste and Potential Contamination Sources**

## PCS Inventory Sites Potential Contamination Source

Map ID#	Site Name	Project Type
A	Sam's Club	NT
B	J&C Industries	MW, MAN
C	Sam's Club Service Center	VSR
D	Tyler Machine	MW
E	Dynamic Chromium Inc.	MW, MAN
F	Wil-Mor Engineering Co.	MW
G	Bocra Industries	MW
H	Martain International	MW
I	Rowe Machine	MW
J	ERA Industries	MAN
K	Dexter Hysol	MAN
L	Walter E. Knowles Auto Salvage	WSPS

Source: NHDES, One Stop Program, WEB GIS, 2006.

## Remediation Sites

Map ID #	Site Name	Project Type
1	HENKEL TECHNOLOGIES	UIC
2	K J QUINN & COMPANY INC.	HAZWASTE, UIC
3	LEONE LEBAR	OPUF
4	EATON PROPERTY	LUST
5	SEABROOK TIRE & AUTO INC.	UIC
6	EATONS FISH MARKET	UIC
7	HOWARD WOLPERT	LUST
8	JAMES YOKLEY	OPUF
9	MILDRED KNOWLES/GAIL MCNATT HAIR SALON	UIC
10	ADAM'S CAMPGROUND	HAZWASTE
11	THOMAS CAMPBELL	OPUF
12	FRANK LOWRY	OPUF
13	IAN LEWIS	OPUF
14	JOSEPH BURNS	OPUF
15	SEACOAST SHOPPING CENTER	HOLDTANK
16	SEACOAST TATOO	OPUF
17	BAILEY CORPORATION/VENTURE	RAPIDINF
18	JIFFY LUBE	HAZWASTE, UIC
19	RICHDALE CONV STORE 90	LUST
20	CORNER OF PINE STREET AND ROUTE 1	SPILL/RLS
21	WATTS GARAGE	HAZWASTE, SPILL/RLS, ETHER
22	SEABROOK (AUTO SHINE)	SEPTIC
23	GETTY STATION 55268	LUST, UIC

Source: NHDES, One Stop Program, WEB GIS, 2006

## Hazardous Waste Generators

Map ID#	Site Name
1	CIMARRON REALTY TRUST
2	J & C INDUSTRIES
3	BOCRA INDUSTRIES INC
4	SEABROOK INTERNATIONAL LLC
5	EVEREST ELECTRONICS CORP
6	AERO DYNAMICS INC
7	WILL-MOR ENGINEERING CO INC
8	VIKING WELDING & FABRICATION
9	HENKEL CORP
10	PROTECTIVE MATERIALS CO INC
11	HENKEL TECHNOLOGIES
12	MORTON INTERNATIONAL INC
13	E R A INDUSTRIES
14	K J QUINN & CO INC
15	RUGGLES KLINGEMANN MFG CO INC
16	J & J AUTO BODY
17	SEABROOK TIRE & AUTO
18	PARKMAN CHIROPRACTIC
19	E J Z CARS II
20	CAREY AUTO BODY
21	BERTS AUTO RESEARCH
22	MACKENZIE SCOTT
23	ADVANCED EQUIPMENT INC
24	SPHEREX INC
25	NORTHEAST GENERATION SERVICES
26	NEW ENGLAND TELEPHONE CENTRAL OFFICE
27	SHAWS SUPERMARKETS INC
28	HOME DEPOT THE 3404
29	MALONEY JOHN J JR DDS
30	EXXON MOBIL OIL CORP 16476
31	MEINEKE DISCOUNT MUFFLER
32	WALMART 1762
33	CAN AM PACKAGING
34	SEABROOK HIGHWAY DEPT TOWN OF
35	PROMPTO INC
36	MIDAS SEABROOK
37	JIFFY LUBE STORE 1489
38	WATTS GARAGE
39	AUTO ZONE 5202
40	SANDS J F
41	PINE STREET AUTO BODY
42	NTB #752

Source: NHDES OneStop Program, WEB GIS, 2006

## **Appendix D**

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### **EPA Nine Criteria Matrix**

**Watershed Plan Key Elements based on EPA Nine Minimum Elements of Watershed Plan  
Cains Brook Watershed Management Plan –June 2008--**

<b>Waterbody Name</b>	<b>Cains Pond</b>
<b>Assessment Unit ID</b>	<b>NHIMP600031004-05</b>
<b>303(d) Impairments</b>	<b>Secondary Contact Recreation--Non-Supporting:</b> navigation channels normally used for boating have been unintentionally filled in as a result of human activity such that passage of boats is now obstructed. (CALM language)
<b>Water Quality Rules</b>	<p>Env-Ws 1703.01(c) All surface waters shall provide, whenever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.</p> <p>Env-Ws 1703.03 general Water Quality Criteria  (c) The following physical, chemical and biological criteria shall apply to all surface waters:  (1) All surface waters shall be free from substances in kind or quantity which:  e. Interfere with recreational activities;</p>
<b>a. Sources &amp; Causes of Impairment</b>	<p><b>Cause:</b> Sediment laden stormwater runoff that is untreated causing obstructions to boating navigation.</p> <p><b>Sources:</b> Accumulated sediment in pond and sediment loading from stormwater runoff and tributaries. Comparisons of pond bathymetric surveys performed in 2003 and 2007 show rapid shoaling of the pond near US Route 1 and Lakeshore Drive, with as much as 2.0 feet of sediment accumulation (near Route 1) and remaining water depths have been reduced 1 to 2.2 feet in the last 4 years. The pond basin near Route 1 has a present rate sedimentation rate averaging 0.3 feet per year and at this rate it is expected that this basin will be filled within 4 to 8 years. From other observations in Cains Pond (western basin), it appears that the invasive Purple Loosestrife covers pond areas less than a foot deep, therefore boat navigation, which is already limited, will be impossible within 4 years if the shoaling near Route 1 is not halted and depths restored. The cause is primarily attributed to stormwater runoff from surrounding roadways and impervious surfaces resulting from residential and commercial development in the watershed. US Route 1, recently widened to 6 lanes in this area, currently has no stormwater treatment or grit separation prior to discharge into Cains Pond. Route 1 to the south of Cains Pond also drains to the pond. There is no curbing or storm drainage system and there is evidence of road-shoulder erosion.</p> <p>Tributaries associated with the pond do not contribute significant amounts of sediment. The tributary to the north is Mary's Brook and Mary's Pond, thus sediments from Mary's Brook are trapped in Mary's Pond. The tributary to the west is Cains Brook, which has Secord's Pond on one branch (trapping sediment) and the western end of Cains Pond where this tributary enters, is a large wetland, further trapping inflow sediment.</p> <p>Residents in the area have traditionally used the pond for fishing and other recreational pursuits; however, these uses have become increasingly restricted as the pond has filled in with sediment to a depth that no longer supports navigation.</p>

<b>Waterbody Name</b>	<b>Cains Pond</b>
<b>Assessment Unit ID</b>	<b>NHIMP600031004-05</b>
<b>b. Estimate of the load reductions expected from management measures</b>	<p><b>Purpose of Project:</b> To remove pond bottom sediments from Cains Pond in order to attain an unimpaired condition for the designated use of secondary contact recreation, including navigation and fishing. To meet the Secondary Contact Recreation function there has to be sufficient depth for a boat to navigate and sufficient depth to prevent the heavy growth of aquatic or wetland plants that would also block navigation. These depths are similar to those minimum depths needed for fish and fishing, including sufficient depth to prevent the pond freezing all the way to the bottom in winter, a condition which would kill fish. Recreational boating activity has been observed on nearby Secord's Pond (just to west on Cains Brook), which was recently dredged to between 8 and 14 feet deep; Mary's Pond (just to the north) at 6 feet deep; and Noyes Pond (just to the east) dredged in the 1980's to between 10 to 12 feet deep; show that these depths are sufficient for boating, fishing and are also sufficient to inhibit the growth of choking aquatic plants.</p> <p><b>Goal (unimpaired condition)</b>—Dredging frequency not to exceed once every 15 years.  <b>Target Dredge Depth</b> — 6 to 7 feet—current depths 1-2.2 feet  <b>Amount of Sediment Removal to Meet Goal</b>—7500 cubic yards.  <b>Current Rate of Sedimentation</b>—0.3 feet per year (based on observation from 2004 to 2008)</p>
c. Describe NPS management measures that will need to be implemented to achieve load reductions and identify locations of BMPs on a map.	<p><b>In Pond BMP:</b> Dredge pond by removing 7500 cubic yards of sediment to mitigate of sediment previously discharged into Cains Pond.</p> <p>Pond deposition has been exacerbated by several unusual weather-related occurrences over the past several years. In 2006, there was significant flooding and deposition of sediment during a 5-day period in May of continual rainfall that totaled over 20 inches. This 2006 flood also caused the breaching of an earthen dam owned by the Town of Salisbury, resulting in substantial sediment discharge directly into Secord's Pond and also into Cains Pond just down stream. Similarly, although not as intense, flooding took place during April of 2007 as a result of extended heavy rainfall.</p> <p><b>Stormwater BMP:</b> Prior to dredging and an action under the first phase of pond restoration, there will be installation of an in-ground water quality treatment unit just north of Cains Pond in a town easement parallel to, and west of, Route 1 to treat stormwater discharge from US Route 1 that is currently untreated. From investigating the Cains Pond site, it is clear that a large volume of sand is coming from US Route 1. Road shoulder erosion, sand deposits within the pond and a substantial sand delta deposit that has buried the primary storm drain outfall have been observed. The sand loading is attributed primarily to bed load from sheet flow and storm drains. Bed load is typically not measured and nor is it reflected in storm drainage water quality prediction models.</p> <p><b>Tributary BMP's:</b> Detention basins associated with recent large developments in Mary's Brook sub-watershed.</p>



<b>Waterbody Name</b>	<b>Cains Pond</b>	
<b>Assessment Unit ID</b>	<b>NHIMP600031004-05</b>	
<b>d. Estimate the amounts of technical &amp; financial assistance needed including costs, funding sources and authorities that will implement BMPs.</b>	<b>Source of Funding:</b> includes implementation, operation and maintenance <ul style="list-style-type: none"> <li>Town of Seabrook--\$59,400</li> <li>NH DES (EPA)--\$89,100</li> </ul>	<b>Estimate of Funding:</b> <ul style="list-style-type: none"> <li>Design &amp; permitting--\$7,000</li> <li>Construction/Construction Oversight--\$135,800</li> <li>Post Construction Monitoring--\$2,700</li> <li>Public Outreach--\$2,000</li> <li>Administrative, misc.--\$1,000</li> </ul>
	<b>Responsible Party:</b> Town of Seabrook, Conservation Commission with assistance from Waterfront Engineers (project consultant)	
<b>e. Describe information and education component used to enhance public understanding and encourage their early &amp; continued participation in selecting &amp; implementing NPS measures.</b>	<p>As part of the first phase of the Cains Brook/Mill Creek Watershed Restoration project, a public outreach plan was established that included a citizen's committee and Website page. A significant portion of the committee's work was to undertake actions to address the man-made debris within the watershed and particularly adjacent to the pond areas near US Route 1. This committee has: 1) established periodic stream walks to collect trash, 2) recruited businesses to maintain clean properties, including frequent pavement sweeping, and 3) building citizen awareness about the connection of storm drains to receiving waters of the watershed. For example, a storm drain stencil program has been initiated where stainless steel markers have been installed on catch basins with the wording <i>No Dumping Drains to River</i></p> <p>The outreach and education component for this project will be continued in this phase, with both restoration outreach and trash input reduction outreach. Other beneficial outreach and education related to bacteria sources has been funded under the 2007 NH DES Dog Waste grant for this watershed.</p>	
<b>f. Schedule for implementing the management measures outlined in the plan. The schedule should reflect the milestones in g.</b>	<p><b>Design &amp; Permitting</b>—July 1 to September 30, 2008. The DES Wetlands permit for this dredging project has already been filed for the dredging, but will require modifying, following wetland locating, to incorporate the BMP treatment unit and public access component.</p> <p><b>Installation of Stormwater Quality Unit</b>—August 1 to August 15, 2008</p> <p><b>Dredging</b>—October 15 to November, 2008—We expect the dredging work to begin following grant approval and regulatory permit approval, and be completed within five months, contingent on any approved permits and environmental dredging window restrictions (none yet specified).</p> <p><b>Post Construction Monitoring</b>—First phase November 2008; Second phase early summer 2009</p> <p><b>Public Outreach</b>—Throughout grant cycle—July 1, 2008 to June 30, 2009.</p>	
<b>g. A description of interim measurable milestones for determining whether BMPs are being implemented.</b>	<p><b>Dredge Cains Pond</b>—No later than December 1, 2008 to a depth of 6-7 feet</p> <p><b>Post Dredge Bathymetric Surveys</b>—Phase 1 immediately after dredging. Phase 2 survey by June 30, 2009</p> <p><b>Restoration of Recreational Activity</b>—Verified by resident survey.</p> <p>The Town of Seabrook intends to dredge Cains Pond in order to restore the pond to its traditional uses. To document restoration of the pond to an unimpaired condition a post dredge bathymetric survey will be performed to show that the target depth (6 to 7 feet) has been obtained. Additional bathymetric monitoring</p>	

<b>Waterbody Name</b>	<b>Cains Pond</b>
<b>Assessment Unit ID</b>	<b>NHIMP600031004-05</b>
	is scheduled for June, 2009. Restoration of boating will be verified by a resident/user questionnaire regarding project effectiveness and if possible user photographs.
<b>h. A set of criteria that can be used to determine whether loading reductions are being achieved over time &amp; substantial progress is being made toward attaining water quality standards.</b>	<p>Criteria to Determine Progress in Attaining Navigable Water Depth</p> <ul style="list-style-type: none"> <li>• Dredging has been completed by December 2008 to remove 7500 cubic yards of sediment from Cains Pond to improve average water depths to around 6-7' in the Pond.</li> <li>• Progress in sediment bed load reduction from watershed sources. Sediment deposition in the water quality unit measured to obtain estimated annual load. Substantial progress will be shown when measured deposition reductions are achieved for a period after installation and/or winter road maintenance methods are changed to reduce the amount sand applied (may be weather dependent).</li> </ul>
<b>i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item h.</b>	<ul style="list-style-type: none"> <li>• Periodic bathymetry measurements for Cains Pond show reasonable depths are being sustained.</li> <li>• Sediment deposition is monitored on a regular basis to determine level of sediment deposition.</li> </ul>

## **Appendix E**

---

### **Memorandum to NHDES Documenting Cains Pond Impairment**



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Stratham, NH 03885  
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www.waterfrontengineers.com

## ***WATERFRONT ENGINEERS LLC***

### **MEMORANDUM**

To: Sally Soule  
NHDES Watershed Division

Re: **Assessment Unit ID NHIMP600031004-05 Cains Pond  
303(d) Impairment for Secondary Contact Recreation**

Primary Town: Seabrook

From: Duncan C. Mellor, PE  
Waterfront Engineers LLC  
Seabrook Conservation Commission Consultant

Date: February 26, 2008

**Assessment Unit ID NHIMP600031004-05 Cains Pond  
303(d) Impairment**

#### **Undocumented Impairment:**

Secondary Contact Recreation

Non-Supporting: navigation channels normally used for boating have been unintentionally filled in as a result of human activity such that passage of boats is now obstructed. (CALM language)

#### **Water Quality rules**

Env-Ws 1703.01

(c) All surface waters shall provide, whenever attainable, for the protection and propagation of fish, shellfish and wildlife, and for recreation in and on the surface waters.

Env-Ws 1703.03 general Water Quality Criteria

(c) The following physical, chemical and biological criteria shall apply to all surface waters:

- (1) All surface waters shall be free from substances in kind or quantity which:
  - e. Interfere with recreational activities;

A similar impairment was previously documented for the Middles Brook Canal in Moultonborough, NH.

**a) Impairment Cause: Obstructions to boating navigation**

Sources: accumulated sediment in pond and sediment loading from stormwater runoff and tributaries.

Comparisons of pond bathymetric surveys (attached) performed in 2003 and 2007 show rapid shoaling of the pond near Route 1 and Lakeshore Drive, with as much as 2.0 feet of sediment accumulation (near Route 1) and remaining water depths have been reduced 1 to 2.2 feet in the last 4 years. The pond basin near Route 1 has a present rate sedimentation rate averaging 0.3 feet per year and at this rate it is expected that this basin near Route 1 will be filled within 4 to 8 years. From other observations in Cains Pond (western basin), it does appear that the invasive plant Purple Loosestrife covers pond areas less than a foot deep, therefore boat navigation, which is already limited, will be impossible within 4 years if the shoaling near Route 1 is not halted and depths restored.

The cause is primarily attributed to stormwater runoff and development. US Route 1, recently widened to 6 lanes in this area, currently has no stormwater treatment or grit separation. Route 1 to the south of Cains Pond also drains to the pond and with no curbing, no storm drainage system and with road shoulder erosion. (As part of the restoration plan for the pond, stormwater BMPs, an oil and grit separator located on Rt. 1, and trash reduction efforts are currently being implemented to reduce sediment loading and nuisance floatables in the pond.)

Tributaries associated with the pond do not contribute significant amounts of sediment. The tributary to the north is Mary's Brook and Mary's Pond, thus sediments from Mary's Brook are trapped in Mary's Pond. The tributary to the west is Cains Brook, which has Secord's Pond on one branch (trapping sediment) and the western end of Cains Pond where this tributary enters, is a large wetland, further trapping inflow sediment.

Local residents report that the dense aquatic plant growth and shallow depths in the pond impede navigation for small, hand powered craft such as kayaks, canoes, and light fishing craft. Small boat paddles are fouled by submerged, surface and emergent pond plant growth. From other observations in Cains Pond (western basin), it does appear that the invasive plant Purple Loosestrife covers pond areas less than a foot deep, therefore boat navigation, which is already limited, will be impossible within 4 years if the shoaling near Route 1 is not halted and depths restored. Residents in the area have traditionally used the pond for fishing and other recreational pursuits; however, these uses have become increasingly restricted as the pond has filled in with sediment to a depth that no longer supports navigation.

Additionally, based on observations of Cains Pond and Cains Mill Pond, water depths of less than 4 feet deep become choked with a complete covering of aquatic plants in summer and are prone to freezing solid in minimal snow winters.

**b) Unimpaired Condition:**

The unimpaired condition is one that allows secondary contact recreation, including navigation, fishing, etc. To meet the Secondary Contact Recreation

function there has to be sufficient depth for the boat to navigate and sufficient depth to prevent the heavy growth of aquatic or wetland plants that would also block navigation. These depths are likely to be similar to those minimum depths needed for fish and fishing, including sufficient depth to prevent the pond freezing all the way to the bottom in winter, which would kill fish.

Observations of recreational boating activity on nearby Secord's Pond (just to west on Cains Brook), which was recently dredged to between 8 and 14 feet deep; Mary's Pond (just to the north) at 6 feet deep; and Noyes Pond (just to the east) dredged in the 1980's to between 10 to 12 feet deep; show that these depths are sufficient for boating, fishing and sufficient to inhibit the growth of choking aquatic plants. The target dredge depth for Cains Pond has been set at 6 to 7 feet, which will be sufficient to support Secondary Contact Recreation for small, hand-powered craft.

**c) Pollutant Loading Reductions and Restoration Actions Needed to Attain Use:**

The primary Route 1 stormwater outfall is being modified to incorporate a load reduction BMP under phase 1 of the Cains Pond Restoration Project, during 2007/2008 and this is expected to reduce the Route 1 sediment and pollutant source. Phase 2 of the Cains Pond Restoration Project is intended to mitigate the sediment already dumped into Cains Pond and restore previous water depths, presently estimated to require the removal of 7,500 cubic yards of accumulated sediment from the pond to correct the navigation impairment.

From investigating the Cains Pond site, it is clear that a large volume of sand has before and presently is coming from Route 1 as seen in road shoulder erosion, sand deposits and a substantial sand delta deposit that has buried the primary storm drain outfall. The sand loading is primarily in the form of bed load in the sheet flow and storm drains, which typically is not measured and not reflected in storm drainage water quality prediction models.

If the eastern basin of the pond is dredged to restore water depths of about 6 to 7 feet (the target dredge depth), this should provide about 16 to 22 years of pond restoration (until pond depths are again reduced to about one foot of depth) at the present sediment accumulation rate; and longer when the stormwater sediment load is reduced.

**d) Post remediation Documentation of Use Attainment:**

Currently, the Town of Seabrook intends to dredge Cains Pond in order to restore the pond to its traditional uses. To document restoration of the pond to an unimpaired condition a post dredge bathymetric survey will be performed to show that the target depth (6 to 7 feet) has been obtained. Restoration of boating will be verified by a resident/user questionnaire regarding project effectiveness and if possible user photographs.



**CAINS POND AIR PHOTO**

## **Appendix F**

---

### **Additional Water Quality Tables 2007 VRAP Results**



# 2007 CAIN'S BROOK WATERSHED VRAP DATA

	Measurements not meeting New Hampshire surface water quality standards
	Measurements not meeting NHDES quality assurance/quality control standards

## 03-FMB, Folly Mill Brook Upstream of Folly Mill Road, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	<10 NTU above backgrd	NA	Narrative	NA	<406	<126
5/23/2007	12:28	8.66	81.8	6.19	1.19	350.7	12.4	15.6		
6/27/2007	12:18	6.35	62.1	5.96	0.23	594.0	14.2	25.3	10	
7/26/2007	12:05	6.12	59.1	5.94	0.17	634.0	13.8	24.5	20	
8/22/2007	11:37	5.82	54.0	6.76	0.81	642.0	12.8	22.1	110	28
9/26/2007	10:40	5.44	55.2	5.82	0.39	669.0	14.7	20.5		

## 09-CNS, Cain's Brook Downstream of I95, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Water Temp. (°C)	Air Temp. (°C)	Specific Conductance (μS/cm)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	<10 NTU above backgrd	Narrative	NA	NA	<406	<126
5/23/2007	12:10	9.63	90.7	6.39	0.67	11.8	18.8	535.0		
6/27/2007	11:50	8.48	86.6	6.44	1.76	16.0	28.1	646.0	190	
7/26/2007	11:45	7.46	78.2	6.48	3.12	16.6	21.5	726	80	
8/22/2007	11:26	8.59	85.7	6.44	1.91	14.8	26.7	757.0	140	129

9/26/2007	10:35	7.85	80.8	6.33	3.33	16.6	21.6	830.0		
-----------	-------	------	------	------	------	------	------	-------	--	--

## 02-FMB, Secord's Pond Outlet, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	<10 NTU above backgrd	NA	Narrative	NA	<406	<126
5/23/2007	11:47	7.65	75.7	6.23	0.92	318.1	13.8	18.0		
6/27/2007	11:31	7.39	92.2	6.93	0.76	468.8	26.7	27.1	50	
7/26/2007	11:30	7.66	94.4	7.03	0.72	530	25.8	26.1	5	
8/22/2007	11:01	5.98	68.5	6.66	3.05	577.0	20.8	20.6	5	11
9/26/2007	10:22	8.35	91.8	6.81	1.54	611.0	20.1	23.4		

## 06-CNS, Cain's Brook Downstream of Secord's Pond, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean	Chl-a
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	As Naturally Occurring	NA	Narrative	NA	<406	<126	15 mg/L
5/23/2007	11:27	9.53	89.7	6.47	0.80	462.7	12.2	17.8			
6/27/2007	11:15	7.43	83.2	6.74	1.49	615.0	20.8	27.8	100		
7/26/2007	11:18	6.28	74.9	6.75	2.92	673.0	20.4	26.2	30		1.994
8/22/2007	10:48	7.94	81.1	6.54	2.28	700.0	15.9	18.2	80	62	
9/26/2007	10:15	7.34	79.1	6.65	2.80	732.0	18.8	21.1			

## 02-MRY, Mary's Pond Above Dam, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean	Chl-a
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	As Naturally Occuring	NA	Narrative	NA	<406	<126	15 mg/L
5/23/2007	11:04	7.81	75.8	6.54	0.79	647.0	13.1	19.5			
6/27/2007	10:55	5.23	62.2	6.53	0.88	722.0	23.8	26.1	30		
7/26/2007	10:56	6.14	72.5	6.73	1.25	716.0	23.5	26.3	30		1.44
8/22/2007	10:30	6.52	70.4	6.47	0.92	710.0	18.4	19.7	60	38	
9/26/2007	10:02	8.81	98.1	6.90	1.38	723.0	20.4	22.4			

## 04-CNS, Cain's Pond Outlet at Weir, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean	Chl-a
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	As Naturally Occuring	NA	Narrative	NA	<406	<126	15 mg/L
5/23/2007	10:42	8.98	86.3	6.54	0.03	548.0	13.5	19.3			
6/27/2007	10:37	7.77	95.0	6.67	2.32	621.0	24.9	30.1	150		
7/26/2007	10:47	4.77	57.1	6.54	2.06	671.0	23.4	26.4	70		2.095
8/22/2007	10:27	2.89	30.3	6.27	2.29	679.0	17.3	18.0	5	37	
9/26/2007	09:57	4.82	53.1	6.39	1.07	703.0	20.0	21.7			

### 03-CNS, Cain's Mill Pond Inlet, Seabrook

Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	As Naturally Occuring	NA	Narrative	NA	<406	<126
5/23/2007	10:21	9.79	94.8	6.66	0.29	531.0	13.5	19.9		
6/27/2007	10:12	6.23	73.7	6.78	1.94	662.0	24.0	28.1	140	
7/26/2007	10:06	5.42	68.0	6.54	2.42	672.0	23	26.3	40	
8/22/2007	10:20	5.30	57.0	6.38	1.79	692.0	17.4	17.4	5	30
9/26/2007	09:50	6.13	67.1	6.51	1.37	734.0	19.8	20.7		

### 02-CNS, Noyes Pond Outlet, Seabrook

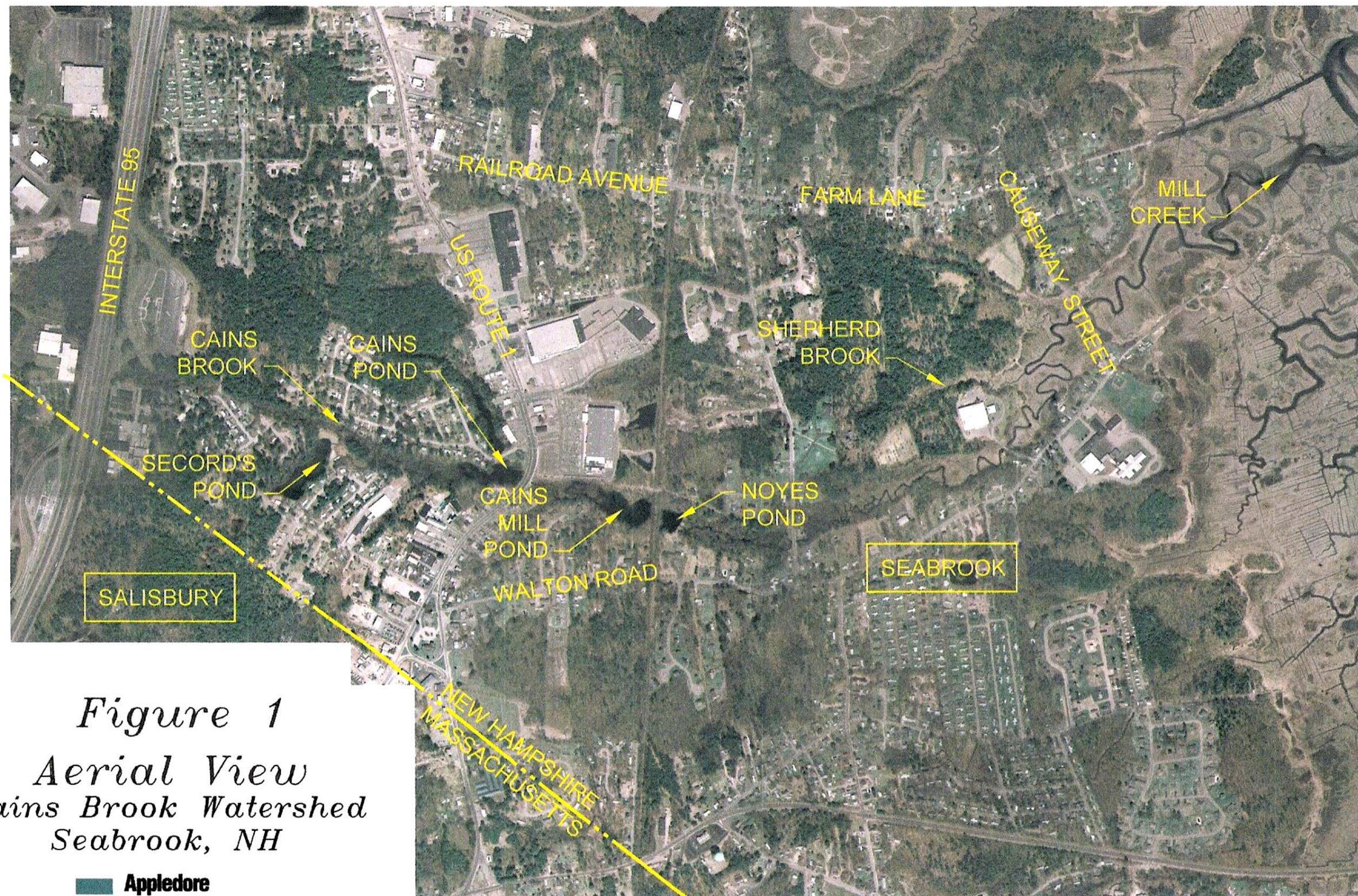
Date	Time of Sample	DO (mg/L)	DO (% sat.)	pH	Turbidity (NTUs)	Specific Conductance (μS/cm)	Water Temp. (°C)	Air Temp. (°C)	<i>E. coli</i> (CTS/100m L)	<i>E.coli</i> Geometric Mean	Chl-a
Standard	NA	>5.0	>75% Daily Average	6.5 - 8.0	As Naturally Occuring	NA	Narrative	NA	<406	<126	15 mg/L
5/23/2007	09:23	8.63	82.4	6.71	0.32	540.0	13.0	12.3			
6/27/2007	09:18	7.25	89.4	7.04	2.77	707.0	25.9	26.4	200		
7/26/2007	09:29	7.60	89.6	6.80	2.58	723.0	23.8	24.3	40		2.091
8/22/2007	09:50	6.77	70.5	6.57	2.99	762.0	17.4	17.1	90	90	
9/26/2007	09:30	7.55	83.4	6.77	4.26	794.0	20.0	21.5			

# Figures

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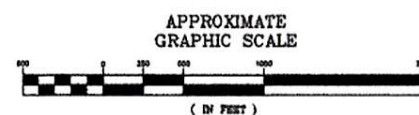




*Figure 1*  
*Aerial View*  
*Cains Brook Watershed*  
*Seabrook, NH*

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 15 Rye Street, Suite 305  
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 June 2008  
 ae@appledoreeng.com  
 2123AERIAL.dwg

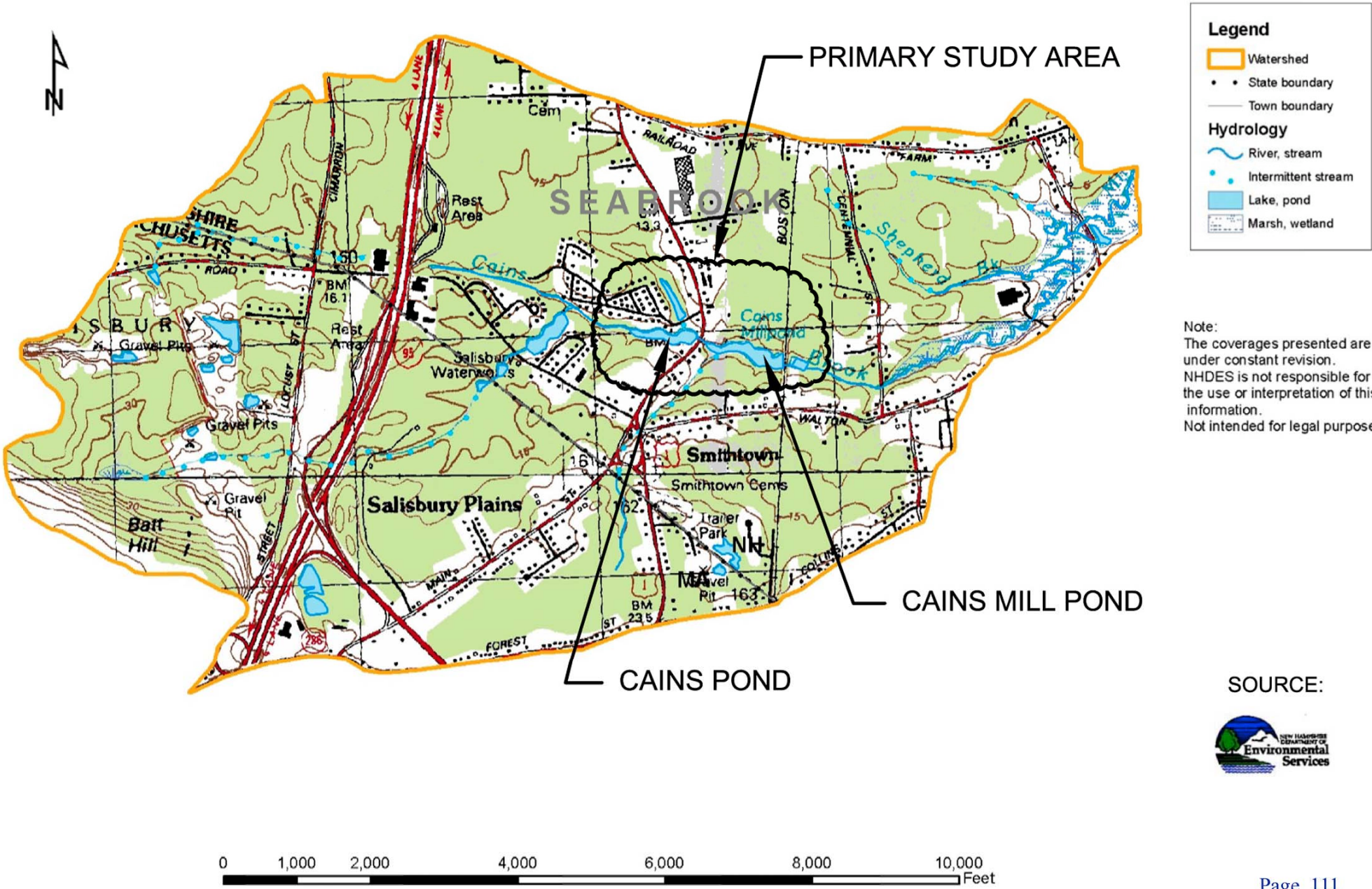


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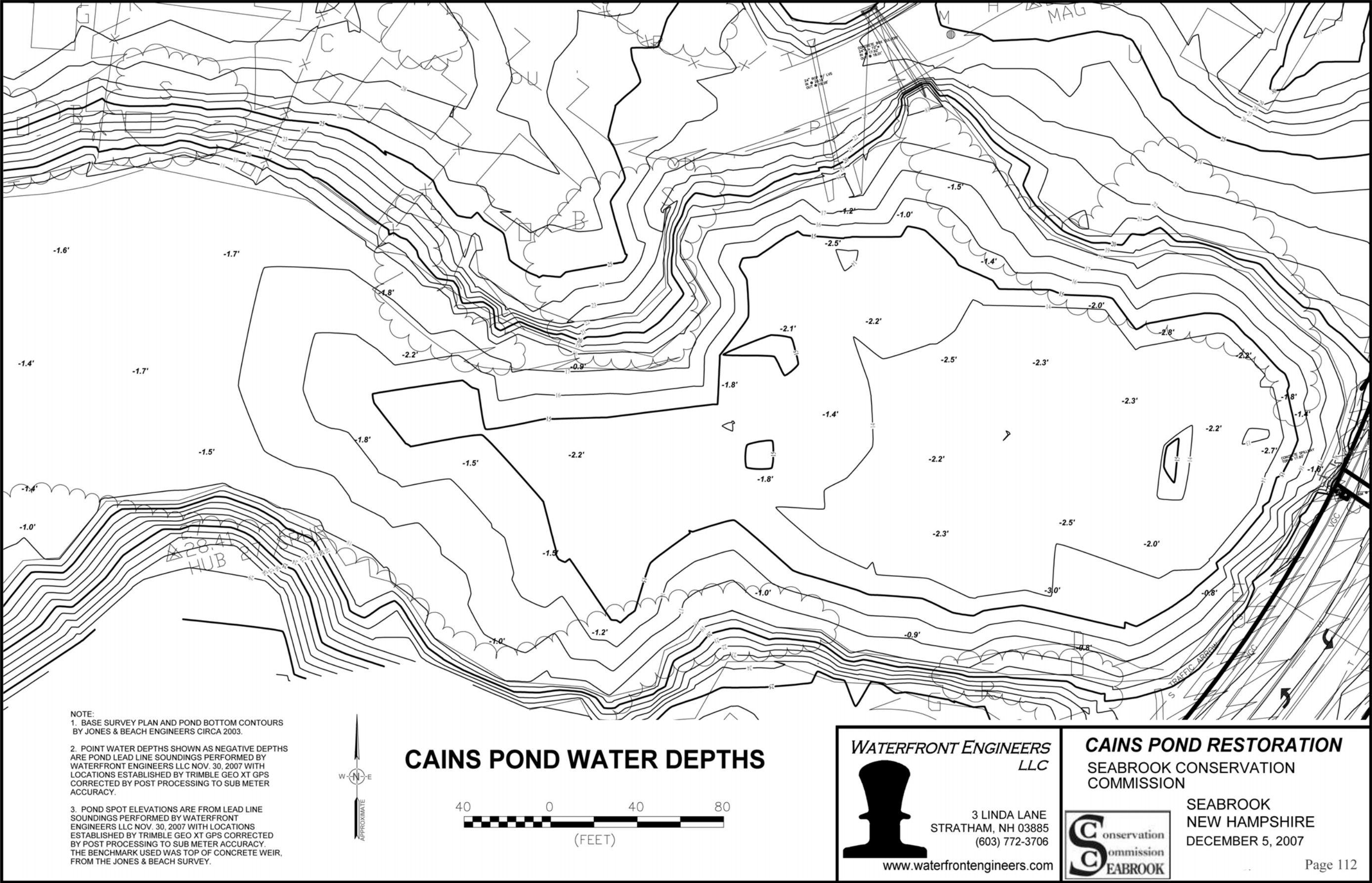
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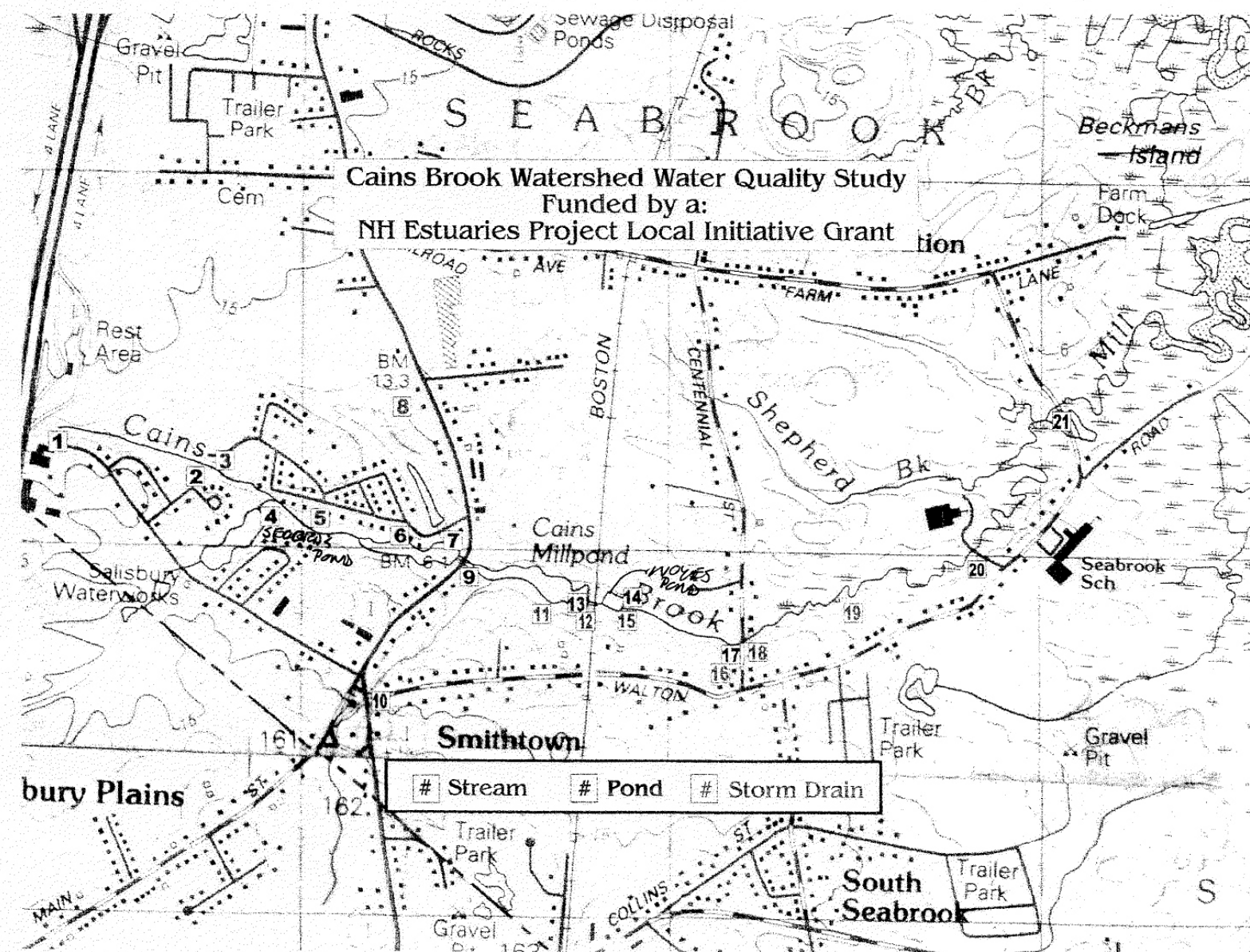
# CAINS BROOK/MILL CREEK WATERSHED SEABROOK, NH FIGURE 2



2123USGS.DWG



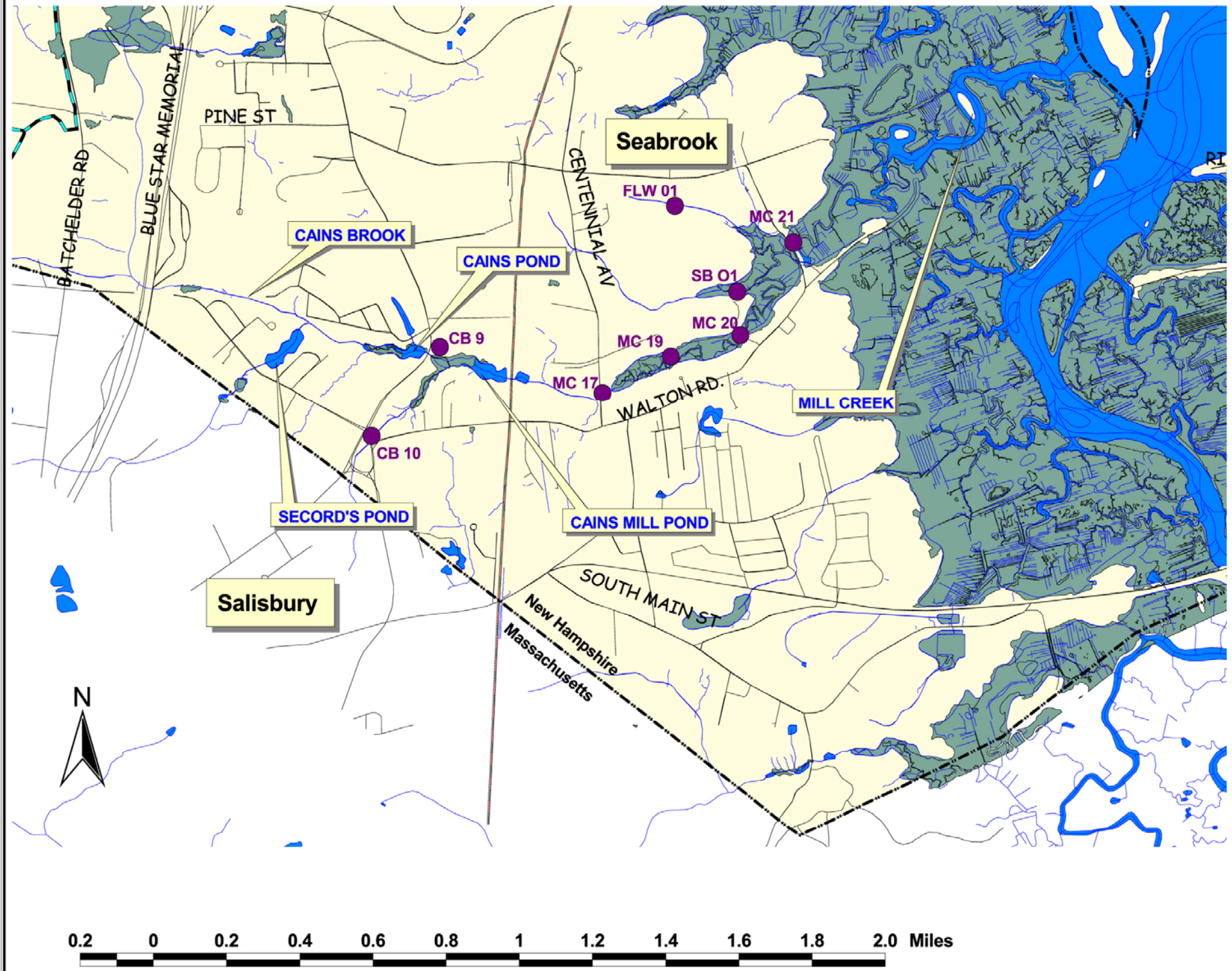




**Figure 3**  
**1997 Study – Water Quality Sampling Locations**  
**Cains Brook Watershed**  
**Seabrook, NH**

**Figure 4**  
**Water Quality**  
**Sampling Locations**  
**2004 NHDES Study**

**Cains Brook**  
**Watershed**  
**Seabrook, NH**



- Sampling Site Locations
- Waterbody
- Wetland
- Town Boundary
- Railroad
- Road
- Stream

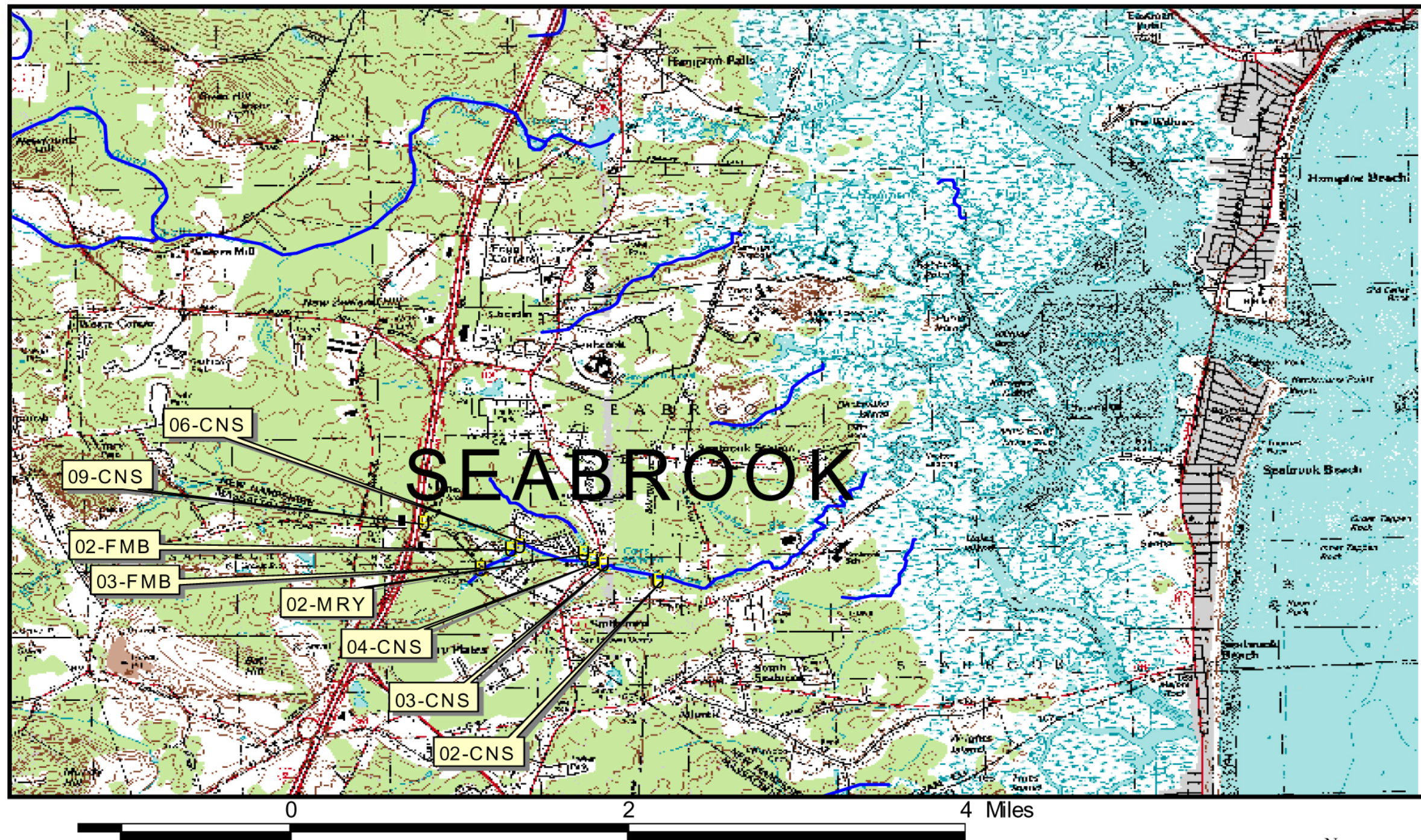
Source: Town of Seabrook and NH GRANIT;  
Digital data in NH GRANIT represent  
the efforts of the contributing agencies  
to record information from the cited  
source materials. Office of Energy and  
Planning (OEP), Complex Systems  
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cooperating agencies make no claim  
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any implied uses of these data.

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March 2006  
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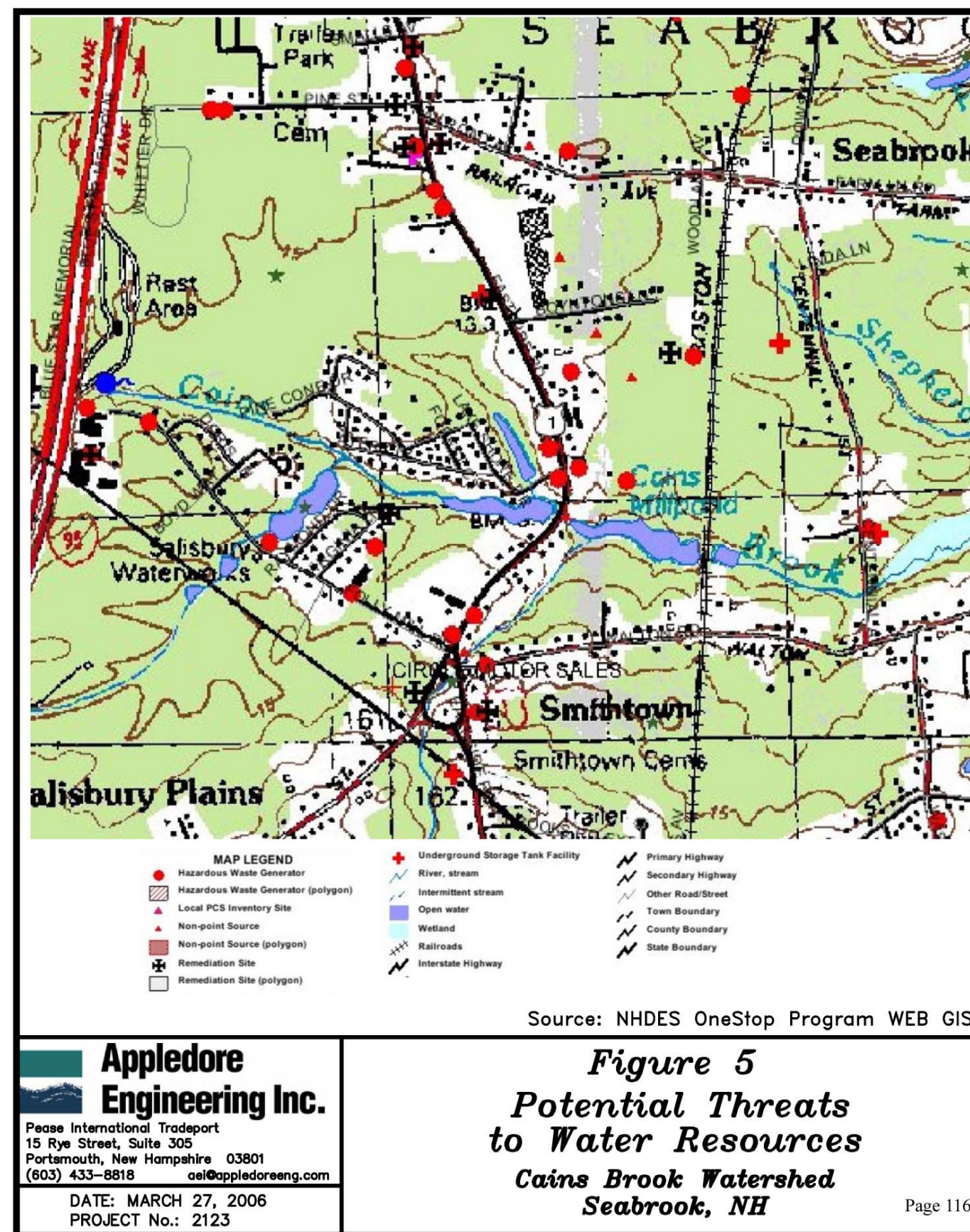




New Hampshire Department of Environmental Services, 2008

**Figure 4 A**  
**2007- Water Quality Sampling Locations**





## **Maps**

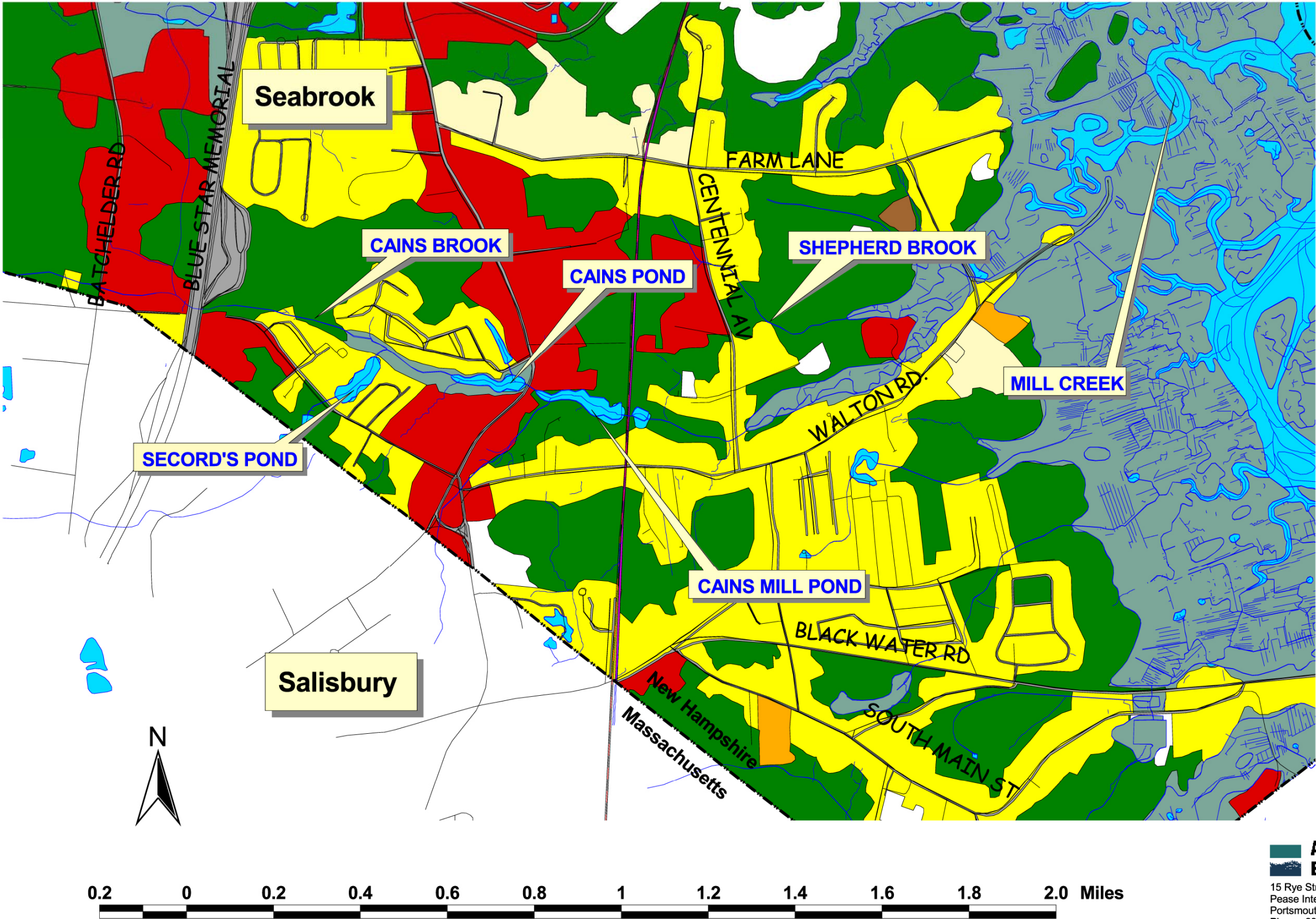
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# Map 1 Land Use Map

## Cains Brook Watershed Seabrook, NH



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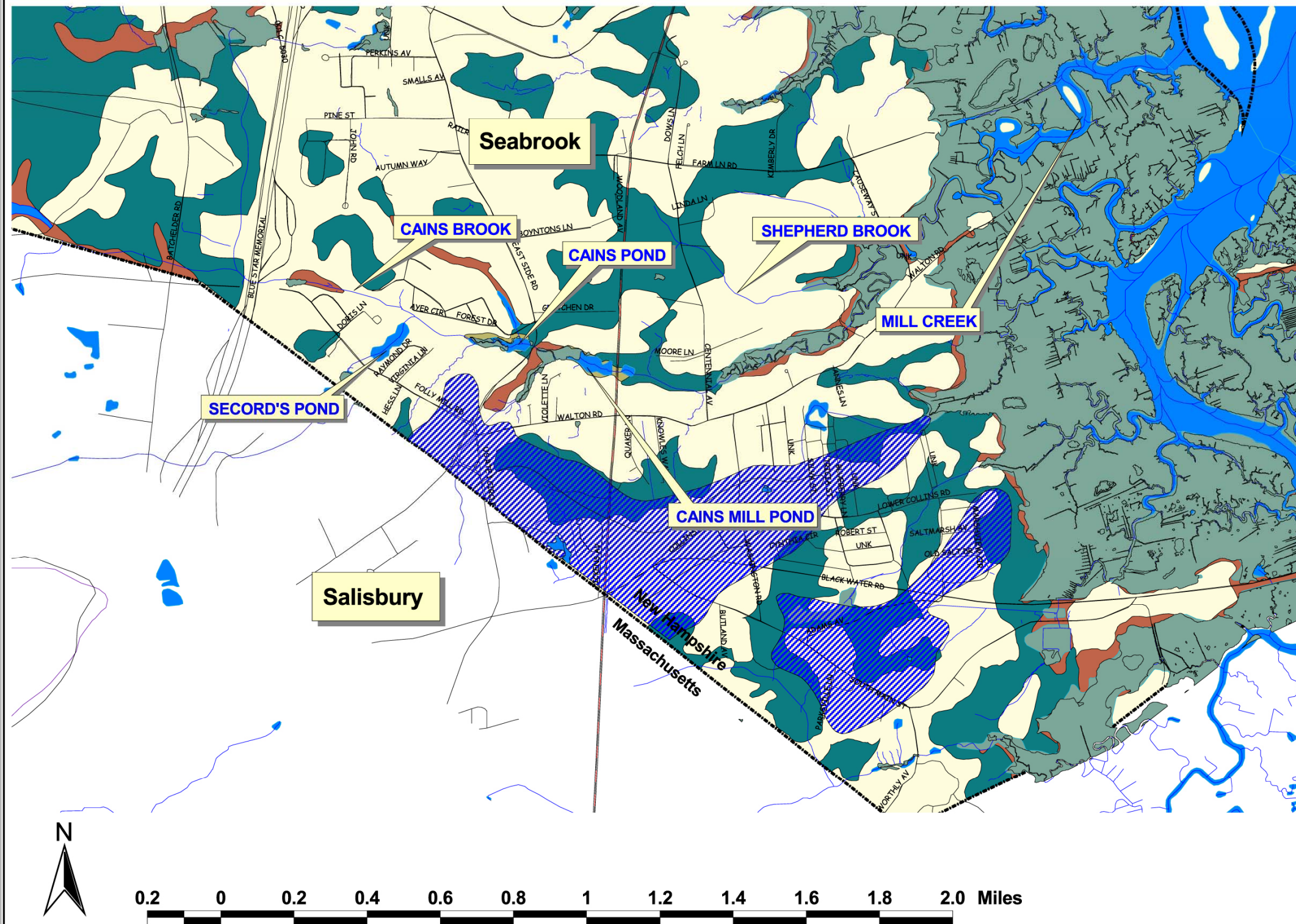
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March 2006



# Map 2 Wetlands & Water Resources

## Cains Brook Watershed Seabrook, NH



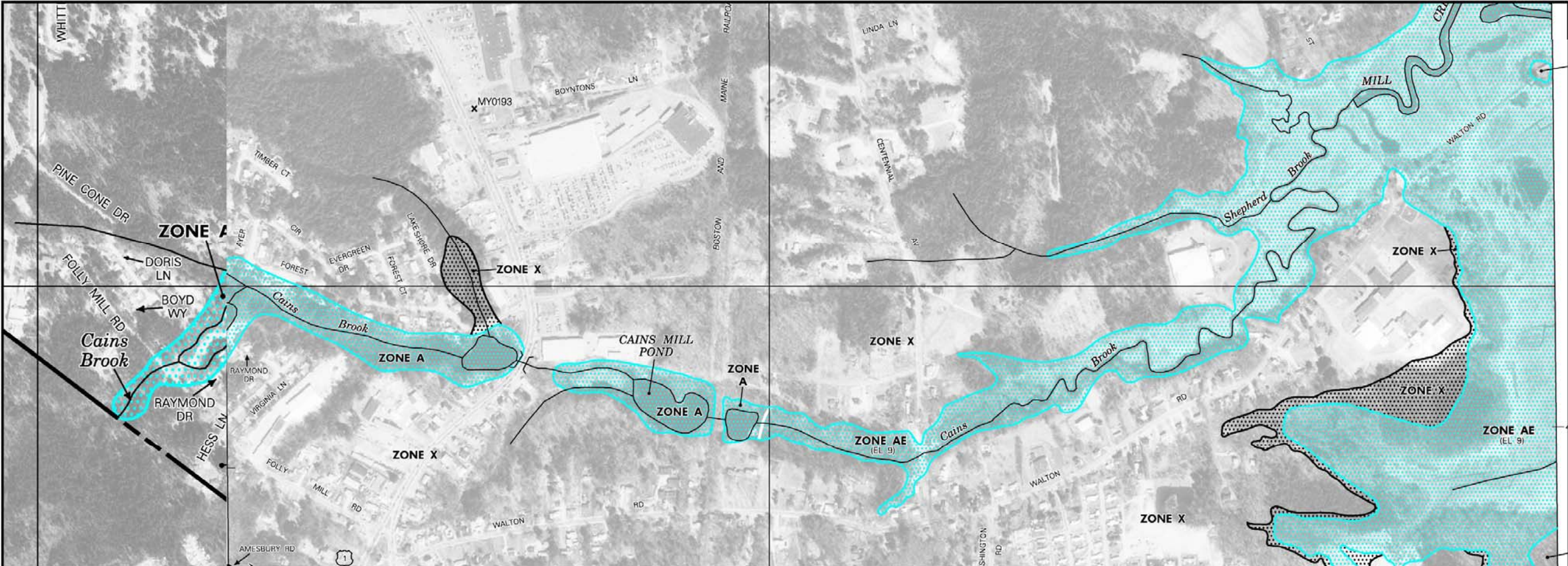
- Road
- Streams
- Waterbody
- Hydic Soils - A
- Hydic Soils - B
- Swamp
- Aquifer Transmissivity 0-2000

Source: Town of Seabrook and NH GRANIT; Digital data in NH GRANIT represent the efforts of the contributing agencies to record information from the cited source materials. Office of Energy and Planning (OEP), Complex Systems Research Center (CSRC), and the cooperating agencies make no claim as to the validity or reliability or to any implied uses of these data.

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**FLOOD INSURANCE RATE MAP**  
**ROCKINGHAM COUNTY,**  
**NEW HAMPSHIRE**  
**(ALL JURISDICTIONS)**

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



**MAP NUMBER**  
**33015C0420E**

**EFFECTIVE DATE**  
**MAY 17, 2005**

Federal Emergency Management Agency

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



**MAP NUMBER**  
**33015C0438E**

**EFFECTIVE DATE**  
**MAY 17, 2005**

Federal Emergency Management Agency

**LEGEND**

**SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

**FLOODWAY AREAS IN ZONE AE**

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.



**ZONE X**

**OTHER FLOOD AREAS**

Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.



**ZONE X**

**OTHER AREAS**

Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D**

Areas in which flood hazards are undetermined, but possible.



**COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**



**OTHERWISE PROTECTED AREAS (OPAs)**

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.



1% annual chance floodplain boundary



0.2% annual chance floodplain boundary



Floodway boundary



Zone D boundary



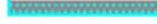
CBRS and OPA boundary



Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.



Base Flood Elevation line and value; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



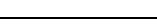
Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*



Base Flood Elevation value where uniform within zone; elevation in feet\*

97° 07' 30", 32° 22' 30"

4276000 M

600000 FT

DX5510 X

• M1.5

Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

1000-meter Universal Transverse Mercator grid tick values, zone 19

5000-foot grid: New Hampshire State Plane coordinate system, (FIPSZONE 2800), Transverse Mercator projection.

Bench mark (see explanation in Notes to Users section of this FIRM panel)

River Mile

*Map 3*  
*FEMA Map*  
*Cains Brook*  
*Watershed*  
*Seabrook, NH*

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2123maps.dwg  
March 2006





# **Map 4A** **Watershed** **Drainage Structures** **Cains Brook Watershed** **Seabrook, NH**

- Catchbasin Manhole
- Outfall Culvert
- Retention/Detention Pond
- Stormwater Line
- - - Watershed Boundary
- - - Town Boundary
- Major Routes
- Local Roads

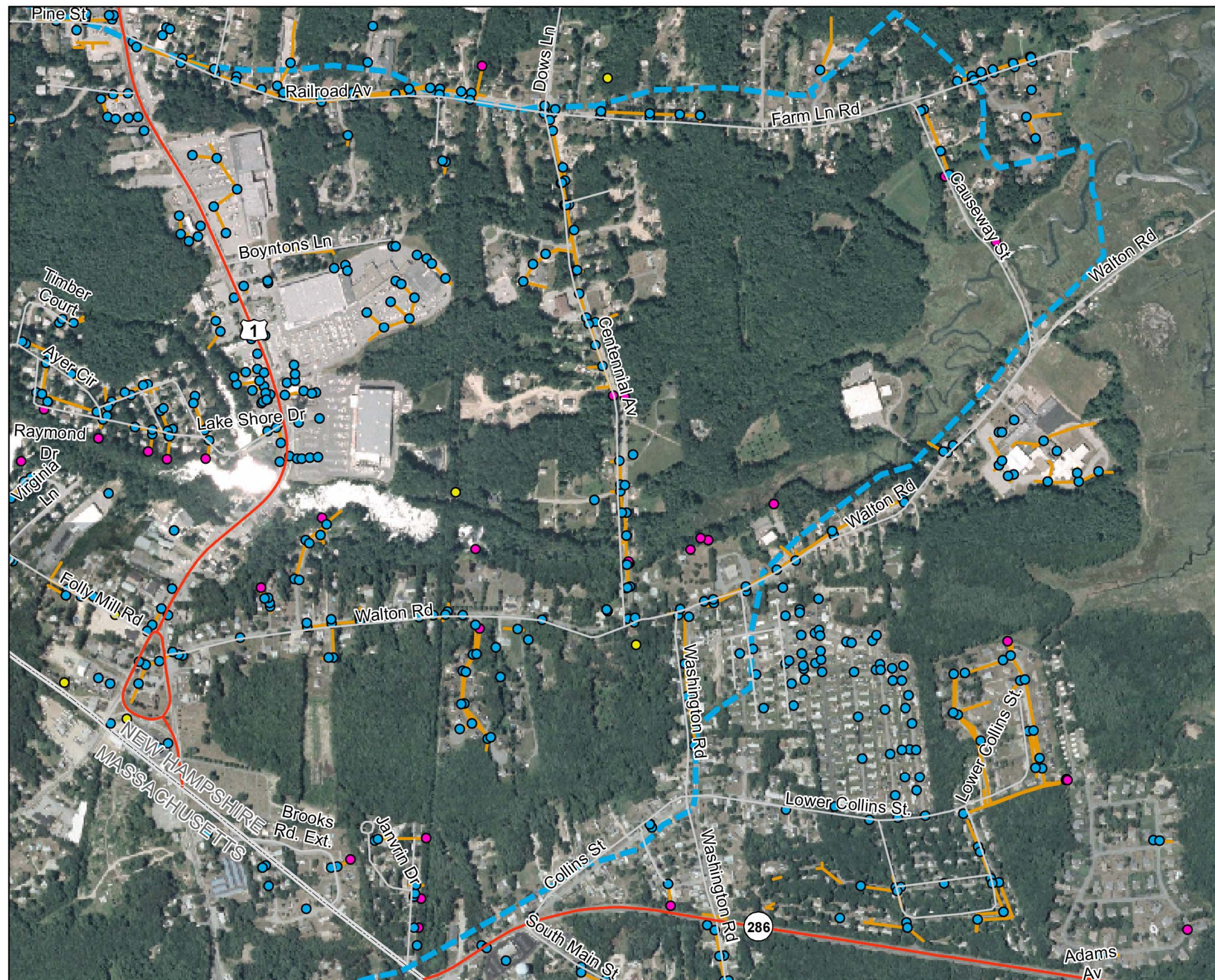
**Data Sources:**  
 Drainage structures mapped by Earth Tech, Inc., Concord, MA. Some feature sets are incomplete due to limitations in field data collection.

Base data sets from NH GRANIT, University of New Hampshire. Imagery from USDA National Agricultural Imagery Program, 2003.

0 250 500 1,000 1,500 2,000 Feet







# **Map 4B** **Watershed** **Drainage Structures** **Cains Brook Watershed** **Seabrook, NH**

- Catchbasin Manhole
- Outfall Culvert
- Retention/Detention Pond
- Stormwater Line
- - - Watershed Boundary
- - - Town Boundary
- Major Routes
- Local Roads

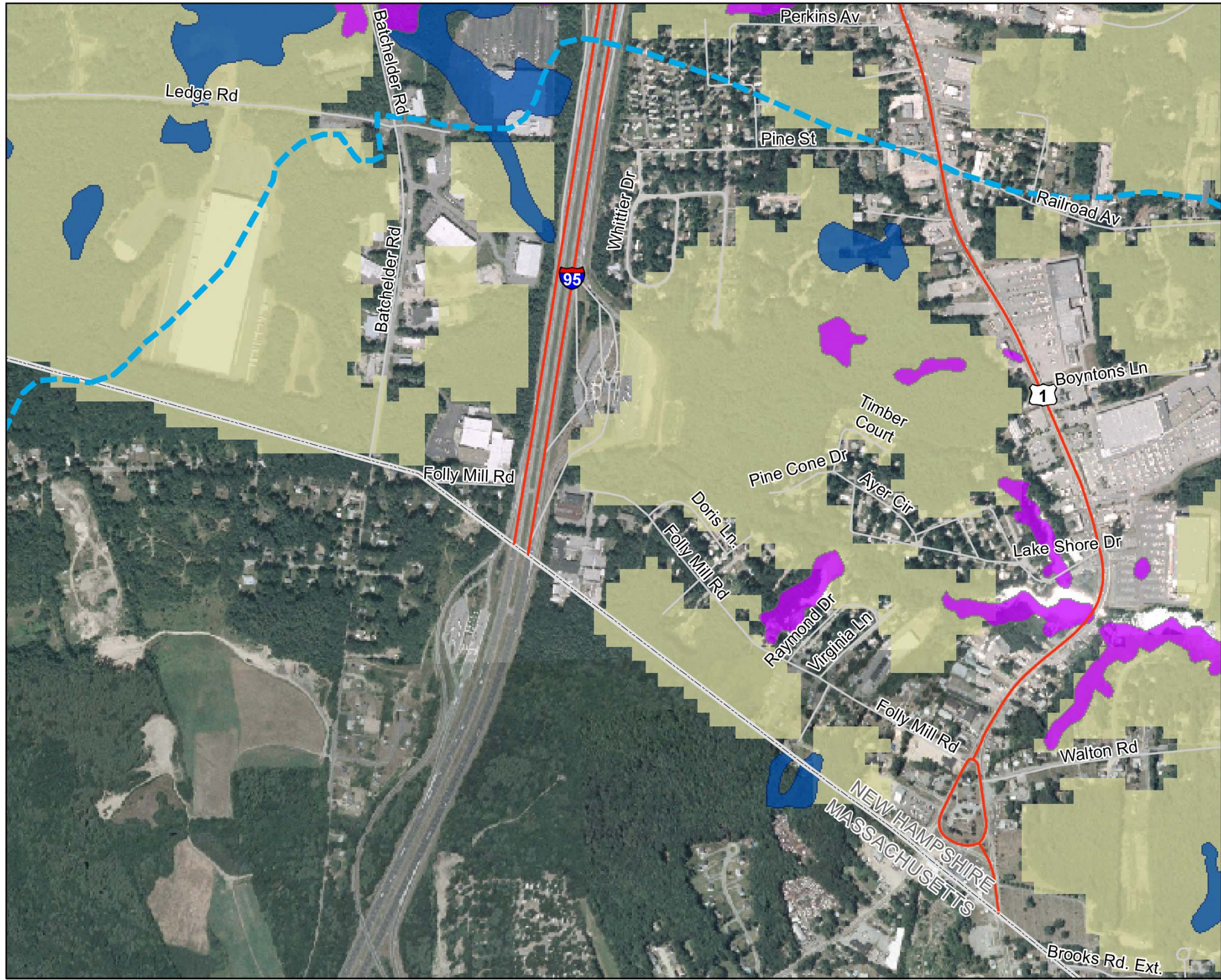
**Data Sources:**  
 Drainage structures mapped by Earth Tech, Inc., Concord, MA. Some feature sets are incomplete due to limitations in field data collection.

Base data sets from NH GRANIT, University of New Hampshire. Imagery from USDA National Agricultural Imagery Program, 2003.

0 250 500 1,000 1,500 2,000  
 Feet







# **Map 5A Wildlife Habitat**

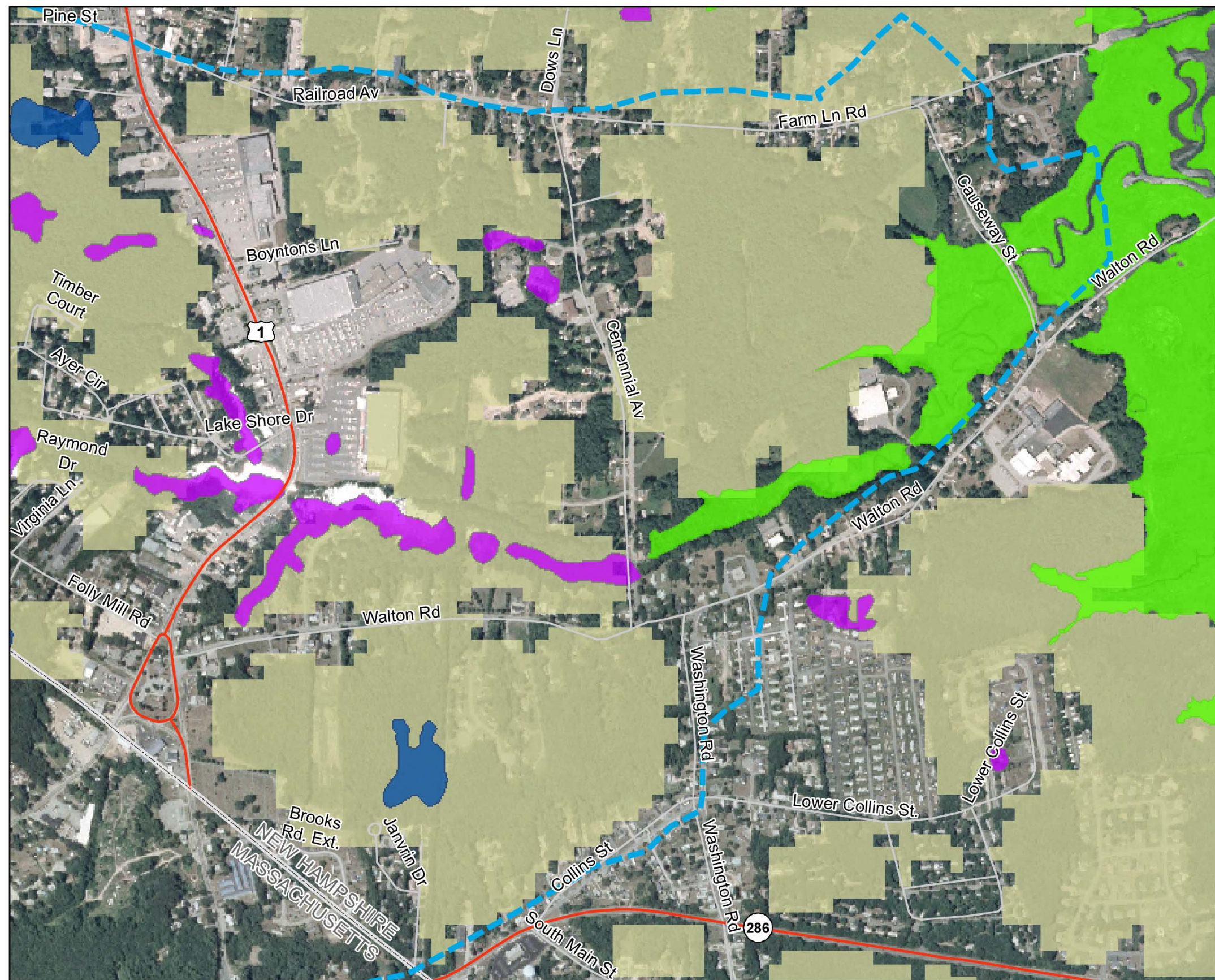
## **Cains Brook Watershed Seabrook, NH**

- Appalachian Oak-Pine Habitat
- Marsh Complex
- Peatlands Complex
- Salt Marsh Habitat
- Watershed Boundary
- Town Boundary
- Major Routes
- Local Roads

**Data Sources:**  
 Habitat layers from NH Wildlife Action Plan, 2005.  
  
 Base data sets from NH GRANIT, University of New Hampshire. Imagery from USDA National Agricultural Imagery Program, 2003.







## Map 5B Wildlife Habitat

### Cains Brook Watershed Seabrook, NH

- Appalachian Oak-Pine Habitat
- Marsh Complex
- Peatlands Complex
- Salt Marsh Habitat
- Watershed Boundary
- Town Boundary
- Major Routes
- Local Roads

Data Sources:  
Habitat layers from NH Wildlife Action Plan, 2005.

Base data sets from NH GRANIT, University of New Hampshire. Imagery from USDA National Agricultural Imagery Program, 2003.

0 250 500 1,000 1,500 2,000  
Feet





# ***Cains Brook Watershed Seabrook, NH***



Source:  
NHDES, Town of Seabrook  
and NH GRANIT; Digital data in NH  
GRANIT represent the efforts of the  
contributing agencies to record  
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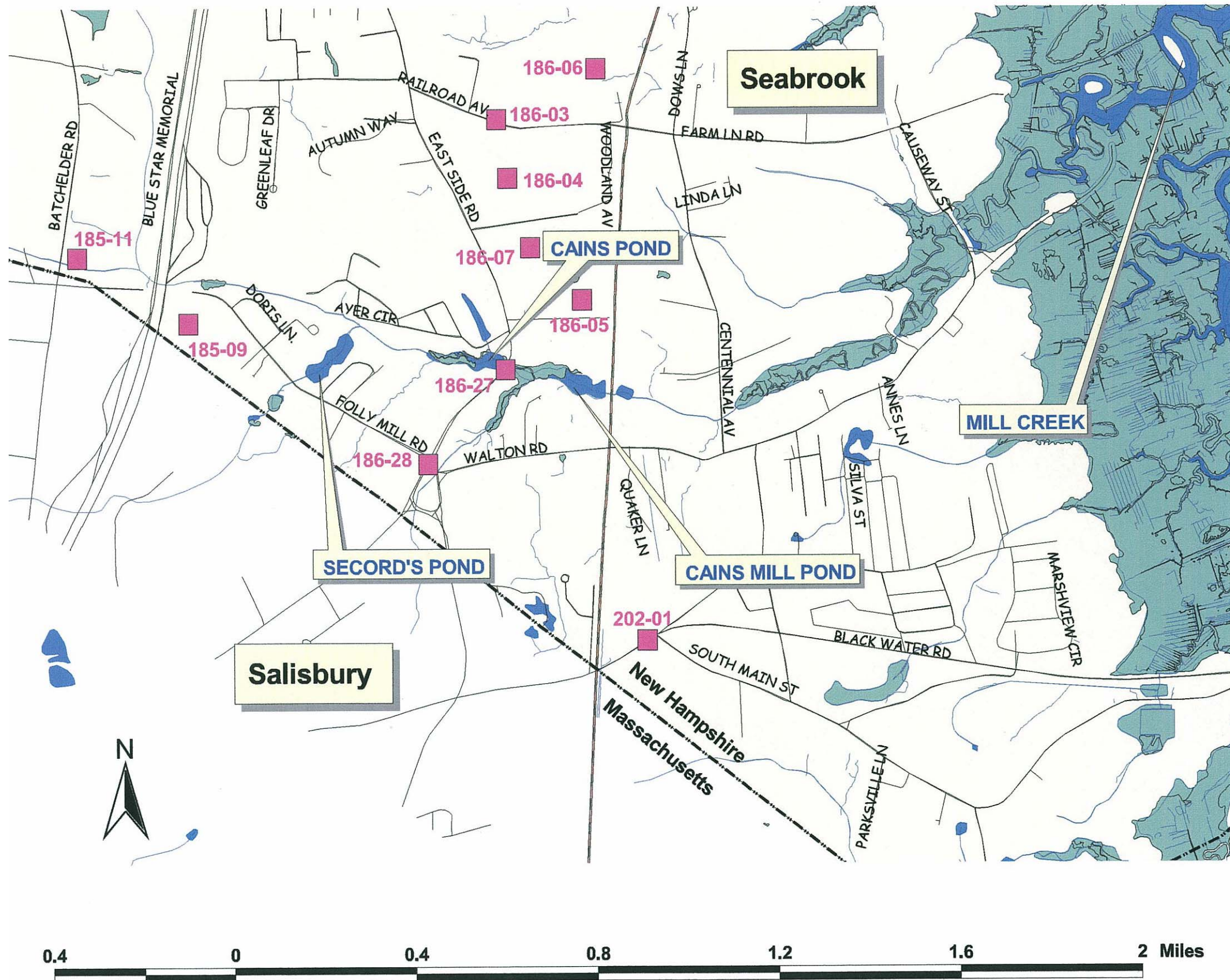
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# MAP 7 NHDES Non-Point Sources

## Cains Brook Watershed Seabrook, NH



Source:  
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and NH GRANIT; Digital data in NH  
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Sue Foote, Mike Colin, Jesse Fowler, Dick Dodge,  
Ivan Eaton, Helen Lalime, Melanie Allen

Photo: New England Cottontail  
Photographer: Sue Foote  
Location: Seabrook, NH, Cains Brook Watershed