Lake Cochituate Nonpoint Source Pollution Watershed Management Plan

1.0 Executive Summary

1.1 Purpose and Goals of the Project

This project focuses on Lake Cochituate, a major recreational and water supply resource in the MetroWest area, and on the 17.7 square mile watershed that contributes flow to the lake. Lake Cochituate is actually a series of four connected ponds located in Natick, Framingham, and Wayland, and its watershed also includes parts of Ashland and Sherborn. The contributing watershed area includes four major tributaries: Beaver Dam Brook, Course Brook, Pegan Brook, and Snake Brook. In addition, the lake receives flow from Fisk Pond and several shoreline subwatershed areas that drain directly to the lake (see Map 1).

Lake Cochituate is an intensively used recreational resource, with a major state park providing a public swimming beach, two boat access ramps, fishing, and picnicking, and several town facilities also offering swimming beaches. Much of the watershed is a densely populated urbanized area, and as a result of urban stormwater runoff the lake is failing to meet its water quality criteria due to nutrients, organic enrichment/low dissolved oxygen and the presence of noxious aquatic plants. The lake is also in close proximity to two of Natick's well fields, and USGS studies have confirmed that the wells induce recharge from the lake.

Urbanization and increased impervious surfaces within the Lake Cochituate watershed are having negative impacts on the watershed's resources. These impacts include the degradation of water quality, impairment of recreational uses, a decreased ability to sustain aquatic life, and altered flow dynamics that result in increased peak runoff and suspended sediments and decreased groundwater recharge.

These negative impacts can in many cases be minimized and mitigated through protection of stream and lake buffers, improved site planning, pollution prevention, and the use of both structural and non-structural Best Management Practices (BMP's) that remove or prevent pollutants and work to sustain the natural hydrodynamics of the watershed.

The purpose of this project is to provide the watershed communities with a recommended action plan to improve water quality, and appropriate implementation tools to achieve the goals of the plan. The plan includes the following components:

- A summary of water quality impacts on Lake Cochituate based on a review of historic state and federal water quality data from previous assessments and studies conducted from the mid-1970's through the mid-1990's.
- An analysis of land use and imperviousness within the watershed
- GIS mapping and database of potential sources of contamination
- A review of existing stormwater control measures in Ashland, Framingham, Natick, Sherborn, and Wayland
- Recommendations for stormwater Best Management Practices by priority sub-watershed
- Recommendations for nonstructural stormwater Best Management Practices such as land use regulations, DPW maintenance practices, and public education

1.2 Methodology

To accomplish the project's goals MAPC worked with the watershed communities through the formation of a Lake Cochituate Water Quality Advisory Committee. The Committee includes representatives from local boards such as the Planning Board, Conservation Commission, Public Works, town engineer, as well as representatives of Cochituate State Park, the Department of Environmental Protection, Department of Conservation and Recreation, the Cochituate State Park Advisory Committee, and the MetroWest Growth Management Committee. The committee met four times during the preparation of the project and provided invaluable input on local conditions, sources of data, historical trends, and public concerns. A fifth meeting will be held to review this draft report.

MAPC conducted a review of existing sources of data on water quality, development, land use, and potential sources of contamination, including previous planning and engineering studies conducted by USGS, state agencies, and private consultants, as well as the Mass GIS office and town boards and commissions. A 1999 shoreline survey of stormwater outfalls conducted by student interns under the supervision of the Department of Environmental Management, corroborated by a 2003 MAPC staff shoreline survey, was incorporated into the mapping, as were the municipal separate stormwater systems (MS4's) in areas of Framingham, Natick, and Wayland contributing stormwater to the lake.

Working with the advisory committee, three priority subwatersheds were selected for more detailed analysis, including Beaver Dam Brook, Pegan Brook, and the North Pond subwatershed. MAPC conducted field surveys of conditions in these subwatersheds and identified several priority sites for mitigation and restoration.

In order to support public education efforts in the watershed, MAPC also produced a public information brochure titled "A Guide to Enjoying and Protecting Lake Cochituate," and a public information workshop will be conducted to disseminate the findings of the project and encourage implementation of the recommendations.

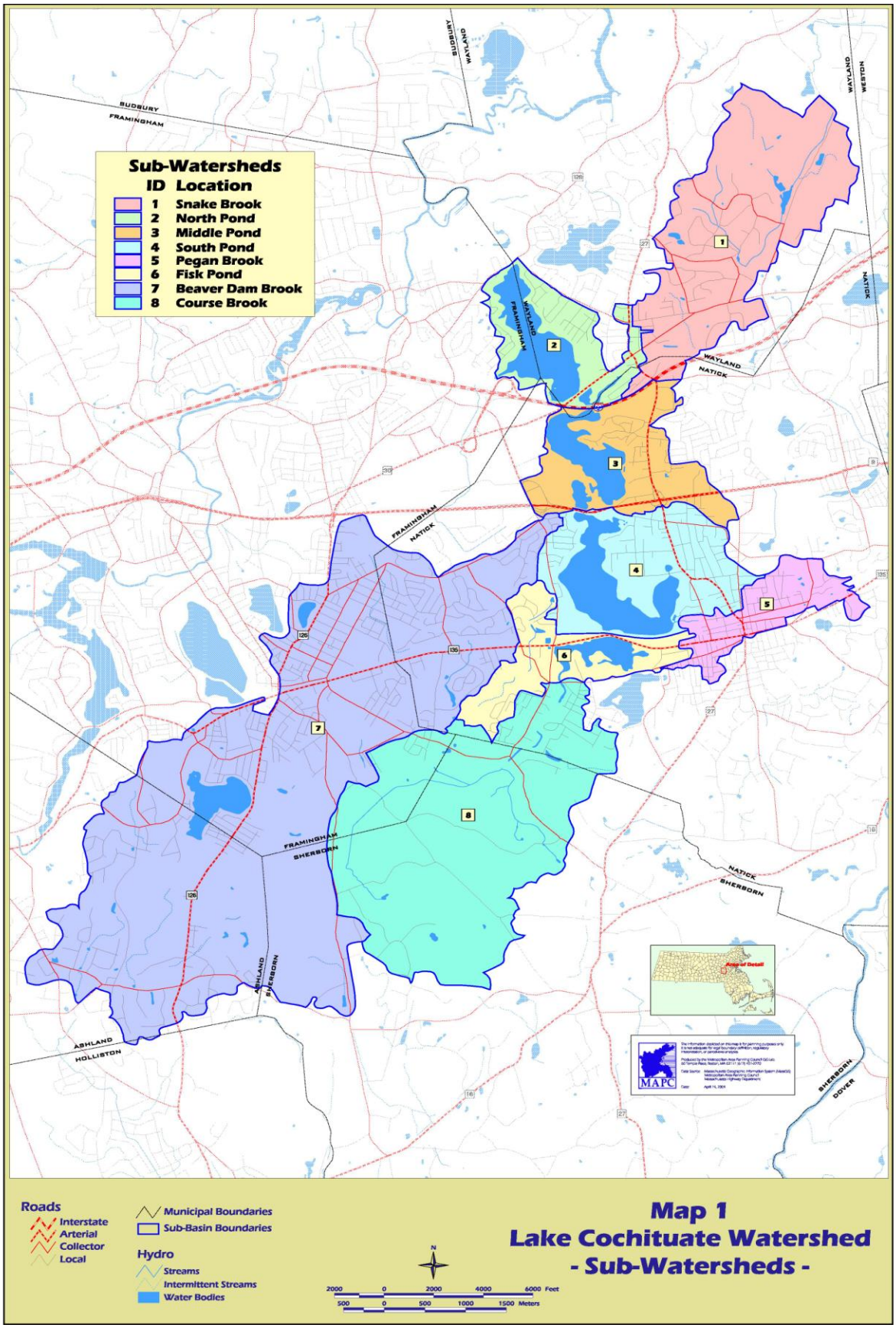
1.3 Findings of the Assessment of Lake Cochituate

The major findings of this project are summarized below:

- Lake Cochituate serves two major public purposes. First, the pond is a heavily used recreational resource for the adjacent towns and the entire MetroWest region. Second, the pond lies within the wellhead protection area of two of the town of Natick's water supply well fields, Evergreen and Springdale.

- Water quality in Lake Cochituate does not support its designated uses. Lake Cochituate is listed on the Massachusetts *Integrated List of Waters* that are not expected to meet their surface water quality standards under the Clean Water Act. The reasons for listing the lake include organic enrichment, low dissolved oxygen, and priority pollutants.

- Stormwater runoff from developed areas and roadways is considered to be the major and primary source of pollution in the lake and its tributaries. There are no permitted NPDES point source discharges into the lake.


Sub-Watersheds
ID Location
1 Snake Brook
2 North Pond
3 Middle Pond
4 South Pond
5 Pegan Brook
6 Fisk Pond
7 Beaver Dam Brook
8 Course Brook
SUDBURY
FRAMINGHAM
WAYLAND
WESTON
NATICK
SHERBORN
ASHLAND
HOLLISTON
DOVER
MAPC
Area of Detail
Roads
Interstate
Arterial
Collector
Local
Municipal Boundaries
Sub-Basin Boundaries
Hydro
Streams
Intermittent Streams
Water Bodies
N
2000 0 2000 4000 6000 Feet
500 0 500 1000 1500 Meters
Map 1
Lake Cochituate Watershed
- Sub-Watersheds -

- Lake Cochituate is a highly impacted resource that suffers from eutrophication, due in part to high inflows of phosphorous into the lake from stormwater runoff due to high levels of impervious cover. Beaver Dam Brook is the largest single source of nutrient loads.

- Sources of phosphorous to the pond may include animal waste and lawn fertilizers. Excess phosphorous in Fisk Pond's bottom sediments contributes to an over abundance of aquatic weeds and also elevates phosphorous levels within the pond's water column during spring and fall turnover of the lake's epilimneon, according to a 1978 study by Jason Cortell and Camp Dresser McKee.

- A combination of steep slopes, development along parts of the lake's shores, heavy recreational use, and highway crossings contribute to erosion in sections of the shoreline.

- The watershed of Lake Cochituate is one of the most heavily urbanized basins in the area west of Boston (MetroWest). The lake, along with its tributaries in the Sudbury River basin; suffer from the effects of urbanization and stormwater runoff.

- The land use in the Lake Cochituate watershed is predominantly urban, with 41 percent in residential uses and about 12 percent in commercial, industrial, transportation, and utility uses. Only 38 percent is undeveloped of that, 29 percent is forested and 3 percent in agriculture. Such a land use pattern results in a high percentage of impervious surfaces in the watershed, which is characteristic of significant urban stormwater impacts.

- It has been noted by the USGS that withdrawals from the Natick wells cause an induced infiltration of lake water into the adjacent aquifer as a result of the wells' cones of depression in the water table.

- Lake Cochituate has recently suffered an outbreak of the invasive aquatic Eurasian Milfoil. The outbreak first occurred in South Pond in 2002, and Milfoil is now found in all three basins. To date there does not appear to be any Eurasian Milfoil in North Pond. The Department of Conservation and Recreation is taking steps to control the outbreak though placement of barriers at the outlets between each pond, and a treatment plan has been proposed and is undergoing review.

- Numerous sites were identified in the three priority subwatersheds that contribute to the water quality impacts on the lake. The most common issues identified include stormwater runoff from paved sites with little or no treatment or mitigation; discharge of sediments from highway runoff, and erosion.

- The water quality impacts of stormwater runoff may be mitigated or reduced by the implementation of "Low Impact Development" techniques, which should be applied to new development and where possible retrofitted at existing development sites. Low Impact Development techniques include Best Management Practices such as rain gardens, recharge of roof runoff, bioretention cells, pervious pavement, vegetated buffers, and other measures to reduce runoff and retain and recharge stormwater.

1.4 Recommendations for Management of Nonpoint Sources of Pollution

The plan contains a series of recommendations to the five watershed towns as well as the Mass. Highway Department. The recommendations include both structural Best

Management Practices (BMPs) as well as non-structural measures such as development regulations, maintenance practices, and public education. The recommendations are described in detail in Section 5, Watershed Action Plan for Priority Subwatersheds, and in Section 6, Assessment of Water Quality Protection Measures and Recommendations. The highest priority recommendations are summarized in the tables below.

1.4.1 Structural Best Management Practices

The table below summarizes the priority structural BMPs that should be considered by the watershed towns and state agencies in order to mitigate existing water quality problems and/or help restore the quality and health of Lake Cochituate. For all structural BMP projects, pre- and post-construction water quality monitoring should be conducted to verify the extent and nature of site specific water quality problems and the effectiveness of BMP's.

Table 1-1 Recommended Structural Best Management Practices

Town	Site/Subbasin	Priority	Recommended BMPs
Framingham	Lakeview Road North Pond	High	• Cleaning of clogged catch basins • Installation of deep sump catch basins or hydrodynamic separators to control discharge of suspended solids to North Pond (estimated cost, $50,000)
Framingham	Saxonville Beach North Pond	High	• Control eroding slopes through drainage alterations • Control of parking lot runoff near the beach through installation of hydrodynamic separators (estimated cost, $150,000)
Wayland	Town Beach North Pond	High	• Mitigate parking lot and road drainage with Low Impact Design techniques and installation of a hydrodynamic separator to control discharge of suspended solids and pollutants near the beach (estimated cost, $50,000)
Natick	Central Street Used Auto Parts, Beaver Dam Brk.	High	• Channel drainage with berms on two sides and direct flow to vegetated swale with check dams for TSS removal. Construct detention basin with overflow to stream (estimated cost, $300,000)
Framingham	A-1 Used Auto Parts, Beaver Dam Brook	High	• Intercept sheet flow with berm along stream and channel to series of catch basins set in a pitched swale. TSS removal units with overflow to stream to accompany each catch basin (estimated cost, $300,000)
Natick	Settling Basins, Beaver Dam Brook	High	• Creation of a rock forebay to slow water and allow for settling of sediments (estimated cost, $500,000) • O&M plan to address maintenance of new structure • An alternative solution would be to dredge the basins to restore their original function.

Table 1-1 Recommended Structural Best Management Practices (continued)

Town	Site/Subbasin	Priority	Recommended BMPs
Natick	Pegan Cove Park Pegan Brook	High	• Mitigate pollution loads from highly urbanized upstream area with constructed wetland system containing wetland chambers and detention ponds (estimated cost, $500,000)
Natick	Pegan Cove Park Pegan Brook, southern tributary	High (Alter-native)	• As an alternative to the constructed wetland in Pegan Brook, create pond/wetland system in the southern tributary below the railroad bed (estimated cost, $500,000)
Wayland	Route 30, North/Snake Brook Pond	Med.	• Control direct discharge of highway runoff through installation of catch basins and hydrodynamic separators (estimated cost, $250,000)
Natick	West Natick Business Center, Beaver Dam Brk.	Med.	• Three separate sites delineated. All would use combination of catch basins and/or TSS removal units to treat stormwater (estimated cost, $200,000)
Natick	Confluence of Saxonville Rail-trail & RR tracks Pegan Brook	Med.	• Restore stream channel (estimated cost, $50,000) • Create a constructed wetland system to address storm water from north of Downtown Natick (estimated cost, $100,000)l
Natick	Route 9 segment draining into Middle Pond and Carling Pondk	Med.	• Improved pre-treatment with TSS removal BMP's such as hydrodynamic separators or deep sump catch basins (estimated cost, $120,000)
Natick	Mass. Turnpike Natick Service Plaza drainage into Middle Pond	Med.	• Retrofit the drainage system with BMP's for pre-treatment, such as hydrodynamic separators (estimated cost, $140,000) • Redesign the drainage ditch to create a vegetated retention area (estimated cost, $100,000)
Natick	Channelized brook from RR to Pegan Cove Park Pegan Brook	Low	• Public education for homeowners • Storm drain inserts to capture sediments and trash (estimated cost, $5,000) • Creation of small impoundment to treat flows from a 4' culvert south of RR tracks (estimated cost, $75,000)
Natick	Catchbasin and outfall off of Lake Street Pegan Brook	Low	• Sump needs to be cleaned • Rip-rap and or a level spreader needs to be added at the system's outfall (estimated cost, $15,000)

Potential sources of funding for some of theses structural BMP project include:

- DEP Section 319 Nonpoint Source Grant Program
- DEP Sectoin 104(b)(3) Wetlands and Water Quality Grant Program
- DEP Research and Demonstration Grant Program
- EOTC, Transportation Enhancement Project funding
- Massachusetts Clean Water State Revolving Loan Fund (SRF)
- Coastal Zone Management, Coastal Pollution Remediation Grant Program
- Massachusetts Environmental Trust Grant Program

1.4.2 Non-Structural Best Management Practices

The table below summarizes the non-structural and BMPs that should be implemented in order to mitigate existing water quality problems and/or help restore the quality and health of Lake Cochituate: Some of these are related to a specific site, while others have broad applicability with respect to a particular issue, as noted in column 2 of the table.

Table 1-2 Recommended Non-Structural Best Management Practices

Town	Site/Subbasin Or Issue	Priority	Recommended BMPs
All Towns, MHD & MTA	Clogging of catch basins and sedimentation	High	• More frequent street sweeping and catch basin cleaning is recommended for the towns, the Mass. Highway Department, and Mass. Turnpike Authority. • Reduced sand and salt application
All Towns	Residential and business activities that affect water quality	High	• Potential pollution sources from residential and business activities such as lawn maintenance, septic system maintenance, car washing, and use and disposal of household chemicals should be addressed by public education measures.
All Towns	Erosion at construction sites, especially single lot ANR's (Approval Not Required)	Med	• Erosion control measures such as silt fences and hay bales should be used on all construction sites. The towns should adopt erosion and sedimentation measures that apply even when subdivision approval is not required.
Natick	Duralectric site, Pegan Brook	Low	• Further investigation of sources of sedimentation and heated water coming from the site; follow-up mitigation and/or enforcement as appropriate.
Framingham	NSTAR ROW North Pond	Low	• Inspect area used for vehicle storage and ensure that adequate erosion and runoff controls are in place

1.4.3 Findings and Recommendations for local bylaws and regulations

Ashland

Ashland has incorporated the DEP Stormwater Standards into its subdivision review, requires onsite treatment of stormwater, erosion and sedimentation controls and maximization of groundwater recharge for all site plan reviews involving 6 or more parking spaces and has included a 20-foot "no-disturb" rule in its wetland bylaw. Ashland should also look into controlling erosion and stormwater on Approval Not Required lots and extend its site plan review process to all land disturbances of 10,000 feet or more.

Framingham

Framingham requires that subdivision development follows the DEP Stormwater Standards and requires an Environmental Impact Statement for most site plan and special permit. The town should complete its drafting and adoption of bylaws governing illicit connections to its storm drain system, and post construction runoff from new development (other than subdivisions) or redeveloped areas. The town should consider adopting a town wide Stormwater Overlay District or a Stormwater Management District.

Natick

A Special Permit for projects within the Aquifer Protection District with greater than 20% impervious coverage is required and the town wetlands bylaw has a 25-foot "no disturb" zone. The highest regulatory priorities for the town should be to strengthen its subdivision and site plan review practices to include specific review and measurable standards for stormwater management and erosion control. In addition, the town should consider accelerating its Stormwater Management Plan implementation schedule and adopt bylaws addressing discharges to its municipal storm water system, land use disturbance and post construction stormwater management.

Sherborn

Sherborn's subdivision controls are strong and emphasize limiting nutrient loading and reducing disturbed areas. Site plan review for erosion control and stormwater are required within the business, flood plain and wireless communications districts and the wetlands bylaw includes a 50-foot no-alteration zone. The town's highest regulatory priority should be to extend its site plan review requirements for all land disturbances of greater than 10,000 square feet and to create bylaws to address illicit discharges to its storm drain system and control post construction storm water management.

Wayland

There are somewhat limited stormwater controls within Wayland's subdivision regulations with no defined standards in place. Stormwater is reviewed under site plan review for all development (except single and two-family, cluster and Planned Unit Development) of 5,000 square feet or more, but no quantitative standards are given. Non residential lots requiring more than 15% impervious cover or greater than 2500 square feet impervious cover require a groundwater recharge system in the Aquifer Protection District. The highest regulatory priority should be to strengthen stormwater and erosion regulations, including specific standards, for all subdivision and site plan review applications outside the Aquifer Protection District.