

5.0 WATERSHED ACTION PLAN FOR PRIORITY SUBBASINS

This section presents a set of recommended actions to improve water quality and help restore the resources of Lake Cochituate at a number of identified priority sites in three subwatersheds: North Pond, Beaver Dam Brook, and Pegan Brook. These three subwatersheds were chosen based on several criteria, including:

- Areas that are connected by stormwater systems to outfalls that discharge stormwater to Lake Cochituate and its tributaries
- Areas that include a representative range of development patterns, including urban, suburban, and low-density suburban, and a diverse mix of land uses, including residential, commercial, industrial, recreation, and transportation
- Areas that include portions of all five communities in the watershed, Ashland, Framingham, Natick, Sherborn, and Wayland
- Areas that contribute significant pollution loads to Lake Cochituate
- Areas that include important recreational resources

The three selected subwatersheds were reviewed by the Lake Cochituate Water Quality Advisory Committee. They were found to meet the criteria as follows:

- Beaver Dam Brook: This is the largest tributary and the largest source of phosphorus loading to Lake Cochituate. There is a diverse mix of land use, including significant industrial and commercial areas, residential uses at all levels of density, and the town center of Framingham. The subbasin includes four towns: Ashland, Framingham, Natick, and Sherborn.
- Pegan Brook: This is the most intensely urbanized subbasin. It includes the downtown Natick commercial district and adjacent residential areas. The stormwater system discharges to Pegan Brook, which flows into the lake.
- North Pond: This is a medium density residential area, with a significant number of homes located directly on the shoreline of the pond. Stormwater collected in these neighborhoods is discharged directly into North Pond. The subbasin covers parts of Framingham and Wayland, and includes two public swimming beaches and one non-motorized boat launching facility.

The three priority subwatersheds include 5249 acres, nearly half of the total watershed.

Table 5-1 Summary of Priority Subwatersheds

Subwatershed	Area (acres)	Percent of Lake Cochituate Watershed	Towns
Beaver Dam Brook	4,536	40.7%	Ashland, Framingham, Natick, Sherborn
North Pond	360	3.2%	Framingham, Wayland
Pegan Brook	349	3.1%	Natick
Subwatershed Total	5249	47%	

5.1 NORTH POND SUBWATERSHED

5.1.1 Overview of North Pond Subwatershed

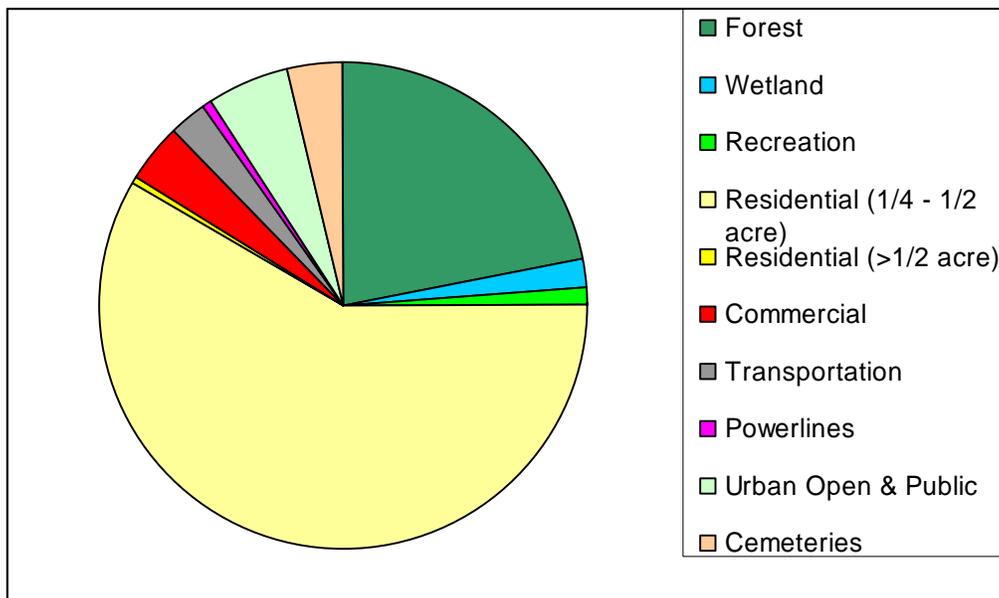
5.1.1.1 Land Use

The areas that drain directly to North Pond encompasses 360 acres in Framingham and Wayland, representing 3.2 percent of the total watershed area of Lake Cochituate (see Figure 2-1 for geographic context). The land use of this subwatershed is predominantly residential (59 percent) with medium densities in the range of ¼ acre to ½ acre lots. About 22 percent of the watershed is forested, most of this being the state park shoreline perimeter on both sides of the lake.

Table 5- 2 Land Use in the North Pond Subwatershed, 1999

Land Use Category	Acres	Percent
Forest	78.9	22%
Wetland	7.1	2%
Recreation	3.7	1%
Residential (1/4 - 1/2 acre)	210.3	58%
Residential (>1/2 acre)	2.6	1%
Commercial	13.7	4%
Transportation	8.6	2%
Power lines	2.9	1%
Urban Open & Public	19.1	5%
Cemeteries	13.4	4%
SUBBASIN TOTAL:	360.2	100%

Figure 5-1 Land Use in the North Pond Subwatershed, 1999



In addition to the residential development, there are two town-operated beaches, Wayland Town Beach and the Framingham (Saxonville) Town Beach. Each of these has a parking lot and associated bathing facilities. Other recreation facilities include a boat launching access site (for non-motorized boats) in part of the state park on North Pond, and town park land adjacent to the town beach. The remaining land use includes a cemetery in Wayland and an NSTAR electric transmission right of way.

5.1.1.2 Water Supply, Wastewater, and Stormwater Infrastructure

Framingham receives its public water supply from the MWRA system, which delivers water from the Quabbin and Wachusset Reservoirs. Wayland is supplied by town owned wells that pump groundwater from aquifers in the SuAsCo basin, in areas downgradient from the Lake Cochituate watershed.

The area on the west side of the lake in Framingham is on public sewers, while the area to the east in Wayland is on septic systems. Framingham's wastewater system is connected to the MWRA, which discharges treated effluent to Massachusetts Bay.

The residential areas of both the Framingham and Wayland side of the watershed have municipal separate storm sewers (MS4s) that collect stormwater from a series of catch basins and discharge it through outfall pipes directly into North Pond (see Map 9). There are a total of 12 stormwater outfalls on the pond, 5 in Framingham and 7 in Wayland. These are connected to 27 catch basins on the Framingham side and 74 catch basins on the Wayland side, for total of 101 catch basins, according to stormwater system plans provided by the towns (see Map 11). All of the catch basins collect stormwater that flows from residential areas, with the exception of two in Framingham and three in Wayland that are connected to parking lots for each of the towns' beaches.

5.1.1.3 Transportation Infrastructure

A segment of about 500 feet of the Massachusetts Turnpike passes through the North Pond subwatershed along the southern shoreline of the pond. The stormwater drainage from this section of the roadway is collected and discharged to North Pond (an adjoining section of the Turnpike to the east, as well as the Natick Service Plaza, discharges stormwater runoff to Middle pond, just east of the state park day use area). The Turnpike's Exit 13 interchange complex is close to North Pond, but just outside of the watershed area.

5.1.1.4 Potential Sources of Contamination

The inventory of potential sources of contamination developed for this project does not include any Underground Storage Tanks or Hazardous Waste (21E) sites in the North Pond Watershed. As mentioned above, an NSTAR electric transmission right of way that passes across the northwest corner of the watershed in Framingham. This is a relatively small segment of the Right-Of-Way (ROW), with about three acres in the watershed.

5.1.1.5 Large Areas of Impervious Surface

The inventory of large impervious surfaces (over 1 acre) includes two sites in the North Pond subwatershed: the parking lots for the Framingham and Wayland town beaches.

5.1.2 Identification of Priority Sites and Issues

Based on field investigations, map analysis, and review of local data, the following priority sites and water quality issues were identified in the North Pond subwatershed. These are shown on Figure 5-3 and are described in more detail in the following tables, which also include action recommendations for each site.

Table 5-3 Summary of Priority Sites and Issues in North Pond Subwatershed

Site No.	Location	Issues
NP-FR-1	Lakeview Rd, Framingham	<ul style="list-style-type: none">o Clogged catch basin causing erosiono Stormwater discharge causing sedimentation
NP-FR-2	Framingham Town Beach	<ul style="list-style-type: none">o Slope erosion in area above beacho Stormwater discharge next to beach
NP-FR-3	NSTAR ROW, Framingham	<ul style="list-style-type: none">o Storage of vehicles; site erosion
NP-WA-1	Construction sites, Wayland	<ul style="list-style-type: none">o No construction site erosion controls
NP-WA-2	Wayland Town Beach	<ul style="list-style-type: none">o Stormwater discharge next to beach
NP-WA-3	Route 30 drainage	<ul style="list-style-type: none">o Direct discharge; sedimentation & trash
NP-FR/WA-1	Lake shoreline, both towns	<ul style="list-style-type: none">o Slope erosion; disposal of yard wastes, docks
NP-FR/WA-2	Residential areas, both towns	<ul style="list-style-type: none">o Stormwater containing fertilizers, pesticides

These sites are primarily related to sedimentation and phosphorus. Although bacterial contamination is an important issue for swimming beaches, the review of water quality data did not indicate any significant problems with bacteria in (see Section 2.2).

5.1.3 Summary Watershed Action Plan for North Pond Subwatershed

5.1.3.1 High Priority Actions

Lakeview Rd, Framingham (NP-FR-1)

- Clean out and re-open clogged two catch basins on Lakeview Road dead end.
- Retrofit the catch basins with pre-treatment devices to remove suspended solids, either deep sump catch basins, or a hydrodynamic separator.
- Pre- and post water quality monitoring should be conducted

Framingham Town Beach (NP-FR-2)

- Site drainage could be reconfigured to avoid the concentration of runoff which is causing erosion above the beach. This could be done with regrading and the addition of a vegetated buffer strip to collect and slow the runoff before it is discharged.

- A pre-treatment device should be added to the stormwater system. Given confined space, a hydrodynamic separator would be the best option. Such a system could remove most suspended sediments and other pollutants associated with the sediments.

Wayland Town Beach Outfall (NP-WA-2)

- The site should be retrofitted to provide pre-treatment of stormwater before it is discharged. A potential mitigation measure for the parking lot is the retrofit of low impact development techniques that provide filtration through vegetated buffers
- For the overall stormwater flow coming from adjacent town roads, the installation of a pretreatment device such as a hydrodynamic separator is recommended.

5.1.3.2 Medium Priority Actions

Route 30 drainage (NP-WA-3)

- The Mass. Highway Department should consider installation of pre-treatment devices to reduce the sediment loads to the lake. This would also require installation of catch basins and piping in this area. In addition, the existing erosion on steep embankments should be corrected.

Construction sites, Wayland (NP-WA-1)

- Erosion control measures such as silt fences and hay bales should be used on all construction sites, including single-lot “Approval Not Required” (ANR) homes. Towns should adopt erosion and sedimentation measures that apply even when subdivision approval is not required. This might be accomplished through amendments to the building code.

Residential areas, both towns (NP-FR/WA-2)

- Potential pollution sources from residential activities such as lawn maintenance should be addressed by public education measures. These will be included in the public information brochure produced for this project.
- Stormwater pollution from residential areas can be reduced by frequent street sweeping and cleaning of catch basins. In some cases, retrofitting with deep sump catch basins would reduce the pollutant load in stormwater.

5.1.3.3 Low Priority Actions

Lake shoreline, both towns (NP-FR/WA-1)

- Shoreline management issues such as slope erosion, dumping of yard waste, and docks should be addressed by public education and outreach measures.

NSTAR Utility Right of Way (Framingham NP-FR-3)

- The vehicle storage yard should be inspected to ensure that good housekeeping measures are in effect and no inappropriate materials or chemicals are being stored. The site should be maintained to reduce the potential for erosion.

5.1.4 Priority Sites and Recommendations for North Pond Subwatershed

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT	
AREA 1: North Pond Sub-watershed	
SITE NP-FR-1	Lakeview Road Drainage
Location	Lakeview Road, Framingham
Site Description	Lakeview Road is a residential street that runs along the shore of North Pond. Stormwater from this area is collected in a series of catch basins and discharged directly to North Pond through a series of four outfall pipes (see Map 9).
Issues/Problems	<p>1) Where Lakeview Road dead ends near the bank of North Pond, there are two catch basins that are not collecting the stormwater flow from the road because they are clogged. As a result of the failed catch basins, stormwater overtops the curb at the dead end of Lakeview Road and flows overland across the yard of the adjacent home, then rushes down the steep slope, causing significant erosion and sedimentation. The homeowner has a set of wooden stairs on the slope which show evidence of sediment deposition, and the roots of trees on the slope have been scoured and undercut by the stormwater flow. Framingham's drainage plan shows these 2 catch basins connected to the outfall southeast of the site. But it appears that some or all of the stormwater is not being conveyed to this outfall because either the catch basins or the line connected to the outfall are clogged.</p> <p>2) The Finley Cove area has experienced significant sedimentation over the years, resulting in the filling in of the cove. Resident Joyce Finley reports that the problem began shortly after Lakeview Road was paved and the stormwater system was installed in the 1960's, indicating that sedimentation from stormwater discharges to the cove is the likely cause.</p>
Recommended Actions / BMP's	<p>The clogged catch basins on the dead end of Lakeview Road need to be cleaned out, and the pipe connecting to the outfall should be inspected to insure that flow is not obstructed in the line. Once flow is restored from these catch basins to the outfall, the slope erosion problem should be ameliorated</p> <p>Given the high degree of sediment buildup both at the dead end catch basins and in Finley's Cove, pre-treatment for total suspended solids before discharge to the lake is recommended. This could be accomplished with the replacement of the existing catch basins with deep sump catch basins. Estimated cost of these is about \$2500 to \$3,000 each. There are two catch basins at the dead end of Lakeview Road, and there are about 10 that are tributary to Finley's Cove. Another alternative for the Finley's cove area could be the installation of a hydrodynamic separator before the stormwater is directed to the outfall. This could capture and retain much of the sediment in one location for the entire subdrainage area. There are several hydrodynamic separators commercially available (see Appendix). Preliminary cost estimate is \$50,000 (\$35,000 for the unit and \$15,000 for installation. For either type of BMP, maintenance will be critical.</p>



Catch Basin at Lakeview Road Dead End



Erosion and Sedimentation on Slope



Erosion and Sedimentation on Slope

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-FR-2	Framingham Town Beach
Location	Corner of Old Connecticut Path and Lake Road, Framingham
Site Description:	The site has a moderately steep slope from the road down to the shoreline; the upper part of the site is partially paved and partially grassed, the lower part of the site is the sand beach. A stormwater outfall is located next to the swimming beach; this discharges runoff from the beach parking lot.
Issue/Problem	<p>(1) Erosion: runoff from the upper portion of the site causes erosion on the lower part of the site. An asphalt walkway concentrates the runoff, causing erosion which has formed a shallow gully along the west edge of the site.</p> <p>(2) Runoff: the parking lot outfall discharges directly to the swimming beach.</p>
Recommended Actions / BMP's	<p>(1) Erosion: site drainage could be reconfigured to avoid the concentration of runoff. This could be done with regrading and the addition of a vegetated buffer strip to collect and slow the runoff before it is discharged.</p> <p>(2) Runoff: A pre-treatment device should be added to the stormwater system. Given confined space, a hydrodynamic separator would be the best option. A similar proposal for this site was submitted to EPA by the Framingham Planning Dept. as a Supplemental Environmental Project in 2001. BMP's proposed included improvements to catch basins, relocation of existing stormwater inlets, and installation of a sediment settling chamber. The cost was \$133,500. An updated cost estimate for 2004 is about \$150,000.</p>



Paved walkway above Town Beach



Erosion above the Town Beach



Pictometry View of Framingham Town Beach and Adjacent Parking Lot

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-FR-3	NSTAR Electric Transmission Right of Way / Vehicle Storage
Location	Framingham and Wayland, across the northern side of North Pond.
Site Description:	A Boston Edison utility right of way (ROW) passes to the north side of North Pond, within a few feet of the town beach. There is a utility truck and vehicle storage yard on the ROW just off of Lakeview Road in Framingham.
Issue/Problem	Trucks and other vehicles are a potential source of fuel, oil and grease. The vehicle yard is unpaved, exposed earth, with the potential for erosion and sedimentation.
Recommended Actions / BMP's	The site should be inspected to ensure that good housekeeping measures are in effect and no inappropriate materials or chemicals are being stored or used on the site. The site should be maintained to reduce the potential for erosion, perhaps by adding crushed stone to the unpaved areas of bare earth and maintaining a vegetated buffer.



NSTAR Utility Right of Way with Vehicle Storage

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-WA-1A SITE NP-WA-1B SITE NP-WA-1C	Residential construction sites
Location	Lake Road, Edgewood Road, and Morrill Road in Wayland
Site Description:	There are three single family homes under construction, in the neighborhood adjacent to North Pond. Each is a separate single-lot development.
Issue / Problem	All three construction sites have extensive areas of disturbed earth and show evidence of some erosion, and neither site has any visible erosion control measures in place. Stormwater from all of these sites is collected in nearby catch basins and discharges directly to North Pond.
Recommended Actions / BMP's	Basic erosion control measures such as silt fences and hay bales should be used on sites like this during the construction period. Most likely these were not required in these cases because each is a single house lot that would not trigger the requirement for subdivision review ("Approval Not Required," or ANR). In the future, the town could adopt erosion and sedimentation measures that apply even when subdivision approval is not required. This might be accomplished with a local erosion and sedimentation bylaw (see Chapter 6).

Site #1A, Edgewood Road



Site #1B, Lake Road



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-WA-2	Stormwater outfall at Wayland Town Beach
Location	Wayland Town Beach, off of Parkland Street
Site Description:	A stormwater outfall discharges to North Pond on the south side of the Wayland Town Beach. The outfall discharges stormwater from the parking lot next to the beach and adjacent town roads.
Issue / Problem	The outfall location results in the discharge of stormwater directly in the area of the town beach. This is a direct discharge with no mitigation of stormwater quality. A discharge of this sort would not be in compliance with DEP stormwater standards today. The outfall pipe has several inches of sediment and muck deposits in it which have an oily appearance. Reinspection of this site in spring 2004 found that much debris had accumulated below the outfall, and a makeshift grate had been placed over the outfall, secured by some logs.
Recommended Actions / BMP's	Since this is a town owned facility and is heavily used by the public, it is recommended to mitigate this stormwater discharge, which could not only improve this site, but also serve as a demonstration project. The site could be retrofitted to provide pre-treatment of the stormwater before it is discharged to the lake. A potential mitigation measure for the parking lot portion of the stormwater is the retrofitting of low impact development techniques that provide filtration through vegetated buffers. A similar site in Acton is being retrofitted with Filterra units, which may be useful for this site (see Appendix). For the overall flow coming from adjacent town roads, the installation of a pretreatment device such as a hydrodynamic separator is recommended. The estimated cost of this option would be about \$50,000, \$35,000 for the unit and \$15,000 for installation. After the installation of BMP's, ongoing maintenance will be critical to their performance in order to achieve water quality benefits.



Stormwater Outfall in close proximity to the beach



Sediment build-up in the pipe (April 3003)



Stormwater Outfall at Wayland Town Beach



Debris accumulation (March 2004)



Grate secured by logs (March 2004)



Wayland Town Beach Parking Lot

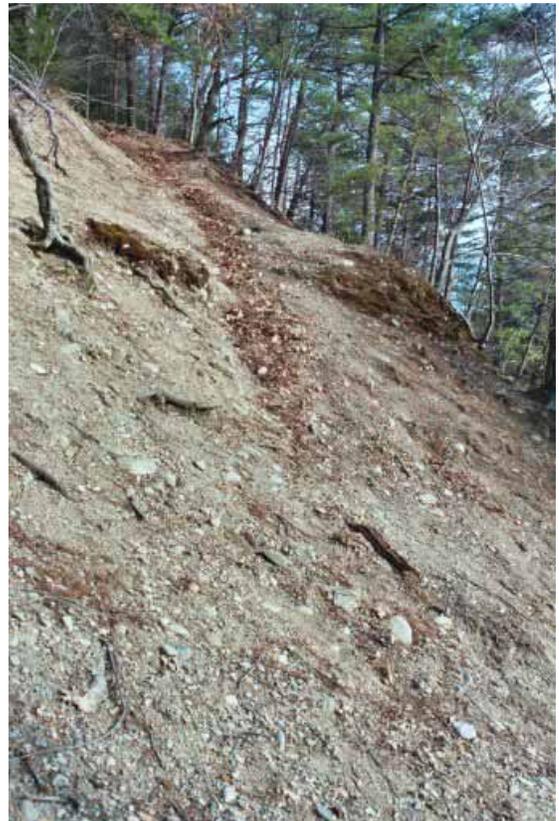


Pictometry View of Wayland Town Beach and Parking Lot

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-FR/WA-1	Shoreline of North Pond in Framingham & Wayland
Location	Residential areas of Wayland and Framingham
Site Description:	Several of the residents with property abutting the North Pond shoreline have adopted practices which have potential impacts on the lake. These include: (1) dumping of leaves, yard waste, and brush onto the steep slopes of the lake's shoreline (2) installation of stairs and paths on the lake's steep slopes to provide access to the shoreline; and (3) installation of docks on the lake and use of motor craft on the lake
Issues / Problems	(1) Since the lake already has elevated inputs of phosphorus, disposal of leaf and yard waste on the shoreline could exacerbate nutrient loading problems. (2) Improper management of steep slopes can lead to erosion, and increased sediment loads to the lake. (3) Boating activity, particularly motor craft, can resuspend sediments, cause shoreline erosion, and has potential impacts from fuel, oil, and greases.
Recommended Actions / BMP's	These practices should be addressed by public education and outreach measures (see the public education brochure for this project). Speed limits for boats should be posted by the Dept. of Conservation and Recreation



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-FR/WA-2	Stormwater discharges from residential areas
Location	Areas adjacent to North Pond in Framingham and Wayland
Site Description	There are 9 stormwater outfall discharges to North Pond, 5 in Wayland and 4 in Framingham, that discharge stormwater runoff from residential areas.
Issues / Problems	Discharges from these outfalls have the potential for conveying stormwater pollutants typical of residential land uses and streets, including nutrients, sediments, bacteria, oils and greases, and pesticides. Potential sources of nutrients may include fertilizers applied to lawns and gardens, and wastewater leachate from septic systems or leaking sewer lines. Sources of sediments include street debris and erosion from construction or landscaping activities. Bacteria can come from pet wastes and malfunctioning septic systems or leaking sewers. Oils and greases are related to vehicles and roadway runoff, and pesticides may be used in lawn and garden maintenance.
Recommended Actions / BMP's	All of these potential pollution sources should be addressed by public education and outreach measures. These will be included in the public information brochure produced for this project. In addition, stormwater pollution can be reduced by frequent street sweeping and cleaning of catch basins. In some cases, retrofitting with deep sump catch basins would reduce the pollutant load in stormwater.



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT

AREA 1: North Pond Sub-watershed

SITE NP-WA-3	Stormwater discharges from Route 30
Location	Route 30 as it crosses the culvert between North Pond and Snake Brook Pond
Site Description:	Route 30 discharges stormwater directly to North Pond and Snake Brook Pond about ¼ mile east of where it passes over the Massachusetts Turnpike. There are 4 paved drainage swales on the westbound lane of Rt. 30 that discharge to North Pond, and 3 paved swales that discharge to Snake Brook Pond.
Issue / Problem	The direct discharges of roadway runoff have no measures in place to mitigate stormwater quality. There is evidence of build up of sediments, organic material, and litter at the bottom of each of the drainage swales. The abutment on the east bound lane also shows signs of erosion of steep slopes. Discharge of road salts in winter runoff is also a concern. This kind of direct discharge of untreated stormwater would not comply with current DEP stormwater guidelines.
Recommended Actions / BMP's	The Mass. Highway Department should consider installation pre-treatment devices such as hydrodynamic separators to reduce the sediment and pollutant load to the lake. This would also require installation of catch basins and piping in this area. In addition, the existing erosion on steep embankments should be corrected. Preliminary cost estimate for installing these BMP's is \$250,000.





Pictometry View of the Mass. Turnpike & Route 30 Crossing Lake Cochituate (North Pond, Snake Brook Pond, & Middle Pond)

5.2 BEAVER DAM BROOK SUBWATERSHED

5.2.1 Overview of Beaver Dam Brook Subwatershed

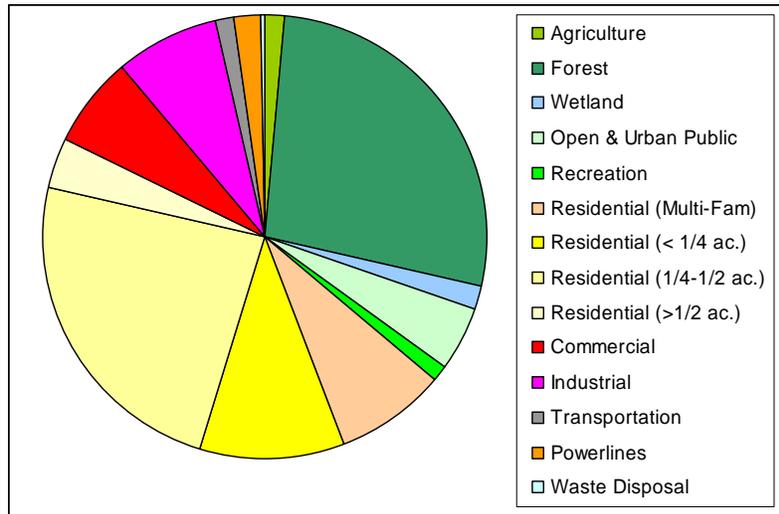
5.2.1.1 Land Use

The areas that drain directly to Beaver Dam Brook includes 4,536 acres in Framingham, Natick, and Sherborn, representing 40.7 percent of the watershed of Lake Cochituate (see Figure 2-1 for geographic context). The land use of this subwatershed is predominantly residential (47 percent) with all ranges of density represented, but the greatest amount in the medium density category ($\frac{1}{4}$ acre to $\frac{1}{2}$ acre lots) and high density category (less than $\frac{1}{4}$ acre lots). Commercial and industrial land combined represent 15 percent of the area (645 acres). About 27 percent of the watershed (1,238 acres) is forested, most of that in the headwater areas of Sherborn and Framingham.

Table 5- 4 Land Use in the Beaver Dam Brook Subwatershed, 1999

Land Use Category	Acres	Percent
Agriculture	57.7	1%
Forest	1,238.6	27%
Wetland	72.7	2%
Open & Urban Public	218.2	5%
Participation Recreation	50.9	1%
Residential (Multi-Family)	366.88	8%
Residential (< 1/4 acre lots)	483.44	11%
Residential (1/4 - 1/2 acre)	1,077.74	24%
Residential (>1/2 acre lots)	162.72	4%
Commercial	303.22	7%
Industrial	342.33	8%
Transportation	64.06	1%
Power Lines	82.32	2%
Waste Disposal	15.87	0%
SUBBASIN TOTAL:	4,536.7	100%

Figure 5- 2 :Land Use in the Beaver Dam Brook Subwatershed, 1999



5.2.1.1 Water Supply, Wastewater, and Stormwater Infrastructure

Framingham receives its public water supply from the MWRA system, which delivers water from the Quabbin and Wachusett Reservoirs. Natick and Ashland are supplied by town owned wells that pump groundwater from aquifers in the SuAsCo basin, and Natick also has wells in the Charles River basin. Ashland's wells are located outside of the Lake Cochituate watershed, while Natick has two well fields within the watershed, the Springdale and Evergreen well fields (see Map 1, Watershed Resources). These wells have a combined permitted withdrawal of 4.1 million gallons per day. The wells and their wellhead protection areas are not located within the Beaver Dam Brook subwatershed.

The portions of the subwatershed in Ashland, Framingham, and Natick are on public sewers, while the area within Sherborn is on septic systems. The wastewater systems of Ashland, Framingham, and Natick are connected to the MWRA, which discharges treated effluent to Massachusetts Bay.

Most of the residential, commercial, and industrial areas in Natick and Framingham have municipal separate storm sewers (MS4s) that collect stormwater from a series of catch basins and discharge it through outfall pipes to Beaver Dam Brook or its tributaries (see Map 11).

5.2.1.2 Transportation Infrastructure

No major transportation facilities are located within the subwatershed; however, a segment of Route 135 crosses the subwatershed in Framingham for about 2.5 miles. There are numerous smaller town streets and residential roads, concentrated mostly in the Framingham and Natick portions of the subwatershed.

5.2.1.3 Potential Sources of Contamination

The inventory of potential sources of contamination developed for this project includes 37 Underground Storage Tanks and 34 Hazardous Waste (21E) sites in the Beaver Dam subwatershed. These are listed in Tables 4-2 and 4-4.

There are two auto salvage junkyards, one in Framingham and one in Natick. Both of these are located directly on the banks of Beaver Dam Brook. These have been identified as priority sites and are described in more detail in section 5.2.2 below. An NSTAR electric transmission right of way passes across the subwatershed in Ashland, Natick, and Sherborn.

5.2.1.4 Large Areas of Impervious Surface

MAPC's inventory of large impervious surfaces (over 1 acre) includes 74 sites in the Beaver Dam subwatershed, totaling 442.15 acres of paved area. The largest of these is the 116.47 acre former GM site, now owned by Adesa Auto Auction. This is the largest impervious site in the Lake Cochituate watershed, and it is identified as a priority site in section 5.2.2 below. Other large impervious sites include a concentration of commercial and industrial sites along Route 135 in Framingham and Natick. Several of these are also identified as priority sites in section 5.2.2. A summarized list of large impervious areas, for the entire Lake Cochituate watershed, is listed in Table 4-7.

5.2.2 Identification of Priority Sites and Issues

Based on field investigations, map analysis, and review of local data, the following priority sites and water quality issues were identified in the North Pond subwatershed. These are shown on Figure 5-5 and are described in more detail in the following tables, which also include action recommendations for each site.

Table 5-5 Summary of Priority Sites and Issues in Beaver Dam Brook Subwatershed

Site No.	Location	Issues
BB-NA-1	Central Street Used Auto Parts of Natick 327 West Central St. , Natick	<ul style="list-style-type: none"> • Junk yard on the banks of two streams • Stormwater run-off to waterbodies
BB-FR-2	A-1 Used Auto Parts 115 rear Beaver St., Framingham	<ul style="list-style-type: none"> • Junk yard on the banks of Beaver Dam Brook • Stormwater discharge wetlands
BB-FR-3	Framingham DPW / MWRA pump station Arthur Street Framingham,	<ul style="list-style-type: none"> • site erosion
BB-FR-4	Adesa Auto Auctions, Western Ave Framingham	<ul style="list-style-type: none"> • Largest impervious site in Lake Cochituate watershed, no known site plan for handling stormwater run-off
BB-NA-5	West Natick Business District West Central Street Natick,	<ul style="list-style-type: none"> • Stormwater to wetlands • Existing BMPs not working
BB-NA-6	Beaver Dam Settling Basins, Natick	<ul style="list-style-type: none"> • Settling basins in need of Maintenance • Sediments and nutrients • Trash

5.2.3 Summary Watershed Action Plan

5.2.3.1 High Priority Sites

BB-NA-1 Central Street Used Auto Parts of Natick

BB-FR-2 A-1 Used Auto Parts

BB-NA-6 Beaver Dam Settling Basins, Natick

5.2.3.2 Medium Priority Sites

BB-FR-4 Adesa Auto Auctions

BB-NA-5 West Natick Business District

5.2.3.3 Low priority sites

BB-FR-3 Framingham DPW / MWRA pump station

5.2.4 Priority Sites and Recommended Actions in Beaver Dam Brook Subbasin

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-NA-1	Central Street Used Auto Parts of Natick
Location	327 West Central Street, Natick
Site Description	A used auto parts site and 21 E site with partially paved lot area abutting Beaver Dam Brook.
Issue/Problem	<ul style="list-style-type: none"> • Stormwater from site drains west towards vehicle entrance/exit driveway, out onto West Central St. (Route 135), into catch basins and then to Beaver Dam Brook • Possible VOC, metals, others from site • Turbidity and sedimentation
Recommended Actions / BMP's	<p>Site drainage could be redirected away from West Central Street by constructing a berm along the western (stream side) and northern edges of the property. Flows would be directed into a vegetated swale on the western side of the lot inside the berm. Check dams in the swale would slow flows and help TSS to drop out into swale. A detention basin could be constructed in the southeast corner of the lot to treat first flush stormwater with an overflow bypass to Beaverdam Brook for flows > 2-5 year storm. Site is about 1 acre. Estimated cost would be about \$300,000.</p>



This photo is the detention basin in the bottom left corner of the top photo



This photo is Beaver Dam Brook beside the bottom of 327 West Central Street in Natick (top photo)

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT	
AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-FR 2	A-1 Used Auto Parts
Location	115 Rear Beaver Street, Framingham
Site Description	Used auto parts yard abuts Beaver Dam Brook
Issue / Problem	<ul style="list-style-type: none"> • Stormwater runoff to Beaver Dam Brook • Possible VOC, metals, others from site • Turbidity and sedimentation
Recommended Actions / BMP's	Site drainage could be redirected away from wetland areas by constructing a berm along the southern (stream side) and western edges of the property. Flows would be directed into a vegetated swale on the southern side of the lot inside the berm. Check-dams in the swale would slow flows and help TSS to drop out into swale. A detention basin could be constructed in the southeast corner of the lot to treat first flush stormwater with an overflow bypass to Beaverdam Brook for flows greater than a 2-5 year storm. Site is about 1 acre. Estimated cost would be about \$300,000.



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-FR 3	Municipal Property, Public Works storage yard and MWRA EXT Pump Station
Location	Arthur Street, Framingham
Site Description	Framingham Department of Public Work yard, abuts Beaver Dam Brook and the Natick town line.
Problem	This is a two-parcel site of about one acre in total size and is paved. This site contributes significant flows of untreated stormwater runoff along with heavy TSS loads from the parking/storage areas into a tributary stream of Beaverdam Brook. Sheet flow runs from west to east across both the MWRA yard and the DPW site into the stream.
Recommended Actions / BMP's	A possible approach to this problem would include the construction of a pitched swale along the eastern edges of both the MWRA pump station site and the DPW yard. The swale would help attenuate TSS by directing stormwater flows towards four deep sump catch basins with attached Vortechs units for first flush treatment of stormwater. Flows greater than a 2-5 year storm would be bypassed via overflow piping to the tributary stream. Estimated cost would be about \$200,000.



PRIORITY SUB-WATERSHED ASSESSMENT	
AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-FR 4	Adesa Auto Auction of Boston site
Location	63 Western Avenue, Framingham
Site Description	Large parking and auto storage facility at former GM plant site: largest single impervious site in Lake Cochituate watershed at about 108 acres in size.
Problem	<ul style="list-style-type: none"> • Very large impervious area with no apparent stormwater detention ponds or other controls • During storm events and winter melt, this site may be contributing nonpoint source pollution to Beaver Dam Brook • Notice of Intent filed with Framingham CC in 1999 to remove buildings on site but no Order of Conditions or Certificate of Compliance on record • Turbidity and sedimentation • Contact with company officials has not yielded information regarding stormwater system
Recommended Actions / BMP's	Existing storm water controls for the site need to be determined. A detailed analysis of existing outfalls and their condition, the number of feet of pipe, manholes and catch basins needs to be determined. Possibly dedicate large detention basin across from existing basin west of the central portion of the site and just east of Beaverdam Brook. Two large TSS removal units would precede the basin or a series of smaller TSS units could be placed further up the drainage area piping system for collection. At least 1000 feet of piping, 15 catch basins and detention basin in addition to TSS removal would mean that this project would cost in the \$500,000 range.



Adesa Auto Auction of Boston site (former GM plant)

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-NA-5	West Central Street Commercial Area
Location	Area bordered by Boden Lane to the west and Mill Street to the east, RR tracks to north and West Central Street to south , Framingham.
Site Description	Roughly 116-acre commercial/industrial district with high percentage of impervious area just south of Beaverdam Brook. The site has been delineated into three delineated NPS sites: 1) the Comcast site at 241 West Central, 2) 233-235 West Central Street, and the 3) the Barber Brothers parcel just east of the 233-235 West Central St.
Problem and Recommended Action/BMP	<p>Site 1: About 26-acres in size. Currently, sheet flow is running west to east across a paved parking area in front of and around the Comcast Building to Beaverdam Brook. The stone collecting swale presently in place would be replaced with a it with a series of 5 catch basins placed at 100-foot intervals alongside the stream. The first flush would be handled by TSS removal units for each catch basin and the basins would be equipped with overflow devices (estimated cost, \$80,000).</p> <p>Site 2: Approximately 6-acres in size, this portion of the overall site is paved and its sheet flow runs from west to east to Beaverdam Brook on its western border. Attenuation here could be accomplished by placing a series of three catch basins in the existing low area of the site to treat flows. TSS removal units would accompany each catch basin and overflows could be run to the existing pocket wetland onsite (estimated cost, \$70,000).</p> <p>Site 3: Just east and south of Barber Brothers, a series of existing catch basins collect untreated stormwater where it is piped underneath the RR tracks and then to Beaverdam Brook. A possible solution here would be insert into a drain line manhole an appropriately sized TSS removal unit as close as possible to the RR tracks to gain maximum treatment benefit (estimated cost, \$50,000).</p>



West Central Street Commercial Area



West Central Street Commercial Area



West Central Street Commercial Area



Drainage system is failing after winter ice & snow lifted the drainage pipes



Photos show parking lot drainage directly emptying to and impacting the drainage tributary draining to Beaver Dam Brook



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 2: Beaver Dam Brook Sub-watershed	
SITE BB-NA-6	Beaver Dam Brook Settling Basin
Location	Between Speen Street, West Central Street (Rt. 135) and the RR tracks Basin is adjacent to the Mitsubishi dealership
Site Description	The settling basins are at the end of Beaver Dam Brook before the brook enters Fiske Pond.
Problem	<ul style="list-style-type: none"> • These basins slow the flow of water allowing sediment to settle to the bottom. Sediments and nutrients have accumulated to the point that the basins have become ineffective at trapping or allowing for settling out of further sediments. • Trash from Rt135 traffic, trash from shopping plaza parking lot, and trash from upstream sources • Turbidity and sedimentation • Algae build up in summer
Recommended Actions / BMP's	<p>Several reports in the past have recommended dredging the settling basins. The associated costs with first dredging and second, the disposal of the potentially contaminated sediments, seem to have rendered this project solution unfeasible. Accordingly, the current recommendation is to build a rock fore-bay at the start of the settling basin. The fore- bay would be big enough to hold and slow the brook's flows and would be engineered so as to not restrict flows during major storm events. The project would attempt to slow the brook's flow using the same principle as the settling basins original design but on a smaller scale. The smaller scale may allow for easier maintenance and less cost. The system design would allow for some detention of stream flows, allowing some settling out of sediments.</p> <p>The recommended area has very good access and municipal ownership. Expected costs would be in the \$500,000. range.</p> <p>Other recommendations for this site are: A clean up of the surrounding land and wetlands and an enforceable maintenance plan for the adjacent parking lots. This should help reduce local sediment input. (note pictures of trash in wetlands and on the net between basins)</p> <p>The long term sedimentation issue is not a single source issue. One issue that seems fairly prevalent is the filling of lots adjacent to the stream. Lot owners attempt to level out their land by removing the gentle slope leading to the stream bed hoping this will halt the meandering tendencies of a natural stream. Change can only be accomplished through an vigorous public education campaign.</p> <p>A couple of options not often discussed but ones that may have a some success on this site would be Hypolimnetic Aeration and Artificial Circulation. The installation of an aeration system would increase oxygen levels, increase the die off of rate of bacteria, and increase the mixing rate to control algae and spread the algae biomass. Hypolimnetic aeration can help reduce the release of phosphorus from sediment and can help increase oxygen levels in the sediments.</p>



This photo shows the settling basins and the end of Beaver Dam Brook. The large body of water on the bottom right is Fiske Pond. The larger rectangular basin is High Priority site # BB-NA 6. Note the trash net and the accumulated trash between bottom basin and Fiske Pond.



Note the trash net and the accumulated trash, under the red truck (same trash rack as previous aerial photo)



Photo shows a small pocket wetland flowing to Beaver Dam Brook and the need for a concerted effort to clean the end of outfalls.



Photo shows a sample effort to channelized part of Beaver Dam Brook. The idea behind this effort is to reclaim lawn space and stop the brook from encroaching on the homeowner's land

5.3 PEGAN BROOK SUBWATERSHED

5.3.1 Overview of Pegan Brook Subwatershed

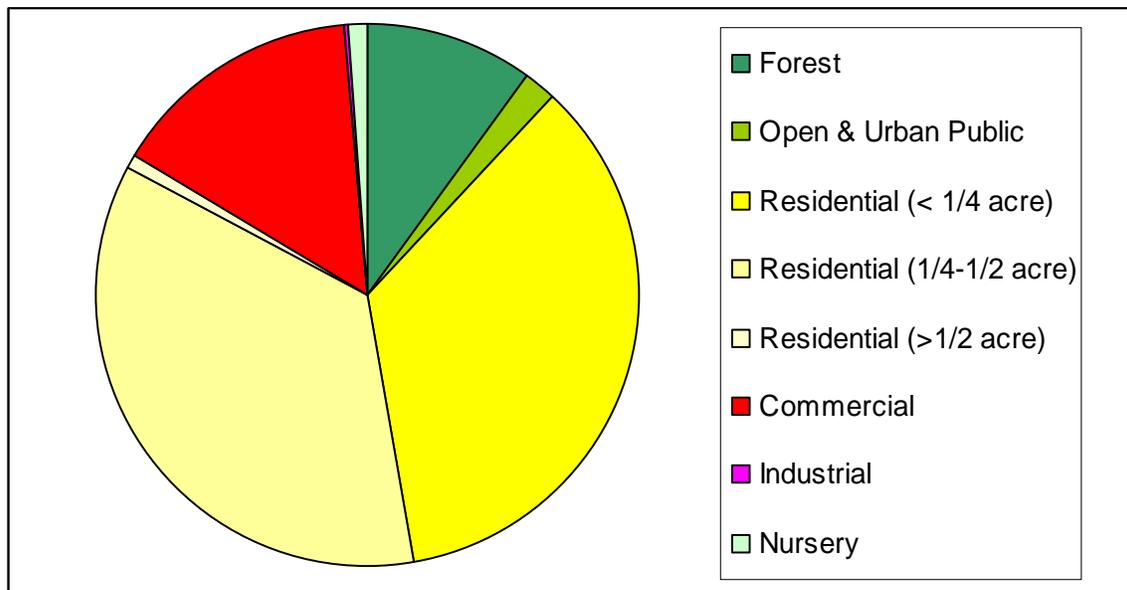
5.3.1.1 Land Use

The Pegan Brook subwatershed encompasses 350 acres in Natick, representing 3 percent of the total watershed area of Lake Cochituate (see Figure 2-1 for geographic context). The land use of this subwatershed is highly urbanized, with the downtown Natick commercial district and surrounding residential neighborhoods. Commercial land makes up 15 percent of the subwatershed, and residential uses make up 71 percent, split evenly between high density (less than ¼ acre lots) and medium density (¼ acre to ½ acre lots). This subwatershed has only 12 percent of land in forest or open land

Table 5- 6 Land Use in the Pegan Brook Subwatershed, 1999

Land Use Category	Acres	Percent
Forest	35.0	10%
Open & Urban Public	7.1	2%
Residential (< 1/4 acre lots)	123.3	35%
Residential (1/4 - 1/2 acre)	124.0	35%
Residential (>1/2 acre lots)	3.3	1%
Commercial	52.6	15%
Industrial	0.3	0%
Nursery	4.2	1%
SUBBASIN TOTAL:	349.8	100%

Figure 5- 3 Land Use in the Pegan Brook Subwatershed, 1999



5.3.1.1 Water Supply, Wastewater, and Stormwater Infrastructure

Natick is supplied by town owned wells that pump groundwater from aquifers in the SuAsCo and Charles River basins. Two of Natick's well fields are located within the Lake Cochituate watershed, the Springdale and Evergreen well fields (see Map 1, Watershed Resources). These wells have a combined permitted withdrawal of 4.1 million gallons per day. The wells and their wellhead protection areas are not located within the Pegan Brook subwatershed.

The Pegan Brook area of Natick is on public sewers connected to the MWRA, which discharges treated effluent to Massachusetts Bay.

The entire Pegan Brook subwatershed is connected to municipal separate storm sewers (MS4s) that collect stormwater from a series of catch basins and discharge it through outfall pipes to Pegan Brook or its tributaries (see Map 13). There are about 13 stormwater outfalls in the Pegan Brook subwatershed, as identified in the inventory conducted by DEM interns in 2001.

5.3.1.2 Transportation Infrastructure

The major transportation facilities located within the Pegan Brook subwatershed, are, a rail line that handles Commuter Rail, Amtrak, and CSX's freight and a segment of Route 135 that crosses the southern edge of the subwatershed for about 4000 feet. There are numerous smaller town streets and residential roads throughout the subwatershed.

5.3.1.3 Potential Sources of Contamination

The inventory of potential sources of contamination developed for this project includes 5 Underground Storage Tanks and 1 Hazardous Waste (21E) site in the Pegan Brook subwatershed. These are listed in Tables 4-2 and 4-4.

5.3.1.4 Large Areas of Impervious Surface

MAPC's inventory of large impervious surfaces (over 1 acre) includes 15 sites in the Pegan Brook subwatershed, totaling 40.32 acres of paved area. Large impervious sites include a concentration of commercial and industrial sites along Route 135 in downtown Natick. The inventory of large impervious sites is summarized in Table 4-7.

5.3.2 Identification of Priority Sites and Issues in Pegan Brook Subwatershed

Based on field investigations, map analysis, and review of local data, the following priority sites and water quality issues were identified in the Pegan Brook subwatershed. These are shown on Figure 5-7 and are described in more detail in the following tables, which also include action recommendations for each site.

Table 5-7 Summary of Priority Sites and Issues in Pegan Brook Subwatershed

Site No.	Location	Issues
PB-NA-1	Lake & LaGrange St, Natick	<ul style="list-style-type: none"> o Under-sized catch basin o Clogged catch basin causing erosion- o Stormwater discharge causing sedimentation which is affecting a wetland
PB-NA-2	Pegan Park, mouth of Pegan Brook	<ul style="list-style-type: none"> o Stream flow disrupted by debris in channel o previous projects never completed /maintained
PB-NA-3	Stream, south of RR empties into Pegan Brook in Pegan Park	<ul style="list-style-type: none"> o Storm water discharging sediments and trash o neighbors' illegal discharge of yard waste is filling wetland area
PB-NA-4	Confluence of the (inactive) Saxonville RR to main railroad line	<ul style="list-style-type: none"> o Invasive weeds, sedimentation o Potential man-made wetland creation site (soon to be part of Lake Cochituate Bikeway)
PA-NA-5	Duraelectric Site on North Avenue	<ul style="list-style-type: none"> o site needs further investigation and possible enforcement for sedimentation and thermal discharge
PB-NA-6	Channelized route of Pegan Brook from RR tracks to Pegan Park	<ul style="list-style-type: none"> o storm water discharge from house directly to brook o neighbors yards drain directly to channelized streambed o invasive weeds

5.3.3 Summary Watershed Action Plan for Pegan Brook

5.3.3.1 High Priority Sites

Pegan Park, mouth of Pegan Brook (PB-NA-2)

- complete man-made wetland system with ponds and chambers

Tributary Stream, south of RR tracks, empties to Pegan Brook in Pegan Park (PB-NA 3)

- Man-made wetland system to augment existing natural system
- removal of sediments from existing watercourse

5.3.3.2 Medium Priority sites

Confluence of the (inactive) Saxonville RR line to main railroad line (PB-NA 4)

- Install a pilot man-made wetland system, site's proximity to new bike rail-trail would call attention to efforts to clean Pegan Brook and visualize the brook's flow

5.3.3.3 Low priority sites

Channelized route of Pegan Brook from RR tracks to Pegan Park (PB-NA 6)

- Add storm drain inserts in culverted section of Pegan Brook south of the RR tracks
- Public education on what ever substance is applied to lawn goes to brook
- Gutter realignment for house adjacent to stream bank

Lake and LaGrange Street, Natick (PB-NA 1)

- Clean sump and add rip-rap at base of outfall

5.3.3.4 Site Needing Further Investigation and Potential Enforcement

Duralectric Site on North Avenue (PB-NA 5)

- site needs further investigation and possible enforcement for sedimentation and thermal discharge

5.3.4 Priority Sites and Recommended Actions in Pegan Brook Subwatershed

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-1	Failing catch basin and outfall
Location	Lake Street and LaGrange
Site Description	1 Lake Street floods after storm events due to poor catch basin design 2 Additional sedimentation at the outfall due to no rip rap
Problem	1 As a result of the failed catch basins lots of mud forms and siltation is easily discharged to the reduced capacity catch basin. 2 As the stormwater discharge exits the outfall pipe velocity stirs up the sediments and a muddy plume heads down stream
Recommended Actions / BMP's	1 Add a deep sump catch basin to hold sediments before discharge to stream 2 Add rip rap at the outfall discharge point to trap and slow effluent 3 Add a small asphalt berm to direct flows toward catch basin and to keep vehicles on the pavement Estimated cost of these measures, \$15,000



Catch basin set very low and seems to be quite small, presently filled with mud. New houses are being built in a lot down the street, trucks coming and going from the site are contributing mightily to the sediment load.



The outfall from the adjacent catchbasin discharges silt and mud from the street. The receiving pool is filled with a muddy plume leading to the mouth of Pegan Brook.



The outfall is located at the bottom of this picture. This pool leads to the mouth of Pegan Brook and runs parallel to Pegan Cove.

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-2	Wetland system in Pegan Cove Park, at the mouth of Pegan Brook
Location	Pegan Cove Park is located on Washington Avenue in Natick, just west of Natick Center The 22 acre park contains the actual mouth of Pegan Brook
Site Description	<p>Extensive wetland system at the mouth of Pegan Brook Site previously had a set of filter beds (built in 1893 and used until 1943) and a dam with a pump system to control flows Additional attempts to clean stream flows are evident by the newer and neglected storm water system in Pegan Park. Concrete structure was an attempt made in the early 80's to work on treating Pegan Brook at the end of the pipe. Cement structure presently over grown with brush, surrounding fence is falling down and missing complete sections. Structure is located in an area adjacent to the old filter beds Structure appears to be partially working despite the brook also running around the side of the structure</p> <p>The park contains the main stream of Pegan Brook as well as a tributary entering from the south under the parallel RR tracks</p>
Problems	<p>No visible maintenance or upkeep of the existing stream bed (See page of photos with past construction project debris)</p> <p>Ponding and meandering of stream appears natural in some place and manmade in others, there is no organized plan for water's flow</p> <p>A visible sand delta at the mouth of Pegan Brook</p>
Recommended Actions / BMP's	<ol style="list-style-type: none"> 1 Area is prime for a constructed wetland system, complete with a forebay, ponds, & wetland chambers all to be located above the existing water quality structure. This up stream area could potentially incorporate and encompass flows from the PB-NA #3 site. Presently the park has areas that appear to have been ponding areas in the past. 2 Work with the EOE's Wetland Restoration Program to develop a management plan for the surrounding wetlands and a design for the formal stream channel
Costs	Estimated costs could be over \$500,000.
Benefits	<ul style="list-style-type: none"> • Combines features of emergent wetlands, ponds, and groundwater for maximum pollutant removal • Relatively low maintenance needs • Land is State owned and leased to the Town of Natick • Site is easily accessible for maintenance of solution, • Land/soils has been used as a treatment system in the past



An over view of Pegan Cove Park
Brook runs north of the RR tracks and almost parallel to the heavy tree in the middle of the photo



Pegan Brook entering Pegan Cove Park

Structure's intake



Structure's outfall





This photo shows the lake in the background, the non-upkeep of the structure, and the main flow of Pegan Brook by-passing and moving to the left of the structure.



Photo shows the new movement of the streamway. Pegan Brook has been redirected several times. Thus the area in and around Pegan Park and the mouth of Pegan Brook has great wetland soils and lots of room for a man-made wetland system consisting of fore-bay and several chambers. Due to the history of filtering at the end of the stream this end of pipe solution would be nothing new.

This page of photos show long lengths of filter fabric and pipes from different projects over the years. These are a few of several sections of the brook that have old building materials left behind.



The structure below has no recorded history of upkeep or usage. Though the system seems to be working to slow the flow of water no purpose is known by the Town.



Some of the phosphate issue in Lake Cochituate is potentially from yard waste disposal into the wetland system. The photo below is an example of heavy yard waste disposal into an area just above the Pegan Cove park wetland system.



Presently Pegan Brook runs to the right of the top photo. The next photo is a swath of land alongside the brook. The photos appear to show what may have been ponding areas of the past. There is another area just west (30-40 yards) of this site that is presently ponding water but with some help could become much more efficient. The ability to pond and slow the flows of Pegan Brook could allow for pretreatment before entering the adjacent wetlands and ultimately Lake Cochituate.





Pegan Cove Park 22 acres of public park in Natick. The land is leased to the Town of Natick from Massachusetts DEM for passive recreation. The park has a small parking lot for approx 10 cars, multiple walking trails and shoreline access to Lake Cochituate.



Pegan Brook as it flows around the hard structure in Pegan Cove Park, note the old pipe in the stream, this is a remnant from the old filter bed system



Effluent from the Pegan Cove park structure



Remnant from the old dam structure used in the days of the original filter beds.



Front view of the hard structure in Pegan Cove Park

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT	
AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-3	Tributary stream to Pegan Brook
Location	Stream from south of the RR tracks to Pegan Brook, drainage arrea south of West Central Street passing under the location of the old RR tracks (circa 1898)
Site Description	<ol style="list-style-type: none"> 1 Tributary to Pegan Brook. Stream located south of the RR tracks. Stream way is heavily impacted by drainage input. 2 Stream channel is loaded with sedimentation from road runoff and area is impacted by household leaf and brush dumping
Problem	<ol style="list-style-type: none"> 1. Sedimentation build up in drainage ditches and stream bed 2. Inadequate detention in catch basins 3. Disposal of brush in wetland area
Recommended Actions / BMP's	<p>The PB-NA 3 site could be an alternative high priority site should it be determined after further investigation that Site PB-NA 2 can not handle additional flows. In that case, use of this site would include:</p> <ol style="list-style-type: none"> 1. Creation of man-made wetlands to augment the existing wetlands. Area has plenty of room and area is wet already. Area located before the old RR bed could be a good site for a Fore-Bay leading to the wetland area. 2. Maintenance, cleaning, and installation of sedimentation removal structures within the storm drain system emanating from the area around West Central Street. 3. Homeowner education on how the local drainage system is designed and works. Description of what happens when you let a stream way get impacted by sediments.
Stream bed north of RR tracks	



North of the railroad tracks
Two 24 inch steel pipes conduct flow from one wetland
to the other (Pipes under water, not visible in this
picture.)



Water course on the South side of RR tracks.



Stream way south of the RR tracks, picture shows
sediment build up and yard debris deposited by
neighbors



Watercourse on the South side of the RR tracks.
Water ponds due to elevations and blockage by debris



This photo is an aerial of site PB_NA 3
The stream can be seen in the center below the active RR tracks.
The old RR track location is at the very bottom of the picture

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-4	Confluence of the northern channelized and covered section of Pegan Brook and drainage from 3 additional storm drain outfalls
Location	Junction of the Main Commuter rail line and the old Saxonville rail line (soon to portion of the rail trail)
Site Description	Site is mainly the north section of Pegan Brook after it has gone under the Saxonville Branch of the RR tracks
Problem	No visible maintenance or upkeep in the area Invasive knotweed
Recommended Actions / BMP's	<ol style="list-style-type: none"> 1 Work with the EOE A Wetland Restoration Program to develop a more natural stream channel and find a way to connect any restoration project to the future bikeway. This inactive rail line has approvals to become the Cochituate Rail-Trail (estimated cost \$50,000). 2 Potential for a man-made wetland system providing for the removal of invasives, and daylighting sections of the presently channelized stream Site chosen because of the potential visibility it could offer as a pilot project (estimated cost, \$100,000)



The weedy area between the RR tracks is a small ponding area of Pegan Brook. The Brook it self is the small light area in the bottom right of this photo.



Soon to be the Cochituate Rail-Trail

Picture shows a southern view of the confluence of the Saxonville RR spur (presently inactive, soon to be a part of the Cochituate bike way) and main RR line in Natick Center. The Natick Center Commuter rail stop in the foreground. Pegan Brook is located on the left side of the picture just before the Saxonville tracks.



Picture shows RR tracks cutting thru Natick Center, Rail-trail will be coming in from the bottom left (Note the high percentage of imperviousness through the center)



LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-5	Duraelectric site on North Avenue
Location	61 North Avenue
Site Description	Industrial site sitting adjacent to the channelized portion of Pegan Brook (north side of RR tracks) Building sits above the RR tracks and Pegan Brook atop a large retaining wall constructed of granite blocks
Problem	Stream channel runs parallel to the property site, on March 3, 2004 heat was emulating from the bottom of the retaining wall. A large amount of algae is presently growing in the section of stream along this property, none above or below property. Some type of sedimentation is also coming out of the wall's bottom. This sedimentation from this site is proceeding to the point where the stream is culverted by the Natick Commuter rail station
Recommended Actions / BMP's	<ol style="list-style-type: none"> 1 Site needs further investigation and possible enforcement 2 Check on the source of the heat source affecting the brook 3 Check on the source and make up of streambed sedimentation



Note the sedimentation on the channelized stream bottom and the stained wall. Sedimentation is not found upstream of this site (see next photos).

Up stream view (no siltation)



Down stream view (siltation)



Note seepage from the bottom course of the wall



This drain pipe below shows no sign of discharge, this photo is right after the seepage points.





This photo shows algae growing while the outside temperature is in the mid 30'

LAKE COCHITUATE PRIORITY SUB-WATERSHED ASSESSMENT AREA 3: Pegan Brook Sub-watershed	
SITE PB-NA-6	Channelized section of Pegan Brook between RR tracks and Pegan Cove Park
Location:	Stream route from RR tracks to Pegan Park, off Washington Ave and Cochituate Street
Site Description:	<ul style="list-style-type: none"> • water leaves RR tracks and runs at an angle in a channeled stream way (under Washington Avenue) to Pegan Park • Last photo shows a small ponding area where a potential fore-bay might be located
Problem:	<ul style="list-style-type: none"> • Due to limited public space options are limited • the southern flows contributing to Pegan Brook, area encompassing Natick Center, are completely culverted and daylight at this point • Lawns run directly into the stream way (anything in contact with the lawn hits the water) • Discharge from houses gutters and street runs directly into stream • Access to ponding area and the large size of the pipe coming under the tracks at this point (4'x4')
Recommended Actions / BMP's:	<ul style="list-style-type: none"> • Constructed wetland with a forebay to handle flows from the culverted flows south of the RR tracks (estimated cost, \$75,000) • Storm drain inserts to capture sediments and trash before dropping to the culvert cost approximately \$300-\$400 per unit x 8- 10 units • House run-off over grass filter strip before straight entrance to stream or a rain barrel for alternative water usage, this would require realigning the gutters on the house pictured below cost about \$300





Any fertilizer or pesticide that is put on these lawns will be in the stream during the first rain event.



Note the downspout and the white drainage pipe draining directly to the stream