Friends of the Bay
protect - preserve - restore

Oyster Bay / Cold Spring Harbor
Watershed Action Plan

August 2011




Prepared by
FUSS & O'NEILL

RAUCH FOUNDATION

Long Island Sound Study
A Partnership to Restore and Protect the Sound

Town of Oyster Bay 1653 New York

Long Island Community Foundation

National Fish and Wildlife Foundation

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Incorporated Village of Laurel Hollow
The Incorporated Village of Lloyd Harbor
Incorporated Village of Matinecock
Incorporated Village of Mill Neck
Incorporated Village of Muttontown
Incorporated Village of Old Brookville
Incorporated Village of Oyster Bay Cove
Incorporated Village of Upper Brookville

We would also like to recognize the Friends of the Bay staff and board members who contributed to the development of this plan. The work of previous Friends of the Bay staff and board members provided a platform from which to build the Watershed Action Plan. The staff of Fuss & O'Neill played an integral role in the development of this Watershed Action Plan. We are deeply indebted to all who have played a role in preserving, protecting and restoring the Oyster Bay/Cold Spring Harbor Estuary.

Funding support for this plan was provided by the National Fish and Wildlife Foundation, Long Island Sound Futures Fund, including the Long Island Sound Study, as well as the Town of Oyster Bay, Long Island Community Foundation, and the Rauch Foundation.

Who We Are

Friends of the Bay (FOB) – a widely respected, not-for-profit organization with thousands of supporters – is dedicated to the protection of the Oyster Bay/Cold Spring Harbor estuary and the surrounding watershed. FOB's advocacy efforts enable the estuary to continue as an unsurpassed scenic, ecological and economically-productive resource.

Our Mission

FOB's mission is to protect, preserve and restore the ecological integrity and productivity of the Oyster Bay/Cold Spring Harbor estuary and the surrounding watershed.

What We Do

- Helping to maintain clean waters that sustain a vital ecosystem, a wide range of recreation and a thriving shellfishing aquaculture business
- Monitoring water quality within the estuary
- Creating awareness of the need to preserve water quality and marine life
- Confronting unsound development proposals
- Promoting responsible development and land use planning
- Partnering with residents, organizations, and local businesses
- Working with government at all levels

How We Are Perceived

Friends of the Bay has received the Region 2 Environmental Quality Award by the Environmental Protection Agency for its water quality monitoring program. This award recognizes individuals and organizations that have significantly contributed to improving environmental quality during the prior year; have demonstrated a high level of achievement; and have created unique or location-specific benefits, produced results that are sustainable or reproducible, or increased public involvement in environmental action.

In 1997, we became one of the few East Coast groups ever to receive the prestigious Walter B. Jones Memorial and NOAA (National Oceanic and Atmospheric Administration) Excellence Award in Coastal and Ocean Resource Management presented to the "Non-Governmental Organization of the Year." In 1999, the New York Chapter of the American Planning Association honored FOB with an Award for Meritorious Achievement. Friends of the Bay was selected in the "Best Environmental Organizations" category of the *Long Island Press'* Best of Long Island 2008 issue (Volume 7, Issue 2). (This is the third year the readers of the *Long Island Press* selected us as their choice in this category.)

More importantly, our cooperative planning efforts are models for local governments and other environmental groups around Long Island Sound that seek to prepare watershed plans to protect their embayments and reap the benefits of a cleaner Sound. Our Executive Director sits on the Long Island Sound Study Citizens Advisory Committee, the Town of Oyster Bay Eastern Waterfront Visioning Plan Steering Committee, the Oyster Bay/Cold Spring Harbor Protection Committee and the Northport Harbor Protection Committee.

FUSS & O'NEILL

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Executive Summary

The Harbor Complex – A Threatened Vital Resource

The Oyster Bay/Cold Spring Harbor Complex is the cleanest estuary in western Long Island Sound and is a vital ecological, economic, and recreational resource. The approximately 6,000-acre estuary, spanning approximately 40 linear miles of shoreline, is the site of one of the most economically important shellfisheries in the State, contains a National Wildlife Refuge, State-designated Significant Coastal Fish and Wildlife Habitats, and has been identified by New York State as an Outstanding Natural Coastal Area. Moreover, the Oyster Bay/Cold Spring Harbor Complex is connected to Long Island Sound, an Estuary of National Significance. Oyster Bay is among the 30-plus areas highlighted by the Long Island Sound Study Stewardship Initiative, in New York and Connecticut, for the ecological and/or recreational values that they support.

The Oyster Bay/Cold Spring Harbor estuary and its watershed have been facing increasing challenges in recent years. Illegal dumping and polluted stormwater threaten water quality, development pressure is reducing the amount of open space and increasing impervious surfaces in the watershed, and man-made dams and culverts inhibit fish passage along streams.

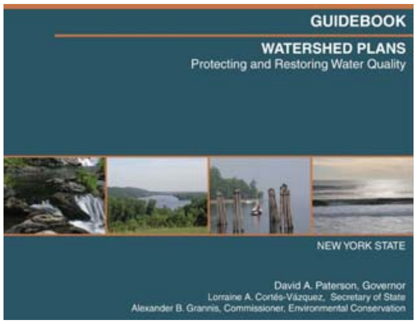
Defenders of Wildlife announced in October 2005 that the Oyster Bay National Wildlife Refuge (NWR) would be placed on their annual list of the ten most endangered Refuges in the country due to polluted stormwater runoff; habitat destruction; non-sustainable development; and human sewage associated with failing sewer infrastructure and inadequate on-site septic systems.

Portions of the Oyster Bay/Cold Spring Harbor watershed are located within the Oyster Bay Special Groundwater Protection Area, designated a Critical Environmental Area by the NYSDEC. The Oyster Bay Special Groundwater Protection Area is one of two such state-designated areas in Nassau County for the purpose of maintaining open space for aquifer recharge. The watershed also contains the West Hills Melville Special Groundwater Protection Area in Huntington, another important protection area for drinking water supply. Ongoing development, intensification of land use, and everyday activities within the watershed has the potential to adversely impact groundwater and public drinking water supplies.

The Oyster Bay/Cold Spring Harbor Complex is the site of one of the most economically-important shellfisheries in the State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of the State's hard clam crop from the heart of the National Wildlife Refuge. Most of the waters of Oyster Bay are classified with the highest and best water quality determination for shellfishing – an unusual distinction given its proximity to New York City and the fact that the harbors to the west have been closed for several decades. The detrimental impact of degraded water quality on shellfishing in the estuary complex is evident as Oyster Bay Harbor, Mill Neck Creek, and its tidal tributaries are among the 69 waterbodies on the New York State list of impaired waters for shellfish harvesting, and the NYSDEC has decertified all shellfish harvesting areas in Mill Neck Creek and some shellfish harvesting areas in Oyster Bay.

The Need for a Comprehensive Watershed-Based Plan

Friends of the Bay, working with the Town of Oyster Bay and other governmental entities, stakeholder groups, and the general public, recognizes the need to address the water resource issues of the Oyster Bay/Cold Spring Harbor estuary complex using a watershed-based approach. A primary way to do this is by developing and implementing a comprehensive watershed management plan to protect and restore water resource conditions throughout the watershed.



GUIDEBOOK

WATERSHED PLANS

Protecting and Restoring Water Quality

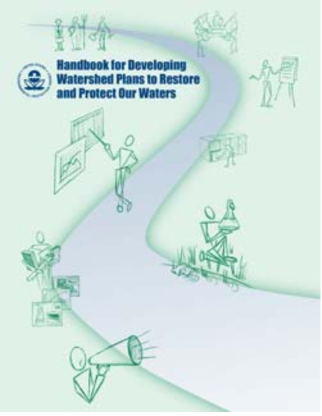
NEW YORK STATE

David A. Paterson, Governor

Lorraine A. Cortés-Vázquez, Secretary of State

Alexander B. Grannis, Commissioner, Environmental Conservation

This watershed management plan has been developed in two phases – a State of the Watershed Report and a Watershed Action Plan – following an approach endorsed by the U.S. Environmental Protection Agency (EPA), the NYSDEC, and the New York State Department of State (NYSDOS) Division of Coastal Resources for developing watershed-based plans.



Handbook for Developing Watershed Plans to Restore and Protect Our Waters

The State of the Watershed Report, prepared on behalf of Friends of the Bay in November 2009 (Fuss & O'Neill, Inc.), summarized existing environmental and land use conditions within the Oyster Bay/Cold Spring Harbor watershed. The State of the Watershed Report integrated a variety of environmental indicators to assess the current health of the watershed and potential future threats. The report provided a baseline assessment of watershed conditions, which can be updated periodically to evaluate changes in the watershed and help direct watershed management planning. The State of the Watershed Report therefore serves as the basis for the Watershed Action Plan.

This Watershed Action Plan identifies prioritized action items to protect and improve the health of the Oyster Bay/Cold Spring Harbor watershed and estuary. The plan has been developed to address the priorities and issues identified in the State of the Watershed Report, with significant participation by a steering committee of interested stakeholders and the public. The Watershed Action Plan is designed to have the clear potential to affect on-the-ground change within the watershed by recommending specific, measurable actions to protect and improve water resource conditions.

Plan Development Process

The Watershed Action Plan has been developed consistent with State and Federal guidance for the development of watershed-based plans. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act and improve the chances for funding through other State and Federal sources.

In addition to building on the baseline information provided in the State of the Watershed Report, development of the Watershed Action Plan consisted of the following major components:

- **Project Steering Committee** – A Project Steering Committee was formed to guide the development of the action plan, including a technical advisory committee consisting primarily of municipal and agency representatives and a larger project advisory committee representing additional stakeholder groups and interested members of the public. A series of workshop meetings were held with the Project Steering Committee to reach consensus on watershed planning goals and objectives and to discuss specific recommended actions. The steering committee also guided the plan development process by providing review comments on draft deliverables. The Watershed Action Plan reflects the combined efforts of Friends of the Bay and the Fuss & O'Neill project team, the Project Steering Committee including representatives of the watershed municipal entities and state/federal resource agencies, and other stakeholders. Members of the Project Steering Committee and others involved in the plan development process are listed in the Acknowledgments section at the beginning of this document.

- **Plan Goals and Objectives** – The project team developed a series of goals and objectives for the watershed based upon the findings of the State of the Watershed Report, the results of a watershed survey developed by Friends of the Bay, and a consensus-building exercise during the initial steering committee meeting.

- **Recommended Actions** – Potential management actions were identified for each of the plan goals and objectives and subsequently refined based upon input from the Project Steering Committee during and following the second workshop meeting. Management actions included short and long-term actions, as well as watershed-wide and site-specific actions. Site-specific retrofit and restoration concepts were developed based on the watershed field inventories and baseline assessments that were performed as part of the State of the Watershed Report. Recommended actions were further refined by considering technical feasibility, cost-effectiveness, potential for success (i.e., achievable), potential environmental impacts and benefits (including anticipated pollutant load reductions), and overall public acceptance, culminating in the plan recommendations that are presented in this document.

- **Public Outreach** – A variety of public outreach also occurred during the watershed planning process to enhance public understanding of issues affecting the watershed and to encourage early and continued participation in the development and implementation of the action plan. The public outreach events and activities included steering committee meetings open to the public, a web-based questionnaire inviting input from the public, dissemination of project-related information though the Friends of the Bay website, and the formation of and collaboration with the Oyster Bay/Cold Spring Harbor Protection Committee.

Priority Actions for the Oyster Bay/Cold Spring Harbor Watershed

The actions in the following table are a subset of the recommended actions that have been identified in this Watershed Action Plan. These "priority" recommendations are actions that are most critical to the success of this watershed plan and will have the greatest benefit to water resource conditions in the Oyster Bay/Cold Spring Harbor Complex and its watershed. The table lists the related plan goals and includes references to specific objectives and actions in *Section 3* of this Watershed Action Plan for more detailed information on each recommendation.

Priority Action	Related Goal	For More Information
Develop and adopt an Oyster Bay/Cold Spring Harbor Protection Committee **inter-municipal agreement**.	Capacity Building	Action 1-4
Create an **Information Resource Center** to serve as a web-based clearinghouse and database of information about the watershed.	Capacity Building	Action 1-8
Improve the understanding of water quality conditions in the harbor complex and sources of impairments through the use of new science and innovative techniques.	Water Quality	Objective 1
Develop **model municipal land use codes and regulations** to better protect water quality and natural resources. Amend municipal land use codes and regulations based on these models.	Water Quality; Land Use and Open Space	Action 4-6 (Water Quality) Action 1-2 (Land Use)
Develop and implement **Watershed Improvement Strategy pathogen reduction plans and stormwater retrofits** to reduce pathogen loads and meet MS4 Permit requirements. Promote **Low Impact Development (LID) and Green Infrastructure** approaches for private development and municipal stormwater infrastructure.	Water Quality	Objective 3
Implement priority **buffer restoration projects** around streams and ponds, and adopt local **riparian buffer regulations**.	Water Quality	Action 4-1 Action 4-2
Strengthen local **septic system regulations** to require new and replacement systems to meet Nassau County standards and to require periodic septic system inspection and maintenance. Provide training to building inspectors on enforcement.	Water Quality	Objective 5
Protect and restore shellfish populations by establishing **a public shellfish spawner sanctuary** and restoring and expanding public shellfish production areas and methods.	Habitat Protection and Restoration	Objective 3
Protect and restore fisheries and wetland habitat by implementing **priority fish passage and stream restoration projects, wetland restoration projects, and adopting alternatives to traditional shoreline hardening.**	Habitat Protection and Restoration	Action 2-1 Action 2-2 Action 2-4 Action 4-3 Action 4-4
Preserve and protect **open space** and increase **public access** to open space and waterbodies. Create a **water trail** along the harbor to increase water-related recreational opportunities, public access to the waterfront, and public stewardship of the estuary complex.	Sustainable Land Use and Open Space	Objectives 2 and 3

1 Introduction

1.1 Importance of the Estuary Complex

The Oyster Bay/Cold Spring Harbor Complex (which is comprised of Oyster Bay Harbor, Cold Spring Harbor, Mill Neck Creek, and Oyster Bay) is the cleanest estuary in western Long Island Sound and is a vital ecological, economic, and recreational resource. The approximately 6,000-acre estuary, spanning approximately 40 linear miles of shoreline, is the site of one of the most economically important shellfisheries in the State, contains a National Wildlife Refuge, State-designated Significant Coastal Fish and Wildlife Habitats, and has been identified by New York State as an Outstanding Natural Coastal Area. Moreover, the Oyster Bay/Cold Spring Harbor Complex is connected to Long Island Sound, an Estuary of National Significance. Oyster Bay is among the 30-plus areas highlighted by the Long Island Sound Study Stewardship Initiative, in New York and Connecticut, for the ecological and/or recreational values that they support.

The harbor complex watershed is an approximately 39 square-mile area located in Nassau and Suffolk Counties. Approximately 80 percent of the watershed is located within the Town of Oyster Bay and its incorporated villages and unincorporated hamlets. A small portion (less than 2 percent) of the watershed is located in Glen Cove, also in Nassau County. The remaining 18 percent of the watershed is within the Town of Huntington and its incorporated villages in Suffolk County. The Oyster Bay/Cold Spring Harbor Complex watershed consists of 14 smaller subwatersheds, from which surface runoff potentially enters the estuary (*Figure 1-1*).

1.2 Issues Facing the Estuary and Its Watershed

The Oyster Bay/Cold Spring Harbor estuary and its watershed have been facing increasing challenges in recent years. Polluted stormwater threatens water quality, development pressure is reducing the amount of open space and increasing impervious surfaces in the watershed, and man-made dams and culverts inhibit fish passage along streams. Use impairments to shellfishing, public bathing, fish consumption, habitat/hydrology, aquatic life, and recreation have been identified for parts of the harbor complex. Future uncontrolled development in the watershed would increase the quantity of stormwater runoff to Oyster Bay/Cold Spring Harbor, despite a 2003 New York State Department of Environmental Conservation (NYSDEC) report that highlighted urban runoff as the dominant source of pathogens to the estuary complex (NYSDEC, 2003).

In addition to these findings by the NYSDEC, Defenders of Wildlife announced in October 2005 that the Oyster Bay National Wildlife Refuge (NWR) was placed on their annual list of the ten most endangered Refuges in the country. The Refuges at Risk: America's Ten Most Endangered National Wildlife Refuges 2005 report explains that the Oyster Bay NWR has become threatened by polluted stormwater runoff; habitat destruction; non-sustainable development; and human sewage associated with failing sewer infrastructure and inadequate on-site septic systems. These human-induced impacts adversely affect the Oyster Bay/Cold Spring Harbor Complex.

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

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Legend

▭	Oyster Bay/Cold Spring Harbor Subwatersheds
▭	County
▭	Village/Hamlet

N
W E
S

0 1 2
Miles

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Open Space Properties: Town of Oyster Bay and Huntington, Nassau and Suffolk Counties, NYSDEC, and the North Shore Land Alliance
ArcMap Document Path: J:\GIS\P2005\1349\A31\SubwatershedRevised.mxd

Figure 1-1
Subwatersheds

Portions of the Oyster Bay/Cold Spring Harbor watershed are located within the Oyster Bay Special Groundwater Protection Area, designated a Critical Environmental Area by the NYSDEC. The Oyster Bay Special Groundwater Protection Area is one of two such state-designated areas in Nassau County for the purpose of maintaining open space for aquifer recharge. The watershed also contains the West Hills Melville Special Groundwater Protection Area in Huntington, another important protection area for drinking water supply. Long Island's drinking water system was designated as the nation's first Sole Source Aquifer, requiring special protection. Ongoing development, intensification of land use, and daily activities within the watershed have the potential to adversely impact groundwater and public drinking water supplies.

The Oyster Bay/Cold Spring Harbor Complex is also the most economically-important shellfishery in the State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of the State's hard clam crop from the heart of the National Wildlife Refuge. Most of the waters of Oyster Bay are classified with the highest and best water quality determination for shellfishing – an unusual distinction given its proximity to New York City and the fact that the majority of the harbors to the west have been closed for more than 30 years. The detrimental impact of degraded water quality on shellfishing in the estuary complex is evident as Oyster Bay Harbor, Mill Neck Creek, and its tidal tributaries are among the 69 waterbodies on the New York State list of impaired waters for shellfish harvesting, and the NYSDEC has decertified all shellfish harvesting areas in Mill Neck Creek and some shellfish harvesting areas in Oyster Bay. The harbor complex is also a highly productive area for marine finfish and an important wintering area for a variety of waterfowl (Cashin Associates, P.C., 2002).

1.3 State of the Watershed

Land Use

Low-density residential land use is the predominant (approximately 64 percent) land use in the watershed (*Figure 1-2*). Approximately 10 percent of the watershed is considered open space, including conservation land and public parks. Transportation land use, including local and county roads and highways, comprises approximately 7 percent of the watershed land area. Commercial land use accounts for less than 2 percent of the watershed area, with the majority of the commercial areas concentrated in Oyster Bay Hamlet and along the Route 106/Pine Hollow Road/South Street corridor. Other isolated commercial areas are located along Forest Avenue in Locust Valley, in Laurel Hollow near the head of Cold Spring Harbor, along Main Street in Cold Spring Harbor, along Jericho Turnpike in Woodbury and West Hills, and the stands and Bridge Marine areas in Bayville. Current and former industrial land use account for a small percentage of the watershed area (0.1 percent) and are located primarily along the Oyster Bay waterfront and Oyster Bay Hamlet.

The harbor complex watershed is characterized by roughly equal amounts of forested and developed land. Approximately 45 percent of the watershed consists of deciduous and coniferous forest cover, which is associated with open space and wooded portions of low-density residential properties. Forest cover in each subwatershed ranges from approximately 15 percent in the White's Creek subwatershed to approximately 65 percent in the Tiffany Creek subwatershed.

Impervious surfaces cover approximately 12 percent of the harbor complex watershed (*Figure 1-3*). Impervious cover, which is one indicator of the cumulative effects of urbanization on receiving water quality and watershed ecology, is generally highest (30 to 70 percent) in the urbanized areas of Oyster Bay Hamlet, the City of Glen Cove, and the Villages of Bayville, Locust Valley, West Hills and the southern portion of Woodbury. The White's Creek subwatershed has the highest impervious cover (approximately 43 percent), which is consistent with the high-density development in Oyster Bay Hamlet. Several of the subwatersheds have significantly less than 10 percent impervious cover, including the Bailey Arboretum and Lloyd Neck subwatersheds.

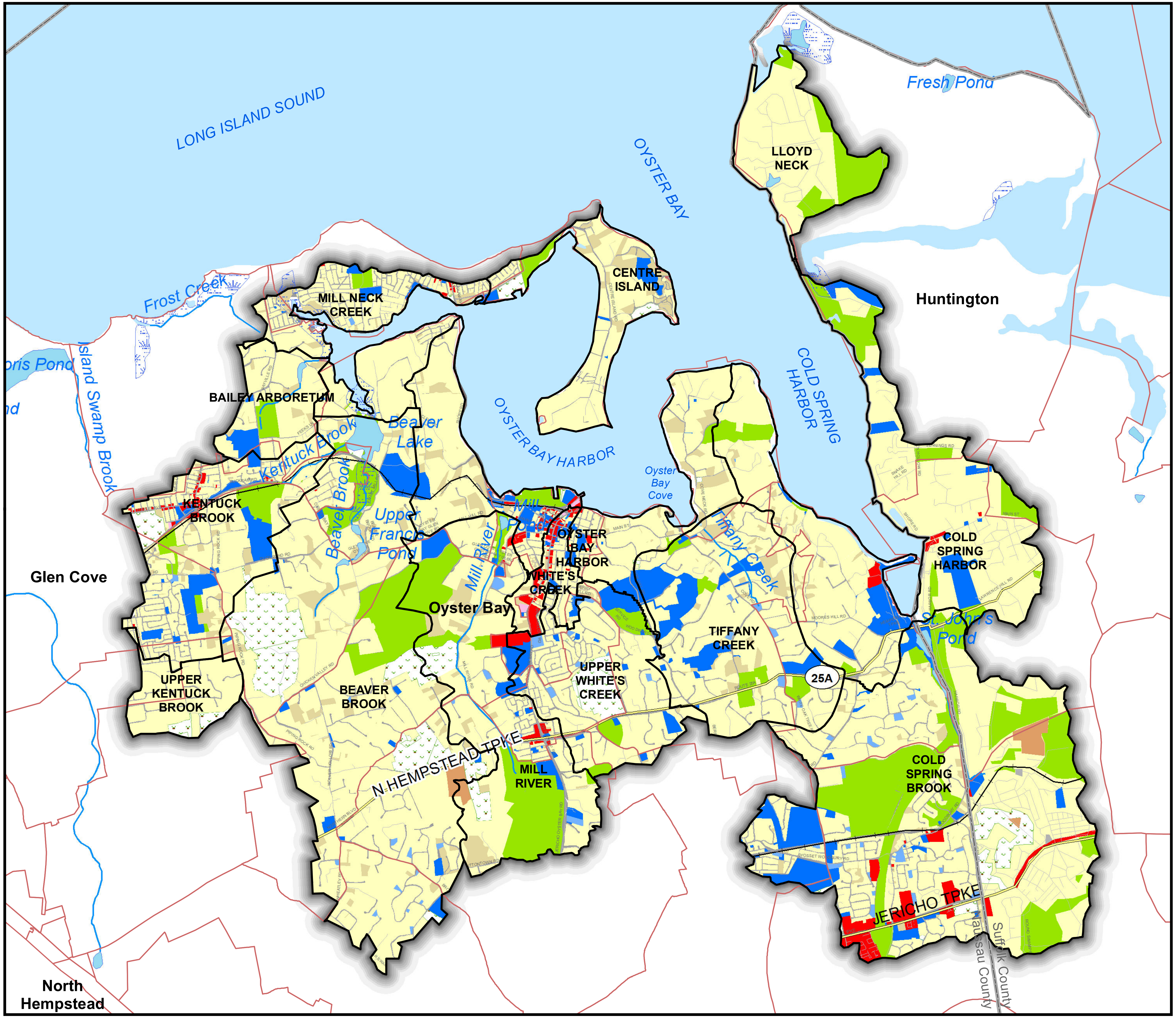
The harbor complex watershed is largely built-out. There are relatively few vacant, undeveloped parcels with future development potential. Most of the undeveloped land in the watershed consists of protected or recreational open space. Overall, less than 3 percent of the watershed area has the potential for new development. The actual amount of land in the watershed that is subject to future development is likely even less since development on these parcels would be restricted by wetlands, steep slopes, and other physical factors, as well as maximum lot coverage, setbacks, and other zoning constraints. Most significant future development will most likely occur as infill or redevelopment. Redevelopment activities – such as new commercial development, residential tear-downs and construction of significantly larger homes, and other infill development – also pose a potential threat to water quality resulting from increased impervious cover, intensification of land use and new pollutant sources, and threats to natural resources such as wetlands and riparian buffers. The impacts of redevelopment can often be more challenging to address effectively given the isolated nature of most redevelopment projects, multiple municipal jurisdictions, and the frequent lack of land use regulations that apply to redevelopment projects.

Water Quality

Mill Neck Creek and parts of both Cold Spring Harbor and Oyster Bay Harbor do not meet water quality standards for shellfish harvesting due to elevated levels of pathogenic organisms. Consequently, water quality issues in the harbor complex have focused on elevated pathogen levels, which impact shellfish harvesting in the estuary. NYSDEC has developed Total Daily Maximum Loads (TMDL) for pathogens for the impaired waters in the Oyster Bay/Cold Spring Harbor complex. A TMDL determines the maximum amount or load of a pollutant from both point and non-point sources that a waterbody can receive and continue to meet applicable water quality standards. Several studies and water quality monitoring programs have identified likely sources of pathogens to the estuary, including:

- Domestic waste disposal using cesspools
- Stormwater discharges
- Wastewater treatment plants
- Freshwater streams
- Boats/marinas/mooring areas
- Wildlife and waterfowl
- Pets

Watershed Action Plan
Oyster Bay/Cold Spring Harbor



Legend

- ▭ Oyster Bay/Cold Spring Harbor Subwatersheds
- ▭ Counties
- ▭ Village\Hamlet

Land Use

- 🟫 Agriculture
- 🟥 Commercial
- 🟦 Community Services
- Industrial
- Public Services
- Recreation and Entertainment
- Residential
- Transportation
- Vacant Land
- 🟩 Wild, Conservation Land and Public Parks

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Open Space Properties: Town of Oyster Bay and Huntington,
Nassau and Suffolk Counties, NYSDEC, and the
North Shore Land Alliance
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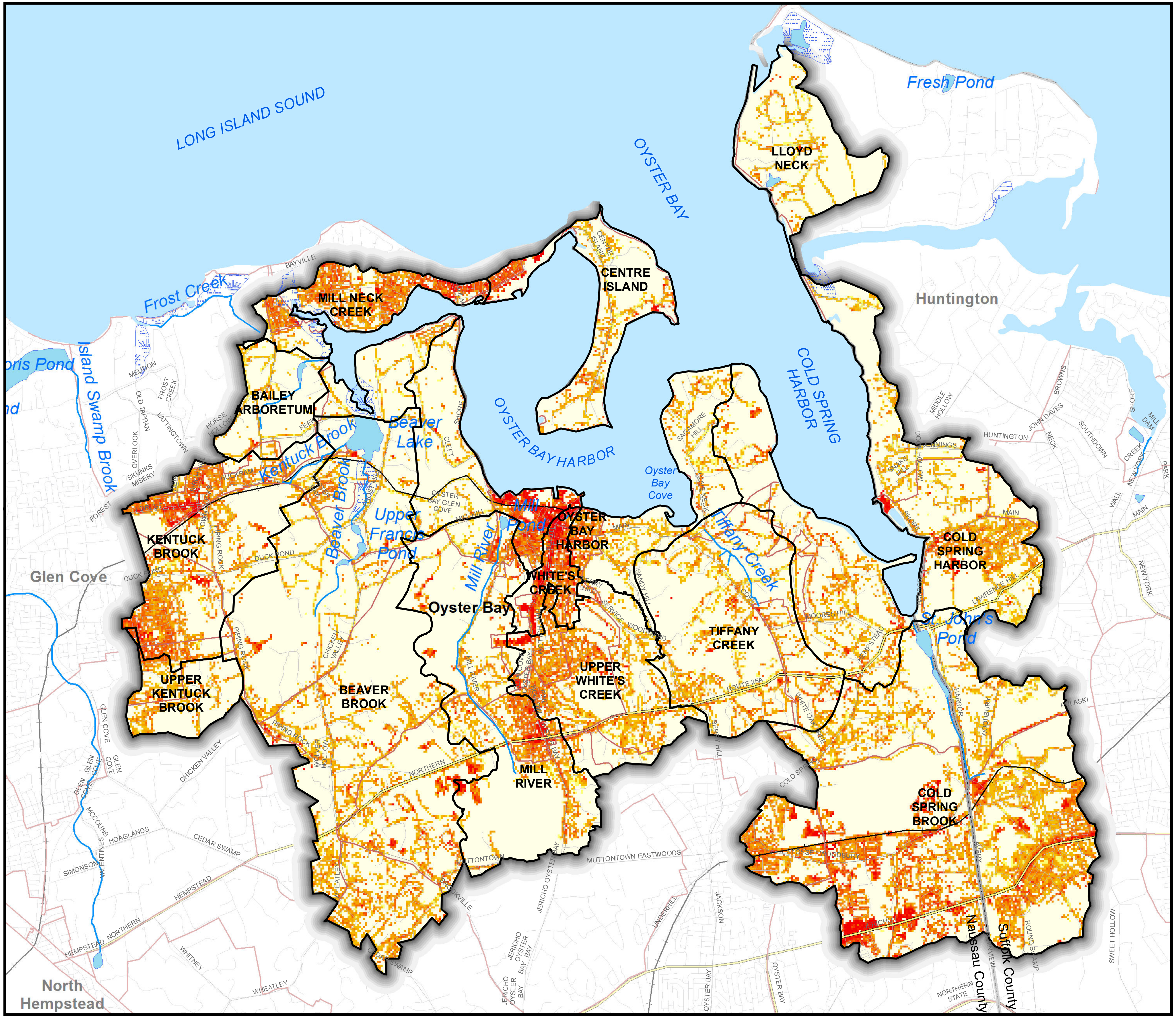
Figure 1-2
Land Use



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

- ☐ Oyster Bay/Cold Spring Harbor Subwatersheds
- ☐ Counties
- ☐ Village/Hamlet

Impervious Cover

- ☐ <10%
- 🟨 10-19%
- 🟨 20-29%
- 🟧 30-39%
- 🟧 40-49%
- 🟧 50-59%
- 🟥 60-69%
- 🟥 70-79%
- 🟥 80-89%
- 🟥 90-100%

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Figure 1-3
Watershed Impervious Cover

Water quality monitoring data collected by Friends of the Bay and other groups suggests that the water quality in the harbor, particularly in near-shore areas, is strongly influenced by freshwater sources and activities on the land. One location, in particular, has been identified as a significant contributor of pollutants to the harbor complex. This site is located near the outflow of Mill Pond and the Mill River, which supports a substantial population of waterfowl, and Beekman Creek, which flows under West Shore Road and the Beekman Beach parking lot and eventually discharges to the Mill River and Oyster Bay Harbor. It is suspected that the outflow of Mill Pond and the Mill River, including stormwater discharges from West Shore Road to Beekman Creek, is contributing to elevated levels of bacteria and nutrients.

The projected increase in future pollutant loads is relatively small for the watershed as a whole since much of the watershed is already developed or consists of protected open space. However, several of the subwatersheds could experience significant increases in pollutant loads and loading rates under a watershed buildout scenario, including the Tiffany Creek, Mill River, Oyster Bay Harbor, and Kentuck Brook subwatersheds. The buildout conditions of the Mill River and Oyster Bay Harbor subwatersheds are projected to result in greater than 5 percent increase in pollutant loading rates for nitrogen, phosphorus and sediment loads.

Wetlands

Freshwater and tidal wetlands provide a multitude of functions including flood and stormwater control, pollution reduction, marine food production, wildlife habitat, recreational opportunities, open space, and aesthetic value. Freshwater wetlands comprise less than 2 percent of the harbor complex watershed. The majority of these wetlands are associated with ponds along Beaver Brook, Mill River, Tiffany Creek, and Cold Spring Brook. Approximately 1,000 acres of tidal wetlands exist within the harbor complex. Extensive areas of coastal shoals, bars, and mudflats occur along Mill Neck Creek, the western and southern shoreline of Oyster Bay Harbor, Inner Cold Spring Harbor, and the northeast shoreline of Centre Island. Most of the shoreline in the harbor complex is fringed by vegetated tidal wetlands of varying width, interrupted by man-made waterfront structures. The west shore of Oyster Bay has experienced significant erosion along the sea wall, which is scheduled for replacement with no plan for restoration of the grass marsh that once fringed the shoreline.

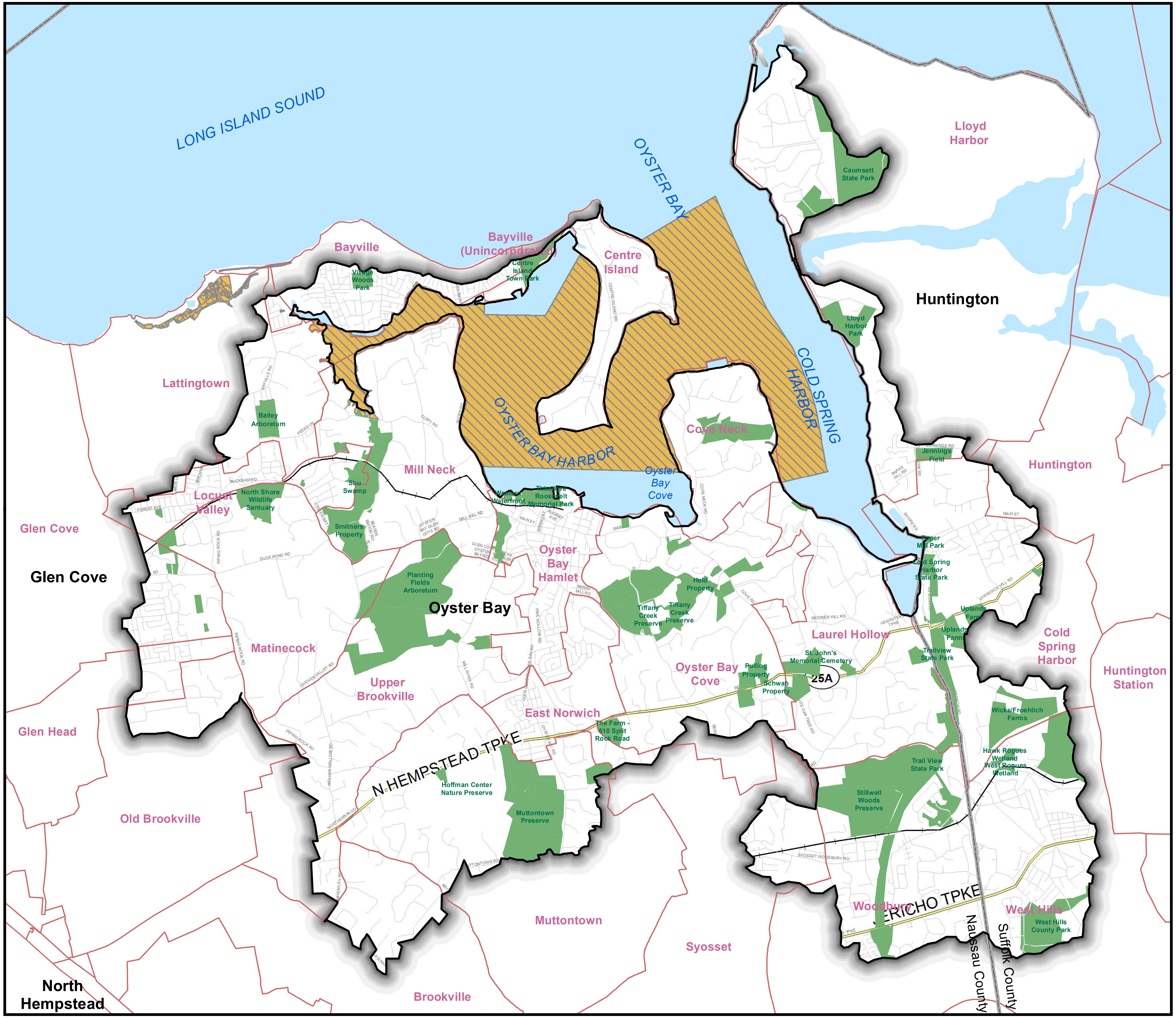
Fish and Wildlife

The Oyster Bay/Cold Spring Harbor Complex and its watershed provide abundant and significant habitat that supports a variety of fish and wildlife. The presence of diverse fish and wildlife habitats and species is indicative of the capacity of the harbor complex and its watershed to support these natural resources, despite the developed suburban landscape that makes up a large percentage of the watershed.

Various estuarine, palustrine, riverine, and upland areas provide habitat to finfish, shellfish, mammals, amphibians, reptiles and birds. The most notable tracts of protected or preserved land (including submerged or tidal areas) within the estuary and watershed include (*Figure 1-4*):

- Oyster Bay National Wildlife Refuge
- Charles T. Church/Shu Swamp Nature Preserve
- Sagamore Hill National Historic Site

Watershed Action Plan
Oyster Bay/Cold Spring Harbor



Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

- ▭ Oyster Bay/Cold Spring Harbor Watershed
- ▭ County
- ▭ Village\Hamlet
- 🟩 Protected Open Space
- ▨ Oyster Bay National Wildlife Refuge

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Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Figure 1-4
Protected Open Space

- Planting Fields Arboretum
- Muttontown Preserve
- Bailey Arboretum
- Stillwell Woods Park
- Tiffany Creek Preserve
- Upland Farm (The Nature Conservancy)

Due to the importance of these habitats, the State of New York has designated some of them as Significant Coastal Fish and Wildlife Habitats (SCFWH), which provide living and feeding areas for animals and are also economically important. Three NYSDEC-designated SCFWH areas exist in the watershed: Mill Neck Creek, Cold Spring Harbor, and Oyster Bay Harbor.

The Oyster Bay National Wildlife Refuge (NWR) is a 3,200-acre refuge that is the largest in the Long Island National Wildlife Refuge Complex. Oyster Bay NWR includes the northern three-quarters of Oyster Bay Harbor, the northwestern quadrant of Cold Spring Harbor (approximately 1,000 acres), and all of Mill Neck Creek (*Figure 1-4*). The Oyster Bay NWR is well-sheltered from Long Island Sound and, as such, provides excellent winter habitat for a variety of water fowl and shorebirds. It also provides significant nursery and feeding habitat for finfish and substrate for shellfish (USFWS, 2009).

Silt carried by stormwater runoff can smother large areas of shellfish beds, inhibiting growth and rendering areas unproductive. Stormwater runoff therefore presents a significant threat to the shellfish industry, as well as water quality due to loss of filtering capacity of shellfish.

Water Supply

All of Long Island's drinking water is obtained from groundwater aquifers, and its drinking water system was designated as the nation's first Sole Source Aquifer. To protect these groundwater aquifers, the state designated nine Special Groundwater Protection Areas (SGPAs), as defined in Article 55 of the NYS Environmental Conservation Law. The Oyster Bay SGPA is one of two such state-designated aquifer recharge areas in Nassau County. The Town of Oyster Bay has an Aquifer Protection Overlay District (APO) in addition to the SGPA, adopted in 2004, which affords added protection to groundwater resources.

The Town of Huntington contains portions of two SPGAs, only one of which (West Hills/Melville in the western part of the Town) is located within the Oyster Bay/Cold Spring Harbor Complex watershed. Most of the Town of Huntington's public water supply wells are located outside of SPGAs. Unlike the Town of Oyster Bay, Huntington has not enacted aquifer protection overlay district regulations.

Wastewater

Oyster Bay Hamlet and portions of the Unincorporated Village of Upper Brookville are served by sanitary sewers that transport sanitary waste to the Oyster Bay Sewer District Sewage Treatment Plant (OBSD). The treatment plant is located in Oyster Bay Hamlet and discharges treated effluent to Oyster Bay Harbor east of the Mill River outlet.

The OBSD has been in service since 1926 and has been upgraded several times. The most recent upgrade occurred in 2006 to provide advanced treatment for nitrogen removal. Nitrogen has been identified as the primary pollutant causing low dissolved oxygen conditions, or hypoxia, occurring throughout much of Long Island Sound's bottom waters each summer. To address this water quality problem, NYSDEC imposed limits to reduce nitrogen discharged from the municipal treatment plants located on the north shore of Long Island. NYSDEC issued a revised discharge permit that required the OBSD to reduce nitrogen discharged to Oyster Bay from the treatment plant by 63.8 percent in three 5-year increments by August 2014. The OBSD advanced treatment facility is achieving the 2014 nitrogen limits imposed by NYSDEC permit, and the upgrade has reduced the daily nitrogen discharged by as much as 75%.

Much of the harbor watershed is served by individual on-site sewage disposal systems, including cesspools and septic tank systems. Cesspools were the most common method of on-site sewage disposal until about 1973, when the local development regulations were modified to require the installation of septic tanks and leaching systems.

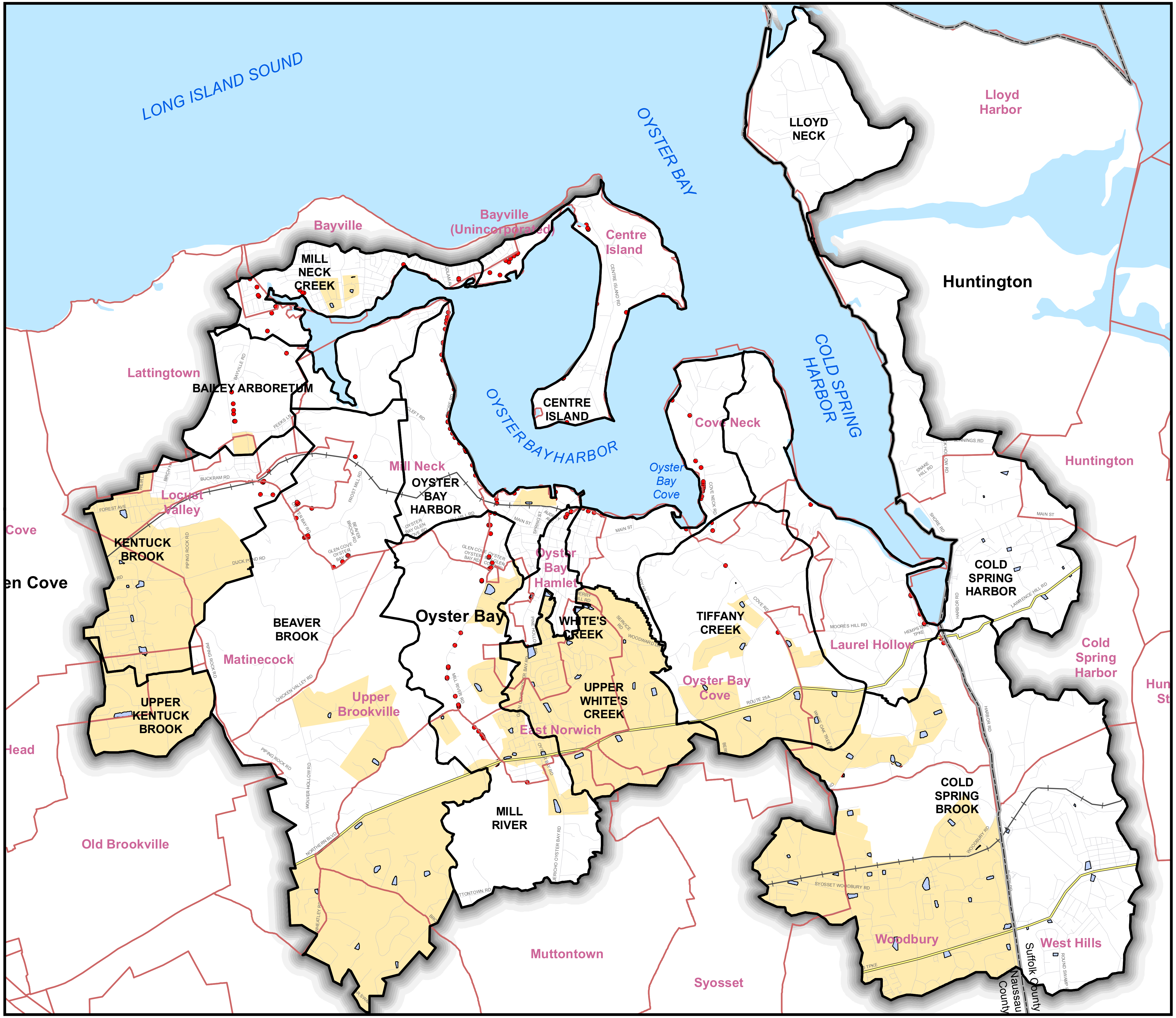
Cesspools and septic systems are a potential source of pollution, including nitrogen, pathogens, and other contaminants, to surface waters and groundwater as a result of system failure (inadequately treating sewage or by creating potential for direct or indirect contact between sewage and the public) or malfunction (typically a slow loss of function that is difficult to detect). Since a large portion of the watershed was developed prior to 1973, failure or malfunction of cesspools and septic systems is believed to be a significant source of pollution to surface water and groundwater.

The Birches (also known as Continental Villas) is a residential subdivision located on the west side of Oak Neck Creek, in the Locust Valley area. This subdivision historically operated its own sewage treatment system, which suffered chronic problems due to cesspool overflows and inadequate treatment of waste, impacting low-lying wetlands and the adjacent creek. Failing and/or low-functioning individual on-site sewage disposal systems located in this area are also believed to have contributed to these chronic problems. Long-awaited upgrades to sewer and water infrastructure in this area are near completion, which will connect the homes in the Birches residential subdivision to the Glen Cove sewage treatment plant. This project will eliminate chronic cesspool overflows from this development to Mill Neck Creek.

Stormwater

The stormwater collection and drainage system within the harbor complex watershed consists of drainage infrastructure operated and maintained by the watershed municipalities, including the Town of Oyster Bay, the Town of Huntington, the associated villages, and Nassau and Suffolk Counties. All of these municipal entities are regulated small Municipal Separate Storm Sewer Systems (MS4s) under the NYSDEC State Pollution Discharge Elimination System Phase II stormwater program. Most of the smaller municipalities in the watershed lack the resources to properly address the Phase II program requirements.

Stormwater within the watershed is discharged to surface waters and to groundwater. A large portion of the watershed drains to surrounding surface waters through numerous outfalls and as overland flow (*Figure 1-5*).



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

☐ Oyster Bay/Cold Spring Harbor Subwatersheds
☐ County
☐ Village/Hamlet
• Storm Drainage Outfall
🟦 Recharge Basins
🟨 Self-contained Drainage Areas

(Huntington Data Unavailable)

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Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Figure 1-5
Stormwater Discharges and Recharge Basins

Increased infiltration of stormwater runoff by use of basins or sumps has been practiced on Long Island since the 1930s to recharge collected stormwater back to the groundwater system. In the 1950s, Nassau and Suffolk Counties adopted regulations requiring stormwater to be retained and infiltrated onsite if feasible. Subsequently, the use of drywells, recharge basins, and drainage reserve areas became common practice to retain and infiltrate stormwater runoff from roadways in residential, commercial, and industrial areas. Recharge basins are most prevalent in eastern Nassau County and western Suffolk County. Most of these facilities have overflow structures that direct stormwater resulting from extreme rainfall events to either other recharge basins or to drainage facilities that ultimately discharge to surface waters. These recharge basins lose function if not regularly maintained (although high groundwater levels may cause standing water in some basins all or part of the year), resulting in increased flows to surface waters. Many recharge basins in the watershed are in need of maintenance.

Since much of the watershed was developed prior to the adoption of stormwater quality regulatory requirements, most of the existing drainage infrastructure that does not discharge to recharge basins consists of traditional storm drains/catch basin and storm pipes that discharge directly to surface waters without treatment, other than detention to maintain peak rates of discharge. Uncontrolled stormwater runoff from impervious surfaces is a significant source of potential impacts to surface waters within the harbor complex watershed, groundwater supplies, benthic habitat of streams, lakes, ponds, and estuaries, and the water quality of the harbor complex itself.

Through their Phase II stormwater management programs and other planning initiatives, the watershed municipal entities, including Nassau and Suffolk Counties, have developed and implemented a variety of Best Management Practices to address stormwater quality and quantity issues associated with land development and redevelopment projects. The municipalities have also begun to address historical development and nonpoint source pollution impacts in the watershed by identifying potential sites for stormwater retrofits and have begun installing retrofits, including hydrodynamic separators and storm drain inserts. However, stormwater runoff continues to be a significant threat to the water quality and overall health of the Oyster Bay/Cold Spring Harbor Complex and its watershed. The current NYSDEC Phase II stormwater permit contains requirements specific to Long Island pathogen impaired watersheds, including Oyster Bay, Cold Spring Harbor, and Mill Neck Creek, to reduce pathogen loads through an inter-municipal, watershed-based approach.

Climate Change

Changes in climate are anticipated to occur over the next century. The magnitude of changes in temperature, sea level, and the timing and intensity of rainfall will depend upon future emissions of carbon dioxide and other greenhouse gases driving climate change. Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise of 2 to 6 feet (Frumhoff et al., 2007). Increases in sea level and frequency of severe storms will result in more inundation of coastal areas, and subsequent increases in shoreline erosion and wetland loss. Inundation of low-lying areas will result in the potential for saltwater to infiltrate into freshwater surface waters and aquifers. Increased flooding and erosion has the potential to impact transportation infrastructure and sewage and septic systems.

Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined affects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al., 2007).

Subwatershed Analysis and Restoration Potential

A comparative subwatershed analysis was performed for the Oyster Bay/Cold Spring Harbor subwatersheds to identify the subwatersheds with the greatest restoration potential (i.e., subwatersheds that have the greatest problems, combined with the potential to address these problems). Subsequent field assessments were performed in priority subwatersheds to evaluate potential pollutant sources and environmental problems, as well as possible locations where restoration opportunities and mitigation measures can be implemented. The findings of these and other related assessments identified a number of key findings and common issues throughout the watershed, including:

- Overall in-stream habitat in the assessed reaches was mixed, although many of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities.

- Many potential barriers to fish passage were observed throughout the watershed. The impacts of these obstructions on fish passage and the feasibility of fish barrier removal efforts in the harbor complex watershed have been evaluated through a study led by the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay. These groups are currently pursuing options for watershed restoration projects based on the results of this study.

- Segments of some streams in the watershed are buried in underground conduits, providing potential opportunities for daylighting and stream restoration to enhance aquatic and wildlife habitat, improve aesthetics, and provide educational opportunities.

- Stream buffer encroachments are prevalent along stream corridors in or near areas of residential, commercial, and industrial development and roads. Education, signage, stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.

- Residential roofs and driveways appear to contribute significant quantities of stormwater runoff to the storm drainage system. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system through the use of rain barrels, rain gardens, and pervious driveways.

- Redevelopment activities such as residential tear-downs and infill development are a major potential threat to water quality. The potential negative impacts of redevelopment are most effectively addressed through revised land use regulations applied consistently by the watershed municipalities. Opportunities exist to strengthen land use regulatory controls through model land use codes and regulations for use by the watershed municipalities.

- Lawn-care maintenance practices in residential areas are typically high. Opportunities exist to educate the public about the impacts of lawn care practices on the water quality of the harbor complex and to encourage the use of residential lawn care best management practices.

- Most of the development in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond water quality inlets and detention basins for peak flow control. Parking lots associated with existing commercial development, municipal and institutional land uses, and commuter parking areas are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use Low Impact Development (LID) and green infrastructure retrofits.

- Opportunities exist for stormwater retrofits at roadway stormwater outfalls throughout the watershed. Opportunities also exist for incorporating LID practices into existing roadway upgrades and retrofit projects (i.e., "green streets") to promote stormwater infiltration, streetscape improvements, and traffic calming.

- Relatively isolated areas of moderate to severe streambank erosion were observed along Beaver Brook, Mill River, Cold Spring Brook, Tiffany Brook, and White's Creek, providing opportunities for bank stabilization projects.

- Hotspot land uses and facilities, including several commercial shopping centers, the Town of Oyster Bay highway yard, the LIRR Maintenance Yard, Commander Oil Terminal, and municipal parking lots, discharge stormwater directly to receiving waters with no treatment or attenuation. Opportunities exist for improved pollution prevention and source controls at these facilities, or even relocation of facilities in sensitive areas to more appropriate locations.

1.4 Plan Development Process

Friends of the Bay, working with the Town of Oyster Bay and other governmental entities, stakeholder groups, and the general public, recognizes the need to address the water resource issues of the Oyster Bay/Cold Spring Harbor estuary complex using a watershed-based approach. A primary way to do this is by developing and implementing a comprehensive watershed management plan to protect and restore water resource conditions throughout the watershed.

This watershed management plan has been developed in two phases – a State of the Watershed Report and a Watershed Action Plan – following an approach endorsed by the U.S. Environmental Protection Agency (EPA), the NYSDEC, and the New York State Department of State (NYSDOS) Division of Coastal Resources for developing watershed-based plans.

State of the Watershed Report

The State of the Watershed Report, prepared on behalf of Friends of the Bay in November 2009 (Fuss & O'Neill, Inc.), summarized existing environmental and land use conditions within the Oyster Bay/Cold Spring Harbor watershed. The State of the Watershed Report integrates a variety of environmental indicators to assess the current health of the watershed and potential future threats. The report provides a baseline assessment of watershed conditions, which can be updated periodically to evaluate changes in the watershed and help direct watershed management planning. The State of the Watershed Report therefore serves as the basis for the Watershed Action Plan. A copy of the State of the Watershed Report is provided on CD in *Appendix A* of this plan.

Watershed Action Plan

The Watershed Action Plan, which is the subject of this document, identifies prioritized action items to protect and improve the health of the Oyster Bay/Cold Spring Harbor watershed and estuary. The plan has been developed to address the priorities and issues identified in the State of the Watershed Report and previous watershed planning documents including the Mill River Watershed Study and Public Stewardship Program (Cashin Associates in association with Friends of the Bay, December 2007) and the Oyster Bay/Cold Spring Complex Harbor Management Plan (Cashin Associates, June 2002), with significant participation by a steering committee of interested stakeholders and the public. The Watershed Action Plan is designed to have clear potential to affect on-the-ground change within the watershed by recommending specific, measurable actions to protect and improve water quality, habitat, and other watershed resources.

The Watershed Action Plan has been developed consistent with State and Federal guidance for the development of watershed-based plans. The EPA guidance outlines nine key elements that establish the structure of the plan, including specific goals, objectives, and strategies to protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary (EPA, 2008). State-level watershed planning guidance developed by the NYSDOS Division of Coastal Resources also reinforces the EPA watershed planning process (NYSDOS, 2009). Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act and improve the chances for funding through other State and Federal sources.

In addition to building on the baseline information provided in the State of the Watershed Report, development of the Watershed Action Plan consisted of the following major components:

- **Project Steering Committee** – A Project Steering Committee was formed to guide the development of the action plan, including a technical advisory committee consisting primarily of municipal and agency representatives and a larger project advisory committee representing additional stakeholder groups and interested members of the public. A series of workshop meetings were held with the Project Steering Committee to reach consensus on watershed planning goals and objectives and to discuss specific recommended actions. The steering committee also guided the plan development process by providing review comments on draft deliverables. The Watershed Action Plan reflects the combined efforts of Friends of the Bay and the Fuss & O'Neill project team, the Project Steering Committee including representatives of the watershed municipal entities and state/federal resource agencies, and other stakeholders. Members of the Project Steering Committee and others involved in the plan development process are listed in the Acknowledgments section at the beginning of this document.

- **Plan Goals and Objectives** – The project team developed a series of goals and objectives for the watershed based upon the findings of the State of the Watershed Report, the results of a watershed survey developed by Friends of the Bay, and a consensus-building exercise during the initial steering committee meeting.

- **Recommended Actions** – Potential management actions were identified for each of the plan goals and objectives and subsequently refined based upon input from the Project Steering Committee during and following the second workshop meeting. Management actions included ongoing, short, medium and long-term actions, as well as watershed-wide and site-specific actions. Site-specific retrofit and restoration concepts were developed based on the watershed field inventories and baseline assessments that were performed as part of the State of the Watershed Report. Recommended actions were further refined by working with the Technical Advisory Committee, culminating in the plan recommendations that are presented in *Section 3* of this document.

1.5 Public Outreach

A variety of public outreach occurred during the watershed planning process to enhance public understanding of issues affecting the watershed and to encourage early and continued participation in the development and implementation of the action plan. The public outreach events and activities included:

- **Steering Committee Meetings** – Workshop meetings were held with the technical and project advisory committees to develop management objectives and priorities, review and evaluate potential management actions, and select the action plan recommendations. A cardstorming exercise was conducted during the initial steering committee workshop to help reach consensus on the issues that should be addressed in the Watershed Action Plan. The cardstorming results assisted in developing clear watershed planning goals and objectives.

- **Watershed Questionnaire** – A web-based questionnaire was developed by Friends of the Bay at the start of the project to identify concerns, issues, and priorities for the watershed; desired outcomes of the action plan; and to request assistance and participation in the plan development process. The questionnaire was distributed to the Project Steering Committee and other interested members of the public.

- **Project Website** – The Friends of the Bay website (friendsofthebay.org) was used to disseminate project-related information during the plan development process and to serve as the long-term home of the Watershed Action Plan and future implementation efforts. Social media tools such as Facebook and Constant Contact are also incorporated into the website and were used during the plan development process.

- **Oyster Bay/Cold Spring Harbor (OBCSH) Protection Committee** – A watershed-wide inter-municipal committee was formed in 2010 to coordinate the watershed protection activities of the various watershed municipalities. Seventeen of the eighteen municipalities located within the watershed have agreed to join the protection committee. The protection committee, working collaboratively with Friends of the Bay, is responsible for implementing the Watershed Action Plan recommendations.

2 Watershed Management Goals and Objectives

This section presents overall management goals for the watershed and specific objectives to achieve these goals. The goals and objectives were developed in conjunction with the project Steering Committee based upon the findings of the State of the Watershed Report, the results of a watershed survey developed by Friends of the Bay, and through discussions and consensus-building during the Steering Committee meetings. Recommended actions to achieve these goals and objectives are presented in *Section 3* of this plan.

Capacity Building for Plan Implementation

Goal: Build a foundation for successful implementation of the Watershed Action Plan by the watershed municipalities, non-governmental organizations (environmental groups and non-profits), residents, local businesses, and other stakeholders.

- **Objective 1: Promote Inter-municipal Coordination.** Since the Oyster Bay/Cold Spring Harbor watershed crosses municipal boundaries and includes numerous governmental entities, the support of and coordination between the watershed municipalities (towns, cities, villages, and counties) is critical to successful plan implementation.

- **Objective 2: Identify and Secure Funding** to implement the recommendations outlined in this plan.

- **Objective 3: Promote Regional Collaboration** with other watershed organizations on and around Long Island Sound to share ideas and strengthen regional watershed management efforts.

- **Objective 4: Continue Watershed Field Assessments** to document future changes in watershed conditions, evaluate previously unassessed areas, identify additional retrofit/restoration opportunities, and involve the public and volunteers as a form of outreach.

Water Quality

Goal: Preserve, protect, and enhance water quality in the Oyster Bay/Cold Spring Harbor Complex and its watershed. Consistently meet water quality standards, maintain and expand areas open to shellfishing, and maintain and improve the health of the watershed tributaries and groundwater resources.

- **Objective 1: Improve Understanding of Estuary and Watershed Conditions** to refine the current understanding of water quality impairments in the estuary complex, particularly pollutants for which previous monitoring results have demonstrated the potential for water quality impairment but which are not currently listed as a cause of impairment, and to identify potential sources of contaminants through DNA and microbial source tracking techniques.

- **Objective 2: Reduce Impacts from Hotspot Land Uses**, which are land uses with higher potential pollutant loads due to the nature of the activities and pollutant sources associated with these land uses.

- **Objective 3: Reduce Impacts of Stormwater Runoff,** on the water quality and ecology of the estuary complex by implementing pathogen reduction plans and stormwater retrofits and through the use of Low Impact Development (LID) and Green Infrastructure approaches for private development and municipal stormwater infrastructure.

- **Objective 4: Protect and Restore Riparian and Wetland Buffers** in the watershed to protect and improve water quality.

- **Objective 5: Reduce the Impacts of On-Site Wastewater Disposal.** Much of the watershed is served by on-site wastewater disposal systems, including septic systems and cesspools. Many of these systems are old and not inspected frequently or maintained properly, and failing systems have a high potential to impact surface water and groundwater quality.

- **Objective 6: Reduce Nuisance Waterfowl** such as mute swans and Canada geese, which are a nonpoint source of pollution, particularly pathogens and nutrients. Reducing these populations could improve water quality by reducing pathogen and nutrient loads to the estuary complex.

Habitat Protection and Restoration

Goal: Protect and restore native habitat, fisheries and stream corridor habitat, shellfish populations, wetland habitat and shorelines, and forests and watershed tree canopy to maintain and increase the watershed's diversity of floral and faunal species.

- **Objective 1: Protect and Restore Native Habitat.** Manage or remove invasive plant and animal species that threaten local biodiversity and ecosystem function in the watershed.

- **Objective 2: Protect and Restore Fisheries and Stream Corridor Habitat** to maintain and restore naturally reproducing fish populations in the watershed by removing barriers to fish passage as well as restoring or enhancing in-stream and riparian habitat.

- **Objective 3: Protect and Restore Shellfish Populations** to preserve a healthy shellfishery and shellfish aquaculture industry, which is a significant contributor to the local economy, provides a sustainable source of fresh seafood, improves water quality, and provides other ecological benefits.

- **Objective 4: Protect and Restore Wetland Habitat and Shorelines** by restoring tidal and freshwater wetlands throughout the estuary complex and its watershed and promoting alternative approaches to traditional shoreline hardening where appropriate.

- **Objective 5: Protect and Restore Forests and Watershed Tree Canopy.** Despite the healthy forest cover that exists in the watershed, homeowner clearing of residential properties and land development/redevelopment activities continue to threaten forests and watershed tree canopy.

- **Objective 6: Plan for Climate Change and Sea Level Rise** by promoting climate change adaptation strategies to address anticipated sea level rise and associated impacts on human and natural communities in the estuary complex.

Sustainable Land Use and Open Space

Goal: Ensure that development within the watershed is sustainable, promote sustainable land use practices to protect natural resources, and expand access to upland and aquatic open spaces without adversely impacting water quality and natural resources.

- **Objective 1: Promote Sustainable Development.** Promote sustainable growth principles in ongoing and future development and redevelopment, and ensure that growth is appropriate and incorporates measures to minimize impacts to water resources.

- **Objective 2: Maintain and Improve Open Space.** Manage, maintain, and improve existing open space and continue to protect/acquire open space that meets resource protection and recreational goals.

- **Objective 3: Increase Public Access** to waterways and open space in the watershed to enhance public appreciation and stewardship of the estuary complex while balancing the interests of competing uses and ensuring that public access does not adversely affect sensitive resources.

Education and Outreach

Goal: Promote stewardship of the Oyster Bay/Cold Spring Harbor estuary complex and watershed through education and outreach.

- **Objective 1: Improve Awareness of Marina and Boating Practices.** Ongoing education of boater owners, marinas, and related waterfront boating facilities, which can directly impact the water quality of the estuary complex, is a critical element in promoting stewardship of the estuary and its watershed.

- **Objective 2: Expand School and Institutional Educational Programs.** Current educational programs of the Town of Oyster Bay school system, the WaterFront Center, and Theodore Roosevelt Audubon Sanctuary should be used as a model for new or expanded educational programs for schools and similar institutions throughout the Oyster Bay/Cold Spring Harbor watershed that don't currently provide comprehensive, watershed-based programs.

- **Objective 3: Conduct Outreach for Golf Courses, Parks, and Institutional Land Owners** since management and maintenance practices at these facilities can have a significant impact on the water quality within the Oyster Bay/Cold Spring Harbor watershed and estuary.

- **Objective 4: Conduct Homeowner Outreach.** Build awareness of land stewardship and management practices and reduce nonpoint source impacts associated with residential land use, which comprises approximately 64 percent of the watershed land area.

- **Objective 5: Provide Outreach to the Business Community.** Advance the business community's awareness of the estuary and its watershed through targeted education and outreach.

- **Objective 6: Improve Awareness of Municipal Practices.** Improve the awareness of municipal employees about the potential impact of their operations on the water quality and environmental resources of the estuary complex and its watershed.

3 Recommended Actions

This section describes recommended actions to meet the watershed management goals and objectives outlined in *Section 2*. The recommendations include watershed-wide and targeted actions:

- **Watershed-wide Actions** are those recommendations that can be implemented throughout the Oyster Bay/Cold Spring Harbor watershed. These basic measures can be implemented in each of the watershed municipalities, are applicable in most areas of the watershed, and are intended to address nonpoint source pollution through municipal land use regulations and planning, green infrastructure and smart growth, public education and outreach, urban watershed forestry, and watershed monitoring. The water quality and natural resource benefits of these measures are primarily long-term and cumulative in nature resulting from runoff reduction, source control, pollution prevention, and improved stormwater management for new development and redevelopment projects.

- **Targeted Actions** are tailored to address issues within specific subwatersheds or areas, rather than watershed-wide. Targeted recommendations also include actions to address common types of problems that were identified at representative locations throughout the watershed, but where additional studies or evaluations are required to develop site-specific recommendations. Targeted recommendations can have both short and long-term benefits. The subwatershed maps in *Appendix B* show the locations of many of the targeted actions recommended in this plan.

Additional site-specific watershed retrofit and restoration concepts are described in *Section 4* of this plan.

The recommendations presented in this section are classified according to their timeframe and overall implementation priority. Recommendations can be viewed as ongoing, short-term, mid-term, and long-term actions:

- **Ongoing Actions** are actions that should occur annually or more frequently such as routine water quality monitoring, as well as actions that occur on an ongoing basis such as fundraising, education and outreach, and coordination between watershed stakeholders.

- **Short-Term Actions** are initial actions to be accomplished within the first one to two years of plan implementation. These actions have the potential to demonstrate immediate progress and success and/or help establish the framework for implementing subsequent plan recommendations. Such actions include adoption of an inter-municipal agreement; development of model codes and ordinances and subsequent revisions to local land use regulations; development of watershed improvement strategies and stormwater retrofit plans to address MS4 requirements and pathogen reduction goals; outfall inventories and illicit discharge investigations; and field inventories within previously unassessed subwatersheds. Small demonstration projects could be completed during this phase, with volunteer service events. Construction of larger retrofits and restoration projects requiring extensive design, engineering, and permitting should be planned for later implementation.

- **Mid-Term Actions** involve continued programmatic and operational measures, delivery of educational and outreach materials, and construction of larger retrofit and/or restoration projects over the next two to five years. Progress on land conservation, especially the protection of headwaters and unique landscapes, LID and green infrastructure implementation, and discharge investigation follow-up activities should be completed during this period, as well as project monitoring and tracking. Sustainable funding mechanisms for watershed-wide green infrastructure programs and implementation of stormwater retrofits should be investigated through the Oyster Bay/Cold Spring Harbor Protection Committee and regional collaboration.

- **Long-Term Actions** consist of continued implementation of any additional projects necessary to meet watershed objectives, as well as an evaluation of progress, accounting of successes and lessons learned, and an update of the watershed management plan. Long-term recommendations are intended to be completed during the next 5- to 10-year timeframe and beyond, consistent with the pathogen reduction timeframes established in the MS4 Permit. The feasibility of long-term project recommendations, many of which involve significant infrastructure improvements, depends upon the availability of sustainable funding programs and mechanisms.

The groups with responsibility for implementing the recommendations are also identified in this section of the plan. Each action has a designated lead group, which is best suited to obtain the necessary funding for, and organize the necessary resources to implement an action. The lead group is assigned based on the organization or entity whose mission or responsibilities best align with the action and, in the case of a government entity, have jurisdiction over the action or associated geographic area. In cases where the Oyster Bay/Cold Spring Harbor Protection Committee is identified for implementation, the member municipalities will provide essential guidance on an ongoing basis.

The remainder of this section describes the recommended actions presented in this Watershed Action Plan. The recommended actions are categorized (and color-coded) according to the five major goals of this plan – (1) capacity building for plan implementation, (2) water quality, (3) habitat protection and restoration, (4) sustainable land use and open space, and (5) education and outreach.

3.1 Capacity Building for Plan Implementation

Goal: Build a foundation for successful implementation of the Watershed Action Plan by the watershed municipalities, non-governmental organizations (environmental groups and non-profits), residents, local businesses, and other stakeholders.

Summary – Capacity Building for Plan Implementation

Timeframe:
C = completed
O = ongoing
S = short-term
M = mid-term
L = long-term

Responsibility:
(subject to change)
● lead ○ assist

Estimated Cost (thousands):
$ = 0 – 10
$$ = 10 – 50
$$$ = 50 – 100
$$$$ = 100+

	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Objective 1: Promote Inter-municipal Coordination													
Action 1-1: Form a Protection Committee	C^3		○	○	●	●	○	○	○				$
Action 1-2: Hire a Protection Committee Coordinator	C^3	●											$$
Action 1-3: Develop Mission Statement and Work Plan	S	●	○	○	○	○	○	○	○				$
Action 1-4: Develop and Enter Into an Inter-municipal Agreement	S	●	○	○	○	○	○	○					$
Action 1-5: Develop Protection Committee Web Site	C^3	●	○	○	○	○	○	○	○				$
Action 1-6: Create Information Resource Center	S	○							●				$$
Objective 2: Identify and Secure Funding													
Action 2-1: Pursue Grant Funding	O	○							●				Varies
Action 2-2: Secure Long-Term Funding for Water Quality Monitoring	M	○							●				$
Action 2-3: Develop Environmental Restoration Bond Fund	L	●	●	●	●	●	●	○					$$
Action 2-4: Lobby for State/Federal Funding	O	●							○				Varies
Objective 3: Promote Regional Collaboration													
Action 3-1: Organize Regional Meeting Series	M	○		●	●				●			○1	$
Action 3-2: Improve Consistency in Water Quality Monitoring	L			●	●				●		○	○2	$
Objective 4: Continue Watershed Field Assessments													
Action 4-1: Assess Additional Areas	S	○							●	○	○		$$
Action 4-2: Perform Ongoing Assessments	O	●	●	●	●	●	●	●	●	○	○		$$$

Summary – Capacity Building for Plan Implementation

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term **Responsibility: (subject to change)** ● lead ○ assist **Estimated Cost (thousands):** $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Action 4-3: Involve the Public	O	○							●		○		-

[1] NYSDEC, Long Island Sound Study
[2] Other Water Quality Monitoring Groups
[3] Protection Committee formed in 2010 with NFWF grant funding. Protection Committee Coordinator hired in 2011

Objective 1: Promote Inter-municipal Coordination

Because the Oyster Bay/Cold Spring Harbor watershed crosses municipal boundaries and includes numerous governmental entities, the support of and coordination between the watershed municipalities (towns, cities, villages, and counties) is critical to successful plan implementation. Inter-municipal watershed committees have proven to be an effective means for coordinating municipal watershed and stormwater management activities in other watersheds on Long Island. An inter-municipal approach is consistent with watershed-based planning through the support and participation of the local governments within the watershed. Watershed-based plans are also most cost-effective and effective in protecting water quality when they are implemented on an inter-municipal basis. The Hempstead Harbor and Manhasset Bay Protection Committees are examples of inter-municipal organizations on Long Island that have successfully implemented water quality planning recommendations on a watershed basis.

Action 1-1: Form a Protection Committee

A watershed-wide inter-municipal committee – Oyster Bay/Cold Spring Harbor Protection Committee – was formed in 2010 to coordinate the watershed protection activities of the various watershed municipalities. The eighteen municipalities located within the watershed have agreed to join the Protection Committee. The Oyster Bay/Cold Spring Harbor Protection Committee's mission is to establish a sustainable, cooperative partnership among the municipalities within the watershed with input from the public and other stakeholders to efficiently protect and improve water quality through a holistic and integrated watershed-wide approach. The Protection Committee, working collaboratively with Friends of the Bay, is responsible for facilitating the implementation of the Watershed Action Plan recommendations.

Action 1-2: Hire a Protection Committee Coordinator

The Town of Oyster Bay has received grant funding through the National Fish and Wildlife Foundation Long Island Sound Futures Fund to hire a coordinator for the Protection Committee and develop a work plan to help implement the recommendations of this Watershed

Action Plan. To date, a coordinator for the Protection Committee has been hired. The coordinator will take a lead role in many of the short-term and ongoing actions described in this section.

Action 1-3: Develop Mission Statement and Work Plan

The Protection Committee has developed a formal statement describing its vision, mission, and core values, which is consistent with the goals and objectives of the Watershed Action Plan.

Develop a work plan that will assign priorities and responsibilities for recommended actions and work tasks. The work plan should be updated regularly as responsibilities and priorities change and actions are completed.

Action 1-4: Develop and Adopt Inter-municipal Agreement

Develop and adopt an inter-municipal agreement for the Oyster Bay/Cold Spring Harbor Protection Committee member municipalities. The Protection Committee coordinator should take the lead in developing a draft inter-municipal agreement, using successful models from Hempstead Harbor, Northport Harbor, and Manhasset Bay. The Protection Committee should also evaluate various options for and select a preferred legal structure, decision-making, funding mechanisms, and administrative procedures, which would be reflected in the inter-municipal agreement.

Action 1-5: Develop Protection Committee Web Site

A web site and social media page have been developed for the Protection Committee to disseminate information, present meeting schedules, solicit feedback, and facilitate education and outreach. The use of social media tools is also recommended to enhance the online presence.

Action 1-6: Create an Information Resource Center

Create an Information Resource Center for the Oyster Bay/Cold Spring Harbor watershed. The Information Resource Center would serve as a web-based clearinghouse and database of information about the watershed. Visitors to the site could access Friends of the Bay's water quality monitoring data and annual report, view maps of the watershed, search literature, and browse a directory of information regarding the Oyster Bay/Cold Spring Harbor Complex. The resource center would include Friends of the Bay's reports and studies, as well as reports prepared by the Town of Oyster Bay, Town of Huntington, Nassau and Suffolk County, State and Federal studies as well as other academic or environmental studies of the area. Among the reports to be included are Friends of the Bay's State of the Watershed Report, studies on the Mill River watershed, stormwater analyses, historic maps, biological inventories, water quality monitoring data, and annual water quality monitoring reports, including the reports produced annually by Friends of the Bay and the long term *Water Quality Data Evaluation* written in 2009. The Information Resource Center would be accessible from the Friends of the Bay website www.friendsofthebay.org. In addition, it would serve as a resource for municipal managers for information regarding the Municipal Separate Storm Sewer (MS4) regulations.

The Information Resource Center would use professional information specialists to set up an expandable information platform. The creation and maintenance of the site would utilize graduate interns from the Palmer School of Library and Information Science at CW Post Campus of Long Island University. Students from the local high schools and community volunteers would also be invited to lend their assistance to this program.

This digital resource center would make available the specialized knowledge of the Friends of the Bay and would provide a gateway to other resources for persons interested in the Oyster Bay/Cold Spring Harbor watershed. The resource center would use GIS technology, providing search capability by subject or by location within the watershed.

When designed and implemented, the database could serve as a model for other non-profit agencies and watershed managers to use as an easily accessible and complete source for watershed information. This information could be used by municipal managers and government agencies to guide decision-making and implement actions to improve the water quality of the harbor complex. It would also provide information to residents and nonprofit groups on environmental conditions and factors affecting the environment within the watershed.

Objective 2: Identify and Secure Funding

Many actions in this plan are only achievable with sufficient funding and staffing. Therefore, a variety of funding opportunities should be pursued to implement the recommendations outlined in this plan. Potential local, state, and federal funding sources for implementation of the plan recommendations are identified in *Section 6* of this plan.

Action 2-1: Pursue Grant Funding

Review and prioritize potential funding sources that have been preliminarily identified in this Watershed Action Plan (see *Section 6*), and prepare and submit grant applications for projects identified in this plan on an ongoing basis.

Action 2-2: Secure Long-Term Funding for Water Quality Monitoring

Identify and secure long-term, ongoing funding for continuation of the Oyster Bay/Cold Spring Harbor water quality monitoring program, which was historically a government responsibility but more recently has been led by Friends of the Bay with grant funding through the National Fish and Wildlife Foundation Long Island Sound Futures Fund.

Action 2-3: Develop Environmental Restoration Bond Funds

Encourage the watershed municipalities and counties to develop “Environmental Restoration Bond Fund” programs similar to the Town of Oyster Bay SEA Fund and Nassau County Environmental Bond Act. Funds would be primarily for restoration projects and would be used as seed money for securing state and federal grants.

Action 2-4: Lobby for State and Federal Funding

Actively advocate for state and federal funding, working jointly with other watershed organizations, inter-municipal protection committees, and the Long Island Sound Study.

Objective 3: Promote Regional Collaboration

Many watershed organizations and municipalities on Long Island are involved in watershed management planning to meet common resource protection objectives and are faced with similar water quality issues such as compliance with the NYSDEC MS4 Permit and watershed improvement strategies to address impaired waters. Lessons learned from other watershed planning efforts on Long Island and throughout Long Island Sound can help to improve the effectiveness of the Oyster Bay/Cold Spring Harbor Watershed Action Plan. This objective is to strengthen coordination of water quality planning activities with those of other watershed organizations on and around Long Island Sound to share ideas and strengthen regional watershed management efforts.

Action 3-1: Organize Regional Watershed Meeting Series

Coordinate with other watershed organizations on Long Island (including the South Shore watersheds) and in Connecticut to share information on ongoing activities, new advances in science and technology, and outreach materials, and to discuss lessons learned. Such a regional collaboration could complement the work of the Long Island Sound Study Citizens Advisory Committee and other existing groups with a similar regional focus.

Action 3-2: Improve Consistency in Regional Water Quality Monitoring

Improve consistency between the Friends of the Bay water quality monitoring program in Oyster Bay and Cold Spring Harbor and the other water quality monitoring programs on the North Shore of Long Island and throughout Long Island Sound. Greater consistency in monitoring methods, equipment, and standard procedures between the various water quality monitoring programs would allow for more useful comparisons of conditions in different waterbodies and areas of Long Island Sound. Comparable data collection efforts would also enhance the usefulness of the water quality data to track regional trends in water quality throughout Long Island Sound and better meet the needs of the Long Island Sound Study. Oyster Bay/Cold Spring Harbor watershed managers could also assist the Long Island Sound Study in developing a Sound-wide coordinated water-quality monitoring program with a regular source (i.e., non-competitive grant) of funding.

Objective 4: Continue Watershed Field Assessments

Watershed field assessments are a screening level tool for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. Field assessments, including stream corridor and upland assessments, were performed in selected areas of the watershed by Fuss & O'Neill in 2009 and by Cashin Associates in 2007, as described in the State of the Watershed Report. The targeted and site-specific project concepts presented in this plan are based, in part, on the findings of these assessments.

The field assessments that have been performed to date within the watershed were not exhaustive and did not address all potential pollutant sources or retrofit/restoration opportunities. Conditions in the watershed also change over time. Therefore, ongoing field assessments are recommended to document future changes in watershed conditions, evaluate previously unassessed areas and identify additional retrofit/restoration opportunities, and involve the public and volunteers as a form of outreach.

Action 4-1: Assess Additional Areas

Not all of the Oyster Bay/Cold Spring Harbor subwatersheds were assessed as part of the development of this watershed-based plan. In some watersheds that were assessed, not all reaches, neighborhoods, and potential hotspots were examined. As time and funding becomes available, field assessments could be extended into these areas to identify new potential retrofit or restoration projects and areas to target for outreach activities. Target areas for additional field assessments include portions of the following subwatersheds:

- Cold Spring Brook
- Cold Spring Harbor
- Oyster Bay Harbor
- Mill Neck Creek
- Centre Island
- Lloyd Neck

Action 4-2: Perform Ongoing Assessments

Perform ongoing field assessments to document future changes in watershed conditions during implementation of the Watershed Action Plan. Stream corridor, neighborhood, and hotspot assessments should be updated every five to ten years to help guide plan implementation activities. Annual field assessments could be performed on a rotating basis for selected subwatersheds.

Action 4-3: Involve the Public

Involve the public in future watershed field assessments by encouraging citizen volunteers to assist individuals trained and experienced in watershed and stream assessment methods, possibly in collaboration with Trout Unlimited or local soil and water conservation districts.

3.2 Water Quality

Goal: Preserve, protect, and enhance water quality in the Oyster Bay/Cold Spring Harbor Complex and its watershed. Consistently meet water quality standards, maintain and expand areas open to shellfishing, and maintain and improve the health of the watershed tributaries and groundwater resources.

Summary – Water Quality

Timeframe:
C = completed
O = ongoing
S = short-term
M = mid-term
L = long-term

Responsibility:
(subject to change)
● lead ○ assist

Estimated Cost (thousands):
$ = 0 – 10
$$ = 10 – 50
$$$ = 50 – 100
$$$$ = 100+

	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Objective 1: Improve Understanding of Estuary and Watershed Conditions													
Action 1-1: Continue and Expand In-Harbor Monitoring Program	S/O	○							●		○		$$
Action 1-2; Continue and Expand Stream and Outfall Monitoring Program	S/O	○							●		○		$$
Action 1-3: Survey and Map Benthic Habitat	M	○							●			○1	$$$
Action 1-4: Evaluate Other Potential Water Quality Impairments	M	○							●			○2	$$$$
Action 1-5: Conduct Harmful Algal Bloom Monitoring	M/O	○	○	○	○	○	○		●			○3	$$$
Objective 2: Reduce Impacts from Hotspot Land Uses													
Action 2-1: Improve BMP Implementation	S	●	○	○	○	○	○	○	○			○	$$
Action 2-2: Review and Enforce Compliance of Regulated Facilities	M/O	○	●	●	●	●	●	●					$$
Action 2-3: Cleanup and Promote Sustainable Re-use of Contaminated Sites	L	●	○	○	○	○	○	○	○				$$$$
Objective 3: Reduce Impacts of Stormwater Runoff													
Action 3-1: Implement MS4 Stormwater Management Programs	S/O	●	●	●	●	●	●	●					$$
Action 3-2: Develop Watershed Improvement Strategy Pathogen Reduction Plans	S	●	●	●	●	●	●	●					$$$
Action 3-3: Implement Stormwater Retrofits and Other WIS Requirements	L/O	●	●	●	●	●	●	●					$$$$
Action 3-4: Enhance Municipal Understanding and Implementation of Green Infrastructure	S	●			○	○	○	○		○			$$
Action 3-5: Incorporate Green Infrastructure into Land Use Plans	S	○			●	●	●	○					$
Action 3-6: Modify Municipal Land Use Regulations to Require LID and GI	M	●	○	○	○	○	○	○	○				$$$
Action 3-7: Encourage Municipalities to Apply NYSDEC Standards to Smaller Sites	S	●	○	○	○	○	○	○	○				$

Summary – Water Quality

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term **Responsibility: (subject to change)** ● lead ○ assist **Estimated Cost (thousands):** $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Action 3-8: Review Existing Recharge Basins	S		●	●	●	●	●						$$$
Action 3-9: Explore and Pursue Long-Term Funding for Municipal Stormwater Programs	M	●	○	○	○	○	○	○					$$$
Action 3-10: Implement Recognition and Awareness Initiatives	M/O	●	○	○	○	○	○	○			○		$$
Objective 4: Protect and Restore Riparian and Wetland Buffers													
Action 4-1: Implement Priority Buffer Restoration Projects	L	●	○	○	○	○	○		●	○	○	○[4]	$$$$
Action 4-2: Adopt Riparian Buffer Regulations	M	●	○	○	○	○	○	○	○	○			$$$
Action 4-3: Provide Education and Outreach	S/O	●	○	○	○	○	○	○	●	○			$$
Objective 5: Reduce the Impacts of On-Site Wastewater Disposal													
Action 5-1: Identify and Map Problem Areas	M	●	○	○	○	○	○	○					$$$
Action 5-2: Improve System Design, Inspection, and Maintenance	M	○	●	●	●	●	●	●			○		$$$$
Action 5-3: Expand Sewer Service in Targeted Areas	L	○	●	●	●	●	●	●					$$$$
Objective 6: Reduce Nuisance Waterfowl													
Action 6-1: Continue Existing Programs to Reduce Nuisance Waterfowl	S/O	●	●	●	●	●	○	○	●				$$

[1] University research programs
[2] NYSDEC (listing for other water quality impairments) and University research programs (hydrodynamic study)
[3] NYSDEC Bureau of Marine Resources Shellfisheries Section and University research programs
[4] Resource agencies, grant funding programs, and University research programs

Objective 1: Improve Understanding of Estuary and Watershed Conditions

The water quality monitoring efforts of Friends of the Bay and other organizations are a vital source of baseline information on current and past conditions within the Oyster Bay/Cold Spring Harbor estuary complex. Continuation of these programs is essential to monitor changes in harbor conditions as a result of changing watershed conditions and implementation of plan recommendations. Additional data collection is also recommended to refine the current understanding of water quality impairments in the estuary complex, particularly pollutants for which previous monitoring results have demonstrated the potential for water quality impairment but which are not currently identified by NYSDEC as a listed cause of impairment (e.g., sediment, nutrients, dissolved oxygen), and to identify potential sources of contaminants through DNA and microbial source tracking techniques.

Action 1-1: Continue and Expand In-Harbor Monitoring Program

Continue the current Friends of the Bay citizen water quality monitoring program at the in-harbor monitoring locations to continue collecting baseline water quality information and to assess the effectiveness of plan implementation over time.

- Most of the existing in-harbor water quality monitoring locations are located along the shoreline or in mid-harbor areas. There are currently no water quality monitoring locations in open water near Long Island Sound. In some estuaries of Long Island Sound, studies have shown that Sound waters can have a significant influence on the water quality within the estuary. Expansion of the existing monitoring program towards Long Island Sound would provide additional information on the potential influence of Sound water quality on the water quality within the Oyster Bay/Cold Spring Harbor estuary complex. The additional monitoring could consist of additional locations sampled by citizen monitoring personnel on a weekly basis, or deployment of a water monitoring buoy with water quality sensors and remote data acquisition similar to the MYSound marine water quality installations operated by the University of Connecticut and other groups throughout Long Island Sound. Understanding the source of water quality impairments, both within the watershed and from external sources (i.e., Long Island Sound) is critical to developing effective water quality protection strategies.

- The existing in-harbor monitoring program consists of weekly monitoring between April and October. Winter monitoring has not been feasible due to challenges associated with sample collection during cold-weather conditions and limited availability of citizen monitoring personnel. Collection of limited (i.e., monthly) winter monitoring data is recommended to address this information gap and allow Friends of the Bay to monitor in-harbor conditions year-round. The Town of Oyster Bay has offered to work with Friends of the Bay to perform winter water quality monitoring.

Action 1-2: Continue and Expand Stream and Outfall Monitoring Program

Continue the current Friends of the Bay stream and outfall monitoring program, focusing on priority outfalls and discharges to the estuary complex.

- The Friends of the Bay outfall monitoring program could augment the illicit discharge detection and elimination efforts of the watershed municipalities through the NYSDEC

MS4 Permit program. The MS4 Permit requires the watershed municipalities to conduct an outfall reconnaissance inventory addressing every outfall within the municipality's jurisdiction and conduct regular field investigations to detect the presence of ongoing and/or intermittent on-site sanitary discharges to the storm sewer system.

- The MS4 Permit also requires municipalities to reduce pathogen loads to the impaired portions of the estuary complex by implementing stormwater retrofits. Municipalities should identify the sources of the pathogens and the relative contribution of the major sources of pathogen loads to develop effective retrofits and estimate pathogen load reductions. Outfall pathogen monitoring is recommended to assist in identifying priority outfalls and drainage areas for pathogen load reduction. Outfall pathogen monitoring should consider the use of microbial source-tracking methods (also known as DNA fingerprinting, DNA source-tracking, or qPCR source-tracking), consisting of fecal Bacteroides analysis (identification and quantification of human Bacteroides and human enterococci for genetic fingerprinting). Bacteroides analysis, in conjunction with enterococci analysis for genetic fingerprinting, can be useful for identifying contamination sources because distinct categories of Bacteroides have been shown to be detected predominately in humans rather than livestock or birds. The major value in using microbial source-tracking methods is the ability to differentiate between human and non-human sources, which can help identify specific pathogen sources and better target controls to address those sources.

Action 1-3: Survey and Map Benthic Habitat

Although many users of the harbor have a working knowledge of the various types of marine habitats within portions of the estuary complex, information is limited regarding the actual quality and distribution of benthic (i.e., bottom-dwelling) communities and habitats throughout Oyster Bay/Cold Spring Harbor. A benthic habitat mapping survey is recommended to identify and assess the quality of benthic habitats and biological communities, including those habitats and biological communities that are threatened, missing, or have been extirpated by human activity. This type of information would be used to identify and guide restoration projects such as a shellfish sanctuary, eelgrass restoration, and restoration of diamondback terrapin nesting areas.

Action 1-4: Evaluate Other Potential Water Quality Impairments

Current efforts at improving water quality concentrate on reducing pathogen loads to the estuary complex, based on the pathogen Total Maximum Daily Load (TMDL) that was developed for portions of Oyster Bay and Mill Neck Creek. While pathogens are a major threat to water quality, as well as to recreation and the shellfish industry, they are just one of many. Water quality monitoring data collected by Friends of the Bay indicates that low dissolved oxygen and elevated nitrogen concentrations are common in areas of the estuary complex during the summer. Although low dissolved oxygen levels in Oyster Bay/Cold Spring Harbor are not as pronounced as in Long Island Sound and other North Shore embayments, hypoxic and anoxic conditions have been measured in the estuary.

Due to the limitations of the existing water quality data, it is unclear if the low dissolved oxygen (DO) levels are due to the hypoxia that occurs in Long Island Sound as a result of the transport of low-DO water into the estuary, or if the low dissolved oxygen levels in the estuary are influenced primarily by nutrient inputs from the contributing watershed. If the low dissolved oxygen levels are due to the hypoxia that occurs in Long Island Sound, this issue would be addressed largely through implementation of the Long Island Sound nitrogen TMDL. However, additional actions may be required beyond those occurring under the Long Island Sound nitrogen TMDL to address the nutrient-related water quality concerns within the estuary.

In addition to pathogens and dissolved oxygen-related issues, silt from stormwater runoff can smother otherwise productive shellfish beds and nutrients such as nitrogen and phosphorus can result in harmful algal blooms (HABs). Watershed activities are known sources of significant sediment and nutrient loads to the estuary complex, which contributes to water quality impairments.

Specific recommended actions to evaluate other potential water quality impairments include:

- Coordinate with the NYSDEC regarding the potential inclusion of Oyster Bay/Cold Spring Harbor for water quality impairments other than pathogens (i.e., low dissolved oxygen, nutrients, sediment) on the next impaired waters (303d) list in 2012.
- As a long-term project, develop a linked hydrodynamic and water quality model of the estuary complex to assess the relative influence of watershed sources and Long Island Sound circulation on the water quality of the estuary. In addition to pathogen load reductions, the model could be used to predict the affect of reduced nutrient loads from the watershed on harbor water quality, focusing on specific water quality concerns, such as dissolved oxygen. The model could also be used to predict the impact of other changes on water quality, such as increased rainfall resulting from climate change.
- Ensure that future management efforts address the full range of water quality parameters and potential sources of water quality impairments.

Action 1-5: Conduct Harmful Algal Bloom Monitoring

Harmful algal blooms (HABs) and marine biotoxins are a part of the marine ecological community in New York State marine waters. Within the past twenty-five years HABs, such as the brown tide bloom in the 1980s and 1990s, have devastated areas of New York coastal waters, threatening important habitat, disrupting food chains for many marine species, and impacting economically viable fisheries (NYSDEC, 2011).

One species of phytoplankton has made a strong appearance in Long Island waters, *Alexandrium* spp. This dinoflagellate produces saxitoxin, the neuromuscular toxin that causes Paralytic Shellfish Poisoning (PSP). The toxin accumulates in the tissues of animals that eat the dinoflagellate and may be present in high concentrations in shellfish. Eating shellfish that may have consumed *Alexandrium* may pose a health threat for animals and humans (NYSDEC, 2011).

Alexandrium spp. has been present in Long Island waters since the 1970s and made its first harmful bloom on Long Island in 2005, causing large shellfishing closures in Northport and Huntington Harbors. Researchers studying the waters of Northport Harbor recently detected a second type of harmful algae, *Dinophysis acuminata*, which produces a toxin that could cause stomach sickness in humans who ingest infected shellfish.

The NYSDEC Bureau of Marine Resources Shellfisheries Section conducts marine biotoxin monitoring of local waters to identify the occurrence of toxic HABs. Several monitoring sites are located in Northport and Huntington Harbors due to the occurrence of toxic HABs in these waters. In addition, the Suffolk County Bureau of Environmental Management performs harmful algal bloom monitoring for brown tide (*Aureococcus anophagefferens*), *Cochlodinium polykrikoides* (a form of red tide), and Cyanobacteria (a potentially toxic blue-green algae). A number of local government and university researchers are also investigating the occurrence, biology, ecology, and genetics of HABs on Long Island, including researchers at Stony Brook University's School of Marine and Atmospheric Science.

Systematic HAB monitoring has not been performed in Oyster Bay/Cold Spring Harbor, despite its close proximity to the Northport and Huntington embayments and the potentially significant risk that toxic HABs pose to economically-important shellfisheries and other marine resources, recreation, and public health. HAB monitoring should be conducted within Oyster Bay/Cold Spring Harbor to address these risks and guide water quality management approaches. Specific recommendations include:

- Coordinate with NYSDEC to expand the NYSDEC Bureau of Marine Resources Shellfisheries Section marine biotoxin monitoring program and/or the Suffolk County HABs monitoring program to Oyster Bay/Cold Spring Harbor
- Coordinate HABs monitoring efforts between state, county, and municipal health departments and marine monitoring efforts
- Incorporate periodic HAB monitoring into the Friends of the Bay water quality monitoring program and compile results in the proposed Information Resource Center.
- Coordinate with local government and university researchers regarding ongoing research findings on HABs and implement related water quality management approaches

Objective 2: Reduce Impacts from Hotspot Land Uses

Hotspot land uses are land uses with higher potential pollutant loads due to the nature of the activities and pollutant sources associated with these land uses. As described in Sections 5 and 6 of the State of the Watershed Report, hotspot land uses within the Oyster Bay/Cold Spring Harbor watershed include commercial land use, existing and former industrial sites, golf courses, horse stabling facilities, municipal public works facilities, marinas and boating storage/repair facilities, gas stations, and high-use parking lots.

An objective of this Watershed Action Plan is to reduce the threat to water quality from land uses with higher potential pollutant loads through good housekeeping and pollution prevention, improved compliance at regulated facilities, and cleanup and sustainable re-use of contaminated (i.e., brownfield) sites. Related education and outreach recommendations are addressed in *Section 3* of this action plan.

Action 2-1: Improve BMP Implementation at Hotspot Land Uses

Opportunities exist for improved pollution prevention and source controls at hotspot land uses and facilities. The facilities that were observed during the watershed field inventories exhibited examples of both good pollution prevention practices and opportunities for improvement. Specific recommended actions include:

- The watershed municipalities and other public entities (e.g., school districts, fire districts, water districts, state agencies, etc.) should review the current compliance of their respective facilities (public works/maintenance facilities, parks, schools, public safety facilities, etc.) in the watershed with pollution prevention best management practices and applicable regulatory requirements. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations, many of which are also subject to stormwater pollution prevention and other similar state and federal regulatory programs (oil pollution prevention, hazardous waste, air emissions). Examples of good practices should be recognized and modeled. The municipalities, working cooperatively with the Protection Committee, should provide guidance (e.g., visits, group training, and/or printed materials) and develop incentives to encourage local businesses to adopt these model practices.

- The Town of Oyster Bay Lake Avenue Highway Yard, which is located along Mill River adjacent to the Oyster Bay National Wildlife Refuge, has been identified by the Mill River Watershed Study and Public Stewardship Program for operational improvements, structural mitigation, and potential relocation. The Town of Oyster Bay should implement the BMPs and structural mitigation measures recommended in the Mill River Watershed Study and Public Stewardship Program. The Town should also consider relocating the highway yard to a less sensitive location and re-use of the site to provide needed stormwater treatment (e.g., regional bioretention basin, stormwater pond, or constructed wetland) for area road runoff. The Town should explore the opportunity for an environmental bond purchase of a more appropriate property for a re-located highway yard facility, thereby restoring and protecting the current site, which is located in an environmentally-sensitive location along the Mill River corridor.

- Limit the use of fertilizers and pesticides at golf courses, parks, and other large intensively managed lawn areas within the watershed by promoting integrated pest management (IPM), the use of stormwater BMPs, and wetland and riparian buffer restoration and protection. Limiting fertilizer and pesticide use is most critical in areas within several hundred feet of a stream, pond, wetland, or the harbor.

- Implement stormwater BMPs at marinas and boat storage and maintenance facilities in the watershed following guidance contained in New York Stormwater Runoff Best Management Practices for Marinas: A Guide for Operators developed by Suffolk

County and the New York Sea Grant Extension Program, Cornell Cooperative Extension and similar guidance documents.

- Require the installation of stormwater quality BMPs at new marinas, marinas that are proposing significant expansions, and marinas that request variances or exemptions from a municipal land use board.

- Implement manure management and other horse-related BMPs for commercial and residential horse pastures and stables in the watershed. Horses produce large amounts of manure that can threaten local water quality. Good housekeeping practices for horses are similar to those applied successfully to small dairy farm operations, and involve the close control of manure, limiting the use of spreading, careful construction of composting areas, preventing horse traffic or grazing over small streams, and similar measures (Battelle, 2007).

Action 2-2: Review and Enforce Compliance of Regulated Facilities

A number of facilities in the watershed have NYSDEC State Pollution Discharge Elimination System (SPDES) discharge permits. Although NYSDEC routinely evaluates facility compliance with SPDES permit requirements, the permits and associated facility compliance should be reviewed during permit reissuance. SPDES discharge permits should contain provisions for TMDL implementation, runoff volume reduction using LID or green infrastructure approaches, and water quality protection. The permits should accurately reflect the areas of the estuary and the associated subwatersheds covered under the pathogen TMDL.

Action 2-3: Cleanup and Promote Sustainable Re-use of Contaminated Sites

As described in the State of the Watershed Report, there are several contaminated former commercial and industrial sites in the watershed that are either inactive or undergoing remediation. Re-use or re-development of these sites presents an opportunity to cleanup historic contamination, which posed a long-term threat to the estuary, and to implement LID and green infrastructure stormwater management approaches to further reduce potential water quality and overall environmental impacts of these sites on the estuary complex. Redevelopment of the Jakobson Shipyard site as a passive waterfront park is an example of the type of sustainable re-use that should be considered for other contaminated or former industrial sites in the watershed including Mill Neck Bay Marina, Commander Oil Terminal, Cold Spring Harbor Terminal, and the Bayville Village Cleaners site.

Objective 3: Reduce Impacts of Stormwater Runoff

Since much of the watershed was developed prior to the adoption of stormwater quality regulatory requirements, most of the existing drainage infrastructure that does not discharge to recharge basins consists of traditional storm drains/catch basin and storm pipes that discharge directly to surface waters without treatment, other than detention to maintain peak rates of discharge. Uncontrolled stormwater runoff from impervious surfaces is a significant source of impacts to surface waters and water quality within the harbor complex and its watershed.

The stormwater collection and drainage system within the harbor complex watershed consists of drainage infrastructure operated and maintained by the watershed municipalities, including the Town of Oyster Bay, the Town of Huntington, the associated villages, and Nassau and Suffolk Counties. Nassau and Suffolk County are responsible for the drainage infrastructure associated with county roadways. All of these municipal entities are regulated small Municipal Separate Storm Sewer Systems (MS4s) under the NYSDEC State Pollution Discharge Elimination System General Permit for Stormwater Discharges from MS4s (MS4 Permit).

Through their MS4 Permit stormwater management programs and other planning initiatives, the watershed municipal entities, including Nassau and Suffolk Counties, have developed and implemented a variety of Best Management Practices to address stormwater quality and quantity issues associated with land development and redevelopment projects. The municipalities have also begun to address historical development and nonpoint source pollution impacts in the watershed by identifying potential sites for stormwater retrofits. However, stormwater runoff continues to be a significant threat to the water quality and overall health of the Oyster Bay/Cold Spring Harbor Complex and its watershed. An important objective of this Watershed Action Plan is therefore to reduce the impacts of stormwater runoff on the water quality and ecology of the estuary complex.

Action 3-1: Implement MS4 Stormwater Management Programs

The watershed municipal entities should continue to work cooperatively through the Nassau County Stormwater Coalition and the recently formed Oyster Bay/Cold Spring Harbor Protection Committee to implement municipal stormwater management programs for their regulated MS4s as required by the MS4 Permit. The six minimum control measures of the MS4 Permit include public education, public involvement, illicit discharge, detection and elimination, construction site runoff control, post-construction runoff control, and pollution prevention and good housekeeping.

Inter-municipal coordination is critical to cost-effectively achieve pathogen load reductions required by the MS4 Permit and associated pathogen TMDLs. The MS4s should continue to work cooperatively to satisfy the following basic minimum control measure requirements of the MS4 Permit, in addition to the enhanced pathogen reduction requirements described in Actions 3-2 and 3-3:

- Public education and outreach programs
- Street sweeping and catch basin cleaning through resource sharing
- Outfall mapping and reconnaissance inventories
- Development and implementation of model codes and regulations for construction and post-construction runoff controls for new development and redevelopment, including procedures for plan reviews, inspections, and enforcement
- Good housekeeping and pollution prevention

Action 3-2: Develop Watershed Improvement Strategy Pathogen Reduction Plans

The MS4 Permit, which became effective in May 2010, also requires the regulated MS4s in the watershed to develop Watershed Improvement Strategies (WIS) to achieve the pathogen load reductions specified in the permit and in the pathogen TMDLs. These enhanced requirements include:

- Additional non-structural BMPs, including targeted public education and outreach, heightened illicit discharge detection and elimination programs including septic system inspection and maintenance, and targeted pollution prevention and good housekeeping, that focus on reducing pathogen sources in the watershed
- Plan and schedule for implementation of structural stormwater retrofits to reduce pathogen loads using green infrastructure and traditional stormwater management practices

Working through the Oyster Bay/Cold Spring Harbor Protection Committee, the watershed MS4s should develop and submit to NYSDEC five-year WIS and retrofit plans by the deadlines specified in the MS4 Permit. The WIS should include:

Public Education:

- Plan and conduct an ongoing public education and outreach program designed to describe the impacts of pathogens on the harbor complex and other waterbodies.
- The program must identify potential sources of pathogens in stormwater runoff and describe steps that contributors can take to reduce pathogens in stormwater runoff.
- Dissseminate educational material dealing with sources of pathogens in stormwater and pollutant reduction practices. The educational material should address the following topics: where, why, and how pathogens pose threats to the environment and to the community; septic systems, geese and pets as a source of pathogens.
- Disseminate educational materials/surveys to households/businesses in proximity to the impaired waterbodies.
- Disseminate education for horse-stabling facilities regarding manure BMPs.

Illicit Discharge Detection and Elimination:

- Develop, implement, and enforce a program to detect and eliminate discharges to the storm sewer system from on-site sanitary systems in areas where factors such as shallow groundwater, low infiltrative soils, historical on-site sanitary system failures, or proximity to pathogen-impaired waterbodies, indicate a reasonable likelihood of system discharge.

- In such areas, ensure that on-site sanitary systems designed for less than 1,000 gallons per day are inspected at a minimum frequency of once every five years and, where necessary, maintained or rehabilitated.
- Conduct regular field investigations/inspections in accordance with the most current version of the EPA publication entitled "Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessment", to detect the presence of ongoing and/or intermittent on-site sanitary discharges to the storm sewer system.
- Develop and maintain a map showing the entire small MS4 conveyance system.

Pollution Prevention/Good Housekeeping:

- Develop, implement and enforce a local law prohibiting pet waste on municipal properties and prohibiting goose feeding.
- Develop and implement a pet waste bag program for collection and proper disposal of pet waste.
- Develop and implement a program to manage goose populations.
- Develop and implement a turf management practices and procedures policy to address proper fertilizer application on municipally-owned lands and the planting of native plant material to lessen the frequency of mowing and reduce the use of chemicals to control vegetation.

The stormwater retrofit plans should be developed using the following general approach:

Stormwater Retrofit Plans: Develop and implement a retrofit program that addresses runoff from sites to correct or reduce pathogen pollutant loading problems.

- Establish procedures to identify sites with pathogen loading problems. A phased approach is recommended. The first phase would consist of prioritizing subwatersheds that pose the greatest risk of pathogen loading. The next phase would consist of developing subwatershed plans to further identify and mitigate pathogen sources in the priority subwatersheds. A targeted outfall monitoring program is recommended in priority subwatersheds to assess relative pathogen loads and better identify potential pathogen sources in those subwatersheds. Outfall monitoring should include parameters such as surfactants, ammonia, *Enterococci* and DNA source tracking methods including fecal *Bacteroides* analysis (identification and quantification of Human *Bacteroidetes* and Human *Enterococci* for genetic fingerprinting). Additional field investigation is recommended to further isolate potential sources of the largest pathogen loads and develop site-specific pathogen reduction strategies to address those loads.
- Establish policy and procedures for project selection, based on the pathogen reduction potential of the specific retrofit being constructed/installed; the ability to use standard, proven technologies; and the economic feasibility of constructing, installing, and maintaining the retrofit. A range of traditional and innovative pathogen load reduction approaches should be evaluated including end-of-pipe stormwater filtration and infiltration, bioretention and other green infrastructure and LID approaches (pervious pavement, roof runoff disconnection, green streets).
- Establish policy and procedures for project permitting, design, funding, construction and maintenance.

- Develop and submit to NYSDEC approvable plans and schedules for completing retrofit projects.
- Demonstrate initial and ongoing compliance with the pathogen reduction requirements through pollutant load modeling or water quality monitoring.

Action 3-3: Implement Stormwater Retrofits and Other Watershed Improvement Strategy Requirements

The watershed MS4s should implement the five-year WIS and stormwater retrofits by the deadlines specified in the MS4 Permit. The pathogen load reductions required by the MS4 Permit must be achieved by 2021 and 2022 for stormwater MS4 pathogen loads to the impaired portions of Oyster Bay and Cold Spring Harbor, respectively.

Priority stormwater retrofits should be identified through the retrofit planning process described in Action 3-2. Opportunities for green infrastructure stormwater retrofits in the watershed generally include:

- Parking lot upgrades (bioretention, pervious pavement, vegetated buffers, water quality swales, and other measures). Area beaches are potential locations for implementing these measures.
- Athletic fields at parks and educational institutions (water quality swales, vegetated buffers, infiltration, bioretention, stormwater re-use for irrigation). Roosevelt Park is a potential location for this type of retrofit.
- Road repair/upgrade projects (green streets, including bioretention, water quality swales, tree planters, below-ground infiltration).

The following potential retrofit locations have been preliminarily identified through subwatershed field assessments performed as part of the State of the Watershed Report and by Nassau County as well as the Town of Oyster Bay. *Section 4* of this Watershed Action Plan provides examples of green infrastructure retrofits that could be implemented at these and other locations in the watershed.

Subwatershed	Potential Stormwater Retrofits
Bailey Arboretum	Revegetate swale along Factory Pond Lane at the River
Bailey Arboretum	Consider infiltration trench for drainage at Park Avenue from the southern end of small subdivision
Bailey Arboretum	Infiltrate stormwater prior to discharge to arboretum pond near Bayville Road
Bailey Arboretum	Reconstruct swale to treat discharges to creek on Arboretum property
Bailey Arboretum	Better stormwater management at bus maintenance area next to Locust Valley Intermediate School

Subwatershed	Potential Stormwater Retrofits
Bailey Arboretum	Infiltrate stormwater at Ann MacArthur Primary School
Beaver Brook	At ice skating facility, increase buffer and treat stormwater discharges near pond
Beaver Brook	Bioretention area to treat discharges to Shu Swamp
Beaver Brook	Replace concrete swale with water quality swale for discharges to Upper Francis Pond
Beaver Brook	Provide treatment for stormwater discharges at Beaver Brook Pond Dam
Cold Spring Brook	Provide treatment for Route 25A outfalls
Cold Spring Brook	Repair erosion and failing outfall from fish hatchery
Cold Spring Brook	Bioretention/infiltration practices at Cold Spring Harbor railroad station
Cold Spring Harbor	Green Street retrofit of Main Street through Cold Spring Harbor hamlet
Kentuck Brook	Replace concrete swale with water quality swale at Kentuck Lane
Kentuck Brook	Treat discharges from railroad embankment area
Kentuck Brook	Assess Oyster Bay Road crossing of brook for potential filtering treatment system
Kentuck Brook	Reshape and revegetate swale along Oyster Bay Road to stop erosion and provide treatment
Mill Neck Creek	Reconfigure end of Walton Avenue to accommodate stormwater wetlands
Mill River	Reconfigure Town of Oyster Bay highway yard to improve management practices
Mill River	Construct a bioretention basin near the intersection of Glen Cove Road and Mill River Road
Mill River	Provide treatment for Lake Avenue outfalls
Mill River	Assess series of recharge basins, include Basin #130, for capacity and effectiveness
Mill River	Install treatment for outfall at Muttontown Lane/Locust Ave; significant pollution was observed in the field.
Mill River	Provide treatment for Route 25A outfalls
Oyster Bay Harbor	Low Impact Development improvements at Town Hall, 74 Audrey Ave
Oyster Bay Harbor	Low Impact Development improvements at Oyster Bay High School, 150 E. Main Street
Oyster Bay Harbor / Beekman Creek	Implement LID principles as part of Beekman Creek restoration project
Oyster Bay Harbor / Spring Lake Creek	Capture and treat Cleft Road stormwater at West Shore Road prior to discharge
Tiffany Brook	Expand existing recharge basin at Yellow Cote Road / Woodland Drive
Tiffany Creek	Assess methods for treating runoff in Laurel Cove Road and Tiffany Road areas
White's Creek	Install hydrodynamic separator at major outfall from South Street
White's Creek	Install treatment catch basins along Elsie Avenue
White's Creek	Rehabilitate and reconfigure Recharge Basin #15 at Pinehollow Road and Route 106
White's Creek	Green Street retrofit project on East Main Street or South Street

Stormwater retrofit and other green infrastructure projects should be implemented by identifying "seed" funding for the initial design phases, followed by the development of subwatershed plans with conceptual designs for specific structural BMPs, which will increase the chances of state and federal funding for these projects, such as the Green Innovation Grant Program, the State Revolving Fund, and the NYSDEC Water Quality Improvement Projects program.

Action 3-4: Enhance Municipal Understanding and Implementation of Green Infrastructure

Low Impact Development (LID) and green infrastructure are the preferred approaches for stormwater management by NYSDEC and EPA, but are also relatively new and sometimes not well-understood by designers, municipalities, and the public.

LID is an approach to land development (or re-development) that works with nature to manage stormwater as close to its source as possible. LID principles include preserving and recreating natural landscape features, minimizing effective impervious cover (i.e., the impervious cover that is directly connected to the storm drainage system and/or receiving waters), and creating functional and appealing site drainage that treats stormwater as a resource. The goal of LID is to mimic a site's pre-development hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source. LID addresses stormwater through small, cost-effective landscape features located at the lot level. LID is a versatile approach that can be applied equally well to new development, urban retrofits, and redevelopment projects.

Green infrastructure is similar to LID and refers to systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater. Green infrastructure and LID include stormwater management practices such as rain gardens, permeable pavement, green roofs, green streets, infiltration planters, trees and tree boxes, and rainwater harvesting, for example. These practices capture, manage, and/or reuse rainfall close to where it falls, thereby reducing stormwater runoff and keeping it out of receiving waters.

In addition to reducing polluted runoff and improving water quality, green infrastructure has been shown to provide other social and economic benefits relative to reduced energy consumption, improved air quality, carbon reduction and sequestration, improved property values, recreational opportunities, overall economic vitality, and adaptation to climate change. For these reasons, many communities are exploring the use of and are adopting green infrastructure within their municipal infrastructure programs.

Key to maximizing the effectiveness of LID and green infrastructure is an understanding of how to select and design LID and green infrastructure practices, including site planning techniques as well as structural practices. The NYSDEC Stormwater Management Design Manual includes a new 5-step process for planning and designing projects to maximize the benefits of LID and green infrastructure, including pollutant removal and runoff reduction. The NYSDEC 5-step process should be implemented in local land use reviews, and municipal land use staff and board members should receive training in this process.

Action 3-5: Incorporate Green Infrastructure into Land Use Plans

The watershed municipalities should incorporate green infrastructure approaches and strategies into their municipal land use plans. For example, the Town of Oyster Bay Eastern Waterfront Community Vision and Revitalization Plan could integrate green infrastructure approaches such as the concepts presented in *Section 4* of this Watershed Action Plan (green streets, LID retrofits of municipal parking lots, etc.).

Action 3-6: Modify Municipal Land Use Regulations to Require LID and Green Infrastructure

Watershed municipalities should modify local land use regulations and design standards to require the use of LID and green infrastructure for municipal projects and private development/redevelopment, consistent with the NYSDEC Stormwater Management Design Manual and MS4 Permit. The regulatory modifications could be based on model codes and regulations (see Sustainable Land Use and Open Space goal).

Action 3-7: Encourage Municipalities to Apply NYSDEC Standards to Smaller Sites

The NYSDEC construction and post-construction stormwater standards in the MS4 Permit apply to projects that disturb an acre or more of land. Municipalities should consider applying the NYSDEC stormwater standards and design requirements to projects that disturb less than an acre. The threshold for applicability of the standards could be based on land disturbance, impervious cover, or project type and could be established through local regulations or ordinances.

Action 3-8: Review Existing Recharge Basins

Stormwater recharge basins are prevalent in many areas of the watershed. Recharge basins are designed to capture and infiltrate stormwater, thereby replenishing groundwater aquifers and reducing the quantity of runoff that is discharged directly to surface receiving waters. Drainage areas that are served by existing recharge basin are believed to be self-contained by infiltrating their entire design volume. Most of these facilities have overflow structures that direct stormwater resulting from extreme rainfall events to either other recharge basins or to drainage facilities that ultimately discharge to surface waters.

Several of the recharge basins maintained by Nassau County and the Town of Oyster Bay are overgrown and have large amounts of accumulated sediment and/or standing water, and a few are completely full. Although some of these deficiencies may be caused by high groundwater levels during all or part of the year, their performance may be compromised by accumulated sediment and reduced storage volume and infiltration capacity, which could potentially result in sediment resuspension and washout.

The counties and municipalities should review existing recharge basins to assess sediment accumulation, infiltration effectiveness, overflow mechanisms, and the need for maintenance and/or retrofit.

Action 3-9: Explore and Pursue Long-Term Funding for Municipal Stormwater Programs

In order to effectively manage and minimize stormwater runoff with green infrastructure, municipalities must establish sustainable, long-term funding sources to move beyond the pilot phase and create a comprehensive green infrastructure program (EPA, 2011). The watershed municipal entities, working through the Oyster Bay/Cold Spring Harbor Protection Committee, should assess potential funding options, including stormwater fees and loan programs.

Action 3-10: Implement Recognition and Awareness Initiatives

Implement green infrastructure demonstration projects at highly visible locations in the watershed to demonstrate the feasibility and multiple benefits of green infrastructure to the public and elected officials. The watershed municipalities and counties should take a leadership role by implementing green infrastructure retrofits at municipal/county facilities and in roadway projects using "green street" approaches. Private development projects that implement green infrastructure or LID should also be highlighted through a recognition program that could consist of public awards, websites, meetings, media, and other methods. Such a program could be led by the counties or the Oyster Bay/Cold Spring Harbor Protection Committee.

Provide education and outreach programs (seminars, training workshops, web resources, volunteer service events, etc.) for developers, designers, land use commissioners, municipal staff, and the public on green infrastructure and LID stormwater management approaches.

Objective 4: Protect and Restore Riparian and Wetland Buffers

Riparian buffers are naturally vegetated areas adjacent to streams, ponds, and wetlands. Vegetative buffers help encourage infiltration of rainfall and runoff, and provide absorption for high stream flows, which helps reduce flooding and drought. The buffer area provides a living cushion between upland land use and water, protecting water quality, the hydrologic regime of the waterway and stream structure. The naturally vegetated buffer filters out pollutants, captures sediment, regulates stream water temperature and processes many contaminants through vegetative uptake. The vegetative community of riparian buffers provides habitat for plants and animals, many of which are dependent on riparian habitat features for survival. Since, in many areas, riparian buffers are becoming reduced in size and impacted by roadways and development, many species of plants and animals that are dependent on the unique blend of characteristics that buffers provide are threatened or endangered species.

As discussed in the State of the Watershed Report, stream buffer encroachments are prevalent in the watershed along stream corridors in or near areas of residential, commercial, and industrial development and roads. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams.

An objective of this plan is to protect and restore degraded riparian and wetland buffers in the watershed to protect and improve water quality. Recommended actions for protection and restoration of riparian habitat, including in-stream habitat, are addressed under the Habitat Protection and Restoration Goal (*Section 3.3*).

Action 4-1: Implement Priority Buffer Restoration Projects

Priority buffer restoration projects identified during watershed field inventories are recommended to restore degraded stream and wetland buffers in the watershed. The most severely impacted riparian buffers are located in the White's Creek and Mill River subwatersheds. Impacted vegetated buffers also exist around many of the ponds and tidal areas. The following table lists several high-priority buffer restoration projects in the Oyster Bay/Cold Spring Harbor watershed.

Subwatershed	Potential Buffer Restoration Projects
Bailey Arboretum	Re-vegetate impacted buffer through Arboretum Grounds
Bailey Arboretum	Work with residents upstream of Factory Hollow Pond to reduce stream encroachment and implement proper waste management practices
White's Creek	Re-vegetate existing aboveground portions of White's Creek and incorporate vegetated buffers in the future design for daylighting of White's Creek
Beaver Brook	Increase buffer surrounding Beaver Lake, especially near livestock pastures.
Mill River	Work with residents along river north of Route 25A to replant impacted buffer, perhaps obtaining conservation easements along stream corridor
Mill River	Mill Pond Overlook Habitat Revitalization Project
Oyster Bay Harbor / Beekman Creek	Incorporate vegetated buffers in the future design for daylighting of Beekman Creek along the Beekman Beach parking lot
Tiffany Creek	Increase buffer to treat runoff with potential high pollutant loads upstream of Storrs Pond

In general, riparian buffers are most effective along smaller, headwater streams, although larger streams, ponds, and shoreline areas could also benefit from buffer enhancements. Potential buffer restoration approaches for the watershed include:

- Installation of new buffers
- Widening existing buffers
- Invasive species removal/management
- Tree planting/reforestation

The feasibility of buffer restoration at specific sites should be further evaluated based on consideration of site-specific factors including site access, available land area, land ownership, soil conditions, appropriate buffer width, and native plant species.

In general, priority buffer restoration projects should be implemented by identifying "seed" funding for the initial design phases, followed by the development of subwatershed plans with more detailed designs, which will increase the chances of state and federal funding for these projects.

Action 4-2: Adopt Riparian Buffer Regulations

Consider adopting local riparian buffer regulations, with the goal of establishing a contiguous vegetated riparian area on either side of the tributaries (rivers and perennial streams) of Oyster Bay, Cold Spring Harbor, and Mill Neck Creek. Riparian buffer model codes and regulations are addressed under the Sustainable Land Use and Open Space goal in *Section 3.4* of this plan. Recommended elements of a riparian buffer regulation include:

- Establish regulated riparian zones, which may vary in width depending on the resource type (stream, pond, or wetlands) and nature of the land use. Larger buffer widths could be required for land uses with the potential to contribute significant pathogen and nutrient loads to receiving waters such as horse stables and other hot spot land uses.

- Establish maximum disturbance and include vegetation replacement and mitigation for various activities.

- Limit the area of vegetation that can be disturbed for various regulated activities. A permit for activity involving disturbance of the riparian zone would be issued only if specific conditions are met, such as:
    - The basic purpose of the project cannot be accomplished on site without disturbing vegetation in the riparian zone.
    - Disturbance to the riparian zone is eliminated where possible and minimized where not possible by relocating the project, reducing the size of the project, or situating the project in portions of the riparian zone where previous development or disturbance has occurred.
    - Any temporarily cleared area of vegetation must be replanted with indigenous, non-invasive vegetation.
    - Limits on the amount of disturbance allowed for specific activities.

- Limit disturbance within specified distances from the top of bank for certain activities.
- Limit or restrict the use of fertilizer, herbicide, and pesticides within riparian buffers.
- Where the standards cannot be met, providing greater than 1:1 compensation in the form of re-vegetation and placing a deed restriction on the compensation area.

Action 4-3: Provide Education and Outreach

Educate designers, municipal staff, and the public about the value and importance of riparian buffers. Stress the importance of maintaining native vegetation within the riparian zone. Healthy vegetation adjacent to surface waters is essential for maintaining bank stability and water quality. The disturbance of such vegetation destabilizes the banks of channels and other surface waters, which leads to increased erosion and sedimentation that exacerbates the intensity and frequency of flooding. The loss of vegetation adjacent to surface waters also reduces filtration of stormwater runoff and thus degrades the quality of these waters. Such impacts adversely affect the health and habitat of fish and wildlife that depend upon clean surface waters and therefore disrupt the ecological balance that is necessary for life. Humans are ultimately affected by this imbalance, since clean water is essential for all life (New Jersey Department of Environmental Protection, Flood Hazard Area Control Act Rules, 2007). Specific education and outreach recommendations relative to riparian buffers are included in *Section 3.5*.

Objective 5: Reduce the Impacts of On-Site Wastewater Disposal

Much of the Oyster Bay/Cold Spring Harbor watershed is served by on-site wastewater disposal systems, including septic systems and cesspools. Many of these systems are old and not inspected frequently or maintained properly, and failing or malfunctioning systems have a high potential to impact surface water and groundwater quality. An objective of this plan is to reduce the water quality impacts of failing or malfunctioning on-site wastewater disposal systems in the watershed. Actions to achieve this objective will also address the MS4 Permit requirements to detect and eliminate discharges to the storm sewer system from on-site sanitary systems, and to inspect, maintain, and repair failing or malfunctioning systems.

Action 5-1: Assess Watershed to Identify and Map Problem Areas

Conduct an assessment of septic system function throughout the watershed or in specific subwatersheds to identify and map areas with failing or malfunctioning systems that could be resulting in system discharge to the storm sewer system or directly to surface waterbodies. The assessment should consider factors such as shallow groundwater, low infiltrative soils, system densities, historical system failures, and proximity to waterbodies, particularly pathogen-impaired waterbodies.

Action 5-2: Improve System Design, Inspection, and Maintenance

Nassau County Department of Health (NCDH) has jurisdiction over the construction of a new or replacement on-site wastewater disposal system for subdivisions of five lots or more. Systems associated with smaller subdivisions and single-family properties are regulated by the local municipalities (Village, Town, or City), which typically contain limited siting and design requirements or reference the NCDH or NYSDEC requirements.

The Suffolk County Department of Health Services (SCDHS) has jurisdiction over all sewage disposal facilities and maintains design standards documents for single family residences and non-single family residence properties. The design standards for the non-single family residence properties were revised in 2009, but design standards for the single-family residences were last revised in 1995. Both sets of standards contain vague or outdated elements, although the regulatory framework and authority provides an opportunity to improve system design and maintenance practices.

Many Villages have no written requirements for redevelopment and replacement of cesspools and septic systems and can allow property owners to replace existing systems at the discretion of the local building inspector, even if they do not meet current NCDH standards. Annual or periodic inspection of individual on-site wastewater disposal systems is not currently required, and there is no enforcement of maintenance standards.

The following actions are recommended to improve design, inspection, and maintenance of on-site wastewater disposal systems:

- Modify local regulations to include septic system replacement standards for new houses and major renovations, including thresholds requiring the installation of new systems to meet NCDH standards (e.g., percent of structure renovated) and minimum septic system setbacks and clearances for new or replacement systems based on NCDH standards. Such modifications could be based on the recommended model codes and regulations described in the Sustainable Land Use and Open Space goal of this plan.
- Prohibit in-kind replacement of existing non-conforming systems in the event of a failure or major renovation.
- Identify and require the use of innovative alternative septic system designs for lots that are too small or too constrained by groundwater and setbacks to be suitable for a standard system.
- Establish inspection and maintenance requirements consistent with the MS4 Permit. The MS4 Permit requires systems in problem areas (i.e., those areas identified by the assessment described in Action 6-1) designed for less than 1,000 gallons per day to be inspected at a minimum frequency of once every five years and, where necessary, to be maintained or upgraded. Consider requiring more frequent inspections in known problem areas. Consider requiring systems to pass an inspection and be pumped out when the properties that they serve are sold.
- NCDH staff should provide review assistance to building inspectors for larger projects, more complex system designs, or projects requiring a variance or waiver from design standards.

- SCDHS should consider revising both sewage disposal system design standards, or combining the two standards into one standard and improving minimum design standards, such as requiring baffled tanks for all systems, and siting standards.
- Incorporate septic system design and inspection in annual building inspector training programs, and require all building inspectors in the watershed to attend the training.
- Encourage regular maintenance of septic systems by homeowners by providing educational materials on how to identify improperly functioning systems and procedures to have systems inspected, cleaned, and repaired or reconstructed.
- Consider implementing a denitrification standard for new and replacement on-site sewage disposal systems in special groundwater protection areas and areas near surface waters.

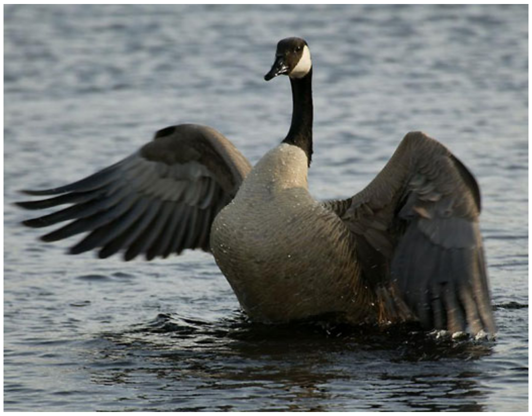
Action 5-3: Expand Sewer Service in Targeted Areas

Consider expanding sewer service in targeted portions of the watershed that are densely-developed and currently served by outdated on-site sewage disposal systems, consistent with municipal land use planning objectives.

Objective 6: Reduce Nuisance Waterfowl

Fecal material from nuisance waterfowl such as mute swans and Canada geese is a source of nonpoint source pollution, particularly pathogens and nutrients. Reducing these populations could improve water quality by reducing bacterial and nutrient loadings to the estuary complex.

Action 6-1: Continue Existing Programs to Reduce Nuisance Waterfowl



Nassau County, Suffolk County, and the Town of Oyster Bay have ongoing programs to control and reduce populations of nuisance waterfowl. Nassau County has a goose management program to address the negative impacts that geese have on water quality and has participated in the GeesePeace program (oiling of eggs prevent hatching) along with the Town of Oyster Bay. Suffolk County has used border collies to control geese at selected areas. The Town of Oyster Bay has also used border collies and a boat to control geese at Town parks, beaches, and waterways. The watershed municipalities and counties should continue existing programs and efforts to reduce populations and nesting of nuisance waterfowl in the watershed, and ensure that ordinances are in place in each jurisdiction to prohibit waterfowl feeding. Existing regulatory controls prohibiting the feeding of waterfowl should be enforced through signage and the potential for fines. The watershed municipalities and counties should continue to implement appropriate nuisance waterfowl population control and habitat reduction measures on public property by assessing problem areas to determine the attraction to nuisance waterfowl and developing strategies to reduce the prevalence of these factors.

3.3 Habitat Protection and Restoration

Goal: Protect and restore native habitat, fisheries and stream corridor habitat, shellfish populations, wetland habitat and shorelines, and forests and watershed tree canopy to maintain and increase the watershed's diversity of floral and faunal species.

Summary – Habitat Protection and Restoration

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term **Responsibility: (subject to change)** ● lead ○ assist **Estimated Cost (thousands):** $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Objective 1: Protect and Restore Native Habitat													
Action 1-1: Develop Invasive Species Management Plan	M	○	○	○	○	○	○		●	○	○	○[1]	$$$
Action 1-2: Raise Awareness of Invasive Species	S	○	○	○	○	○	○		●	○	○	○[2]	$$
Objective 2: Protect and Restore Fisheries and Stream Corridor Habitat													
Action 2-1: Identify Priority Fish Passage and In-Stream Habitat Improvement Projects	S	●	○	○	○	○	○		○				$$
Action 2-2: Implement Fish Passage Improvement Projects	L	●	○	○	○	○	○		○				$$$$
Action 2-3: Avoid Creation of New Obstructions	S/O	○	●	●	●	●	○	○	○				$$
Action 2-4: Implement In-Stream Habitat Improvement Projects	L	●	○	○	○	○	○		○				$$$$
Action 2-5: Conduct Ongoing Stream, Shoreline, and Beach Clean-ups	O	○			○	○	○	○	●		○		$
Objective 3: Protect and Restore Shellfish Populations													
Action 3-1: Establish Public Spawner Sanctuary	L	○	○		●				○			○[3]	$$$
Action 3-2: Preserve and Expand Shellfish Seeding Program	M	○	○		●				○			○[3]	$$$$
Action 3-3: Identify and Restore Unproductive Shellfish Beds	L	○	○		●				○			○[3]	$$$$
Action 3-4: Continue and Expand Bay Management Area Program	M	○	○		●				○			○[3]	$$$
Action 3-5: Continue to Monitor and Manage Shellfish Predator Populations	M	●	○		○				○			○[3]	$$
Action 3-6: Investigate Reasons for Limited Natural Oyster Sets	M	●	○		○				○			○[3]	$$$
Action 3-7: Educate the Public About the Shellfish Industry	S/O	●	○		○				○			○[3]	$
Objective 4: Protect and Restore Wetland Habitat and Shorelines													

Summary – Habitat Protection and Restoration

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term **Responsibility: (subject to change)** ● lead ○ assist **Estimated Cost (thousands):** $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Action 4-1: Conduct Watershed-wide Freshwater Wetland Inventory	M	○							●		○	○[4]	$$
Action 4-2: Monitor Changes in the Extent of Tidal Wetlands	M/O	○							●		○	○[4]	$$
Action 4-3: Adopt Alternatives to Traditional Shoreline Hardening	L	●	●	●	●	●	●	●	○				$$$
Action 4-4: Develop and Implement a Strategy for Wetlands and Shoreline Restoration	L	●	○	○	○	○	○	○	●	○			$$$$
Action 4-5: Reduce Wildlife Predators	M	●	○	○	○	○	○	○	●				$$$
Objective 5: Protect and Restore Forests and Watershed Tree Canopy													
Action 5-1: Refine Watershed Tree Canopy Analysis	S	○							●		○		$$
Action 5-2: Establish Tree Canopy Goals and Protection Strategies	S	○							●				$$
Action 5-3: Implement Reforestation Projects	M	●	○	○	○	○	○	○	○		○		$$$
Action 3-6: Encourage Native Tree Species	S/O	●	○	○	○	○	○	○	○		○		$
Objective 6: Plan for Climate Change and Sea Level Rise													
Action 6-1: Identify At-Risk Resources & Areas	M	●	○	○	○	○	○	○	○			○[4]	$$
Action 6-2: Develop Climate Change Adaptation Strategies	M	○	●	●	●	●	●	●				○[4]	$$$

[1] U.S. Fish and Wildlife Service and The Nature Conservancy
[2] The Nature Conservancy, Long Island Invasive Species Management Area (LIISMA)
[3] Local shellfishing industry and University research programs
[4] University research programs
[5] The Nature Conservancy, NOAA, University research programs

As described in the State of the Watershed Report, the Oyster Bay/Cold Spring Harbor Complex and its watershed provide abundant and significant habitat that supports a variety of fish and wildlife. Various estuarine, palustrine, riverine, and upland areas provide habitat to finfish, shellfish, mammals, amphibians, reptiles and birds.

Notable tracts of protected or preserved land (including submerged or tidal areas) within the estuary and watershed include the Oyster Bay National Wildlife Refuge, Charles T. Church/Shu Swamp Nature Preserve, Sagamore Hill National Historic Site, Planting Fields Arboretum, Muttontown Preserve, Bailey Arboretum, Stillwell Woods Park, Tiffany Creek Preserve, and the Nature Conservancy's Uplands Farm. These tracts of privately and publicly owned land provide valuable habitat or unique natural resources in an otherwise developed suburban watershed.

Due to the importance of these habitats, the State of New York has designated some of them as Significant Coastal Fish and Wildlife Habitats (SCFWH).

The following objectives and recommended actions will serve to protect and restore the various habitats that exist within the estuary complex and its watershed.

Objective 1: Protect and Restore Native Habitat

Native vegetation plays an important role in ecosystem biodiversity. Invasive plants have displaced native species and threaten local biodiversity and ecosystem function in the watershed. Invasive plants and invasive aquatic plants have been identified in many areas of the watershed. The most common and visible plant species include *Phragmites australis*, purple loostrife, and Japanese knotweed. Invasive aquatic plants such as Water Chestnut are also prevalent in some waterbodies in the watershed such as Mill Pond. Efforts to eradicate Water Chestnut from Mill Pond are ongoing, through the joint efforts of Nassau County, the U.S. Fish and Wildlife Service, The Nature Conservancy, volunteers, and other groups.

Action 1-1: Develop Invasive Species Management Plan

A survey should be performed to identify the extents and locations of invasive plant and animal species in the watershed, as well as potential restoration sites. The survey could be performed for the entire watershed or for selected subwatersheds, starting with the Mill River subwatershed as recommended previously in the Mill River Watershed Study and Public Stewardship Program.

Following the surveys, an invasive species management plan (or separate plans for individual subwatersheds) should be developed for the watershed or targeted subwatersheds. The plan should include eradication and control methods, prevention and education efforts to preempt arrivals, early detection and citizen monitoring efforts, rapid response measures for successful eradication, and when a species cannot be eradicated, continued control efforts that are necessary to minimize ecological and economic impacts. The invasive species management plan should borrow from the successes of other local regional invasive species control programs elsewhere on Long Island.

Action 1-2: Raise Awareness of Invasive Species

Both Nassau and Suffolk Counties have passed legislation prohibiting the sale, introduction, and propagation of invasive, non-native plants as part of their long-term plans to slow the spread of invasive species. The prohibition went into effect January 2009 for most species. Both counties developed the same "Do Not Sell" list in collaboration with The Nature Conservancy, Long Island Invasive Species Management Area (LIISMA), the nursery industry, botanists, field scientists, and environmental agencies.

Local education and enforcement programs are essential to the success of these and other invasive species management efforts within the watershed. Ongoing education is recommended for residents, facility maintenance personnel, landscapers and local nurseries, and land use commissions about the negative effects of non-native invasive species, pathways of introduction, and alternatives to invasive ornamental plants.

Additionally, invasive species are not necessarily limited to plants. Aquatic and upland vertebrates and invertebrates can also be invasive. NYSDEC considers White Perch and Alewife to be invasive when introduced into landlocked and inland waters. Baitfish, including Rusty Crayfish, Fathead minnow, Goldfish, Red Swamp Crawfish, Banded Darter, Virile Crayfish, Red Wigglers, Rainbow Darter, and Nitro-worms can be invasive, and baitfish have also introduced Viral Hemorrhagic Septicemia into gamefish in New York. Ongoing education is also recommended for anglers and other target groups that influence the spread of faunal invasive species.

Objective 2: Protect and Restore Fisheries and Stream Corridor Habitat

Attempts in recent years have been made to open up fish passage throughout the watershed to anadromous fish (which spend most of their adult lives in coastal marine waters) such as river herring, sea lamprey, and sea-run brook trout and catadromous fish (which live in freshwater but spawn at sea) such as American eel (NYSDOS, 2005; Gomez & Sullivan, undated). A fish ladder has been constructed at the downstream end of Beaver Lake to open passage to sea-run trout and potentially other anadromous and catadromous fish (NYSDOS, 2005).

Fish passage feasibility studies have also been completed by the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay to evaluate fish passage restoration of the Mill River and other areas of the harbor complex watershed. According to an evaluation conducted by NYSDEC, Region 1 Fisheries Bureau (Kozlowski, 2001), the fishery in the Oyster Bay/Mill River system is unusual for Nassau County (Gomez & Sullivan, undated) due to the documented presence of brown trout and brook trout.

The NYSDEC has determined that Mill River, upstream of Mill Pond, has a naturally reproducing brown trout population. It is one of only several known reproducing brown trout populations on Long Island, believed to have been from stockings of brown trout in Mill Pond. Brook trout are also believed to be using Mill River during various times of their life cycle. The presence of brook trout in Beekman Creek, a tributary of Mill River, is one of only two known spawning populations in Nassau County. In February 2008, for the first time, natural reproduction of brook trout in Beaver Brook was documented by NYSDEC and Long Island Trout Unlimited (Gomez & Sullivan, undated).

An important objective of this plan is to protect and restore naturally reproducing fish populations in the watershed by removing barriers to fish passage as well as restoring or enhancing in-stream and riparian habitat.

Action 2-1: Identify Priority Fish Passage and In-Stream Habitat Improvement Projects

Trout Unlimited conducted a Stream Visual Assessment Protocol (SVAP) of the stream corridors in the watershed in 2008. The SVAP identified numerous barriers and potential fish passage and stream restoration projects throughout the watershed. Similar stream assessments performed by Nassau County, Friends of the Bay, and Natural Resources Defense Council identified other opportunities for fish passage restoration, as well as opportunities for stream restoration. The following tables summarize these potential opportunities.

Subwatershed	Potential Fish Passage Restoration Projects
Beaver Brook	Improve passage below Cleft Rd; provide passage at Beaver Pond dam
Beaver Brook	Install fish ladder or remove structures at Francis Ponds Dams; improve passage below Frost Mill Road
Beaver Brook	Facilitate passage through, or remove, Beaver Brook Pond Dam; Oyster Bay Road culverts are currently passible
Cold Spring Brook	Provide passage through USGS weir and St. Johns Pond Dam
Cold Spring Brook	Install fish ladder at Franklin Falls Pond Dam or install fish ladder
Cold Spring Brook	Re-design Stillwell road crossing and remove in-stream grade control structures
Factory Pond Creek	Remove Factory Pond Road dam or construct fish passage; improve culvert below road
Kentuck Brook	Remove Lower Kentuck Pond (Rake's Pond) dam or construct fish passage
Kentuck Brook	Install rock ramp at Upper Kentuck Pond Dan, improve habitat structure downstream from dam
Kentuck Brook	Remove Coffin Pond dam or construct fish passage
Mill River	Replace West Shore Road culvert (carrying Beekman Creek) with bottomless arch or clear span bridge
Mill River	Install fish bypass channel at Mill Pond Dam
Mill River	Install passage or remove small dam approximately 1/5 mile north of Mill River Road
Mill River	Replace Route 25A culvert with bottomless arch or clear span bridge
Oyster Bay Harbor / Beekman Creek	Daylight creek to restore passage and habitat
Oyster Bay Harbor / Spring Lake Creek	Replace culvert at West Shore Road
Oyster Bay Harbor / Spring Lake Creek	Remove dam at first pond south of Cleft Road, install passage at second pond (second pond may be historically significant)
Oyster Bay Harbor / Spring Lake Creek	Remove berm between wetlands upstream from Spring Lake Creek Mill Pond Dam
Tiffany Creek	Storrs Pond Dam removal or fish ladder

Subwatershed	Potential Fish Passage Restoration Projects
Tiffany Creek	Replace Cove Neck Road box culvert with bottomless culvert
Tiffany Creek	Assess seawall structure for effect on passage
Tiffany Creek	Replace undersized Laurel Cove Road culvert with bottomless arch
Tiffany Creek	Replace undersized Tiffany Road culvert with bottomless arch
Tiffany Creek	Culvert replacement, fish ladder or rock ramp at dam near Tiffany Road residence
Tiffany Creek	Replace culvert at abandoned path with footbridge near Tiffany Road residence
Tiffany Creek	Replace Tiffany Creek Mill Race culverts at Sunset Road and Morris Lane with bottomless arch culverts or clear span bridges
Tiffany Creek	Install rock ramps at two low-head dams on Mill Race, replace culvert at Oyster Bay Cove Road, remove dam at very small pond
Tiffany Creek	At Cove Road residence, remove dam at private pond or construct rock ramp
Tiffany Creek	At Cove Road residence, remove obsolete culvert
Tiffany Creek	Replace culvert at Oyster Bay Cove Road
Tiffany Creek	Install rock ramp or fish ladder at Held Pond

Subwatershed	Potential Stream Restoration Projects
Bailey Arboretum	Restoration of channelized banks through Arboretum Grounds
Beaver Brook	Improve habitat structure through Shu Swamp
Beaver Brook	Create deeper pools throughout Beaver Brook while avoiding impacts to cobble and gravel substrate
Cold Spring Brook	Remove invasive species in Lower Reaches and improve impacted channel geometry
Kentuck Brook	Improve habitat structure and width to depth ratio in reach surrounding Glen Cove-Oyster Bay Road
Oyster Bay Harbor / Beekman Creek	Improve stewardship with homeowners along Harborview Drive
Oyster Bay Harbor / Beekman Creek	Improve habitat structure upstream from section to be daylighted and restored and ensure that brook trout are not impacted
Mill River	Restore Mill River, including walking trails, in-stream enhancements, invasive species removal, fish passage provisions, LID stormwater retrofits, and educational signage.
Tiffany Creek	Upstream of Storrs Pond, improve habitat through in-stream structures such as lunkers
Tiffany Creek	Improve width to depth ratio, add habitat structure, remove invasive species, address eutrophication
Tiffany Creek	Remove invasive species near Tiffany Road residence
Whites Creek	Daylight Whites Creek and incorporate it as a keystone of the Eastern Waterfront Revitalization Project

Further evaluation is recommended to prioritize these potential fish passage and in-stream habitat improvement projects. The evaluation should consider overall site-specific feasibility (land ownership, upstream and downstream conditions, infrastructure constraints, construction access, etc.) and ecological benefits, and should include geomorphic assessments to identify specific stream reaches in need of habitat restoration.

Action 2-2: Implement Fish Passage Improvement Projects

Implement the priority fish passage improvement projects identified based on the outcome of Action 2-1 above. Provisions for fish passage (fish ladders, bypass channels, barrier removal, etc.) should be initially considered for the major impoundments immediately upstream of the estuary, including Beaver Pond, Mill Pond, and St. Johns Pond to allow fish passage into upstream areas.

Action 2-3: Avoid the Creation of New Obstructions

Local and county drainage design standards should be reviewed and modified, as necessary, to require the design of new or modified stream crossings to include provisions for passage, as well as the movement of semi-aquatic and terrestrial organisms along the stream corridor. The New York regional conditions of the U.S. Army Corps of Engineers Nation Wide Permit for Stream Crossings require the use of a bottomless arch culvert, bridge, or embedded culvert, and that the culvert meet minimum width and openness ratio criteria. Similar requirements should be considered for local and county stream crossing design.

Action 2-4: Implement In-Stream Habitat Improvement Projects

Implement the priority stream restoration projects identified based on the outcome of Action 2-1 above. Common stream restoration techniques that could be implemented in the watershed include:

- Slope stabilization
- Redirective or flow changing techniques
- Toe protection techniques
- Bioengineering techniques
- Grade control techniques
- Riparian buffer improvement

Friends of the Bay, in conjunction with the Town of Oyster Bay, is proposing a comprehensive, phased restoration of Mill River and Beekman Creek, including fish passage restoration, in-stream enhancements, riparian restoration, invasives removal, walking paths, education signage, stormwater retrofits, and other improvements. This project can serve as a model for future stream restoration efforts in the watershed.

In general, stream restoration and other habitat improvement projects should be implemented by identifying "seed" funding for the initial design phases, followed by the development of subwatershed plans with more detailed designs, which will increase the chances of state and federal funding for these projects.

Action 2-5: Conduct Ongoing Stream, Shoreline, and Beach Clean-ups

Continue to conduct regular stream, shoreline, and beach cleanup projects throughout the watershed. The cleanup events should be publicized to involve citizen volunteers. The amount and type of material removed should also be documented and publicized to reinforce the accomplishments of these efforts.

Objective 3: Protect and Restore Shellfish Populations

Healthy shellfish populations are critical to maintaining water quality. Shellfish are filter feeders that are capable of filtering large quantities of water each day and the high water quality in the Oyster Bay/Cold Spring Harbor estuary is largely attributed to a vibrant shellfishery and shellfish aquaculture industry. This industry is also a significant contributor to the local economy and provides a sustainable source of fresh seafood. Shellfish populations also serve other ecological functions, including providing nursery and essential habitat for fish and crustaceans, and protecting coastal marshes from wave erosion.

Action 3-1: Establish a Public Shellfish Spawner Sanctuary

Establish a public shellfish spawner sanctuary as a designated area for establishing a vibrant, self-sustaining oyster and clam population in public waters. The sanctuary would be established through existing oyster farmers growing juvenile clams and oysters that would then be transplanted to the proposed sanctuary as well as transplanting breeding sized clams from other areas of the harbor. The proposed sanctuary should be located in an area that is currently closed to shellfishing to avoid closure of existing open shellfishing areas and to help improve water quality in those areas. Also consider establishing oyster reefs to protect eroding shoreline areas and in conjunction with wetland restoration projects. Such reefs could also act as spawner sanctuaries.

Action 3-2: Preserve and Expand Shellfish Seeding Program

Modernize and increase the capacity of the floating upweller systems (flupsys) and increase the number of seeded clams and oysters. Consider relocating flupsys to areas of the bay with better tidal flow and higher water quality.

Action 3-3: Identify and Restore Unproductive Shellfish Beds

Many areas that were formerly productive beds have been impaired due to the accumulation of silt and mud. Mechanical cultivation of these areas and amendment of the substrate with clam and oyster shells should be considered to restore their productivity.

Action 3-4: Continue and Expand the Bay Management Area Program

The Bay Management Area (BMA) is manipulated for public shellfish production, including ensuring adequate spawning stock for natural sets throughout the estuary. The current BMA has been compromised by the accumulation of silt and mud. Improvements could be made with mechanical cultivation, shelling, and seeding. Consider creating additional BMAs in other areas of the estuary. Portions of the BMAs could be used for transplanting shellfish from uncertified waters for cleansing and re-harvest.

Action 3-5: Continue to Monitor and Manage Shellfish Predator Populations

Continue to monitor and control known shellfish predators such as sea stars, oyster drills, conch and crabs. Prepare a management plan to address population spikes of common shellfish predators.

Action 3-6: Investigate Reasons for Limited Natural Oyster Sets

A substantial population of oysters is maintained in the estuary though F.M. Flowers aquaculture operation. Despite the large population of spawning oysters, natural sets occur infrequently and in smaller numbers than would be expected. The reasons and underlying causes for the limited numbers of natural oyster sets in the estuary should be investigated through a collaborative effort between the local shellfish industry, government agencies, and university researchers.

Action 3-7: Educate the Public About the Shellfish Industry

Educate the public about the benefits that the shellfish industry provides to water quality, the economy and providing fresh, sustainable seafood, as well as the threats to the shellfish industry and how the public can help reduce these threats. Install interpretive signage at the Jakobson Shipyard pier and other public waterfront areas describing these benefits and other unique or interesting aspects of shellfishing in Oyster Bay and Mill Neck Creek.

Objective 4: Protect and Restore Wetland Habitat and Shorelines

Approximately 1,000 acres of tidal wetlands exist within the harbor complex. Extensive areas of coastal shoals, bars, and mudflats occur along Mill Neck Creek, the western and southern shoreline of Oyster Bay Harbor, Inner Cold Spring Harbor, and the northeast shoreline of Centre Island. Most of the shoreline in the harbor complex is fringed by vegetated (IM and HM) tidal wetlands of varying width, interrupted by man-made waterfront structures. Freshwater wetlands account for approximately 2 percent of the harbor complex watershed area, with the majority of these located in the Beaver Brook, Cold Spring Brook, and Mill River subwatersheds.

Tidal wetlands are a vital part of the estuary ecosystem, providing habitat for many bird, fish and invertebrate species, filtering sediment and reducing loadings of other pollutants, and buffering coastal areas from storm surge. Similar to most embayments on Long Island, tidal wetlands have been decreasing in the Oyster Bay/Cold Spring Harbor complex due to a number of factors including coastal development and shoreline hardening, boat wake, altered salinity due to stormwater discharges, and rising sea levels. Many of the remaining tidal wetland areas have experienced a shift from native salt marsh plants to non-native species, which provide significantly lower habitat value for many species. Freshwater wetlands in the watershed around streams and ponds have also been impacted by development, stormwater runoff, and the introduction and proliferation of invasive species.

A key objective of this plan is to protect and restore tidal and freshwater wetlands throughout the estuary complex and its watershed, including a shift away from traditional shoreline hardening approaches to non-structural and bioengineering techniques whenever possible.

Action 4-1: Conduct Watershed-Wide Freshwater Wetlands Inventory

Freshwater wetlands are regulated under the Freshwater Wetlands Act (under Article 24 of the Environmental Conservation Law) and are defined and mapped by NYSDEC. However, only wetlands 12.4 acres and larger are mapped and protected under the Freshwater Wetlands Act. Smaller wetlands, which are prevalent throughout the watershed, may be protected if they are considered of unusual local importance. The NYSDEC freshwater wetlands mapping should be augmented by conducting a watershed-wide wetlands inventory to identify and map smaller wetlands and stream corridors that are not currently protected (e.g., Mill River, Tiffany Creek and small wetlands along West Shore Road are some examples of wetlands that are not mapped by the NYSDEC). Developing detailed wetlands mapping for the watershed would also assist in establishing local riparian buffer regulations and providing increased protection of local wetlands and water quality.

Action 4-2: Monitor Changes in the Extent of Tidal Wetlands

Tidal wetlands and creeks can be significantly impacted by development and shoreline modifications (bulkheads and waterfront structures). Tidal creeks, such as Mill Neck Creek, are subject to significant sedimentation and decreased water depths due to discharges of stormwater runoff and other internal sources such as the deposition of algal cell material. Changes in the extents of tidal wetlands and the depth of tidal creeks should be monitored over time to identify at-risk areas and help prioritize restoration efforts. The aerial extent of tidal wetlands can be mapped and compared over time using aerial photography and field surveys, and the depth of tidal creeks can be monitored to assess sedimentation rates.

Action 4-3: Adopt Alternatives to Traditional Shoreline Hardening

Alternatives to shoreline hardening should be considered whenever possible for waterfront or shoreline redevelopment projects and in coastal restoration efforts. Traditional "hard" shoreline construction approaches have focused on using vertical concrete, metal, or wooden break-walls; gabions; and rip-rap to protect against storm surge and wave energy. However, instead of absorbing the energy of wave and water action like vegetated sloping shorelines do, these hardened vertical or near vertical structures reflect wave energy, worsening turbulence and increasing erosion in front of and adjacent to the structure. These factors have an adverse

impact on the chemical, biological, and physical condition of the waterbody and limit recreational opportunities (NYSDEC, 2011).

The NYSDEC Department of Fish, Wildlife and Marine Resources developed Staff Interpretative Guidance for Shoreline Protection, which provides recommended alternatives to bulkheading in New York State. The guidance recommends for new or replacement shoreline erosion projects, the project sponsor should be required to select the least structural or softest approach available to address the erosion problem and that, whenever possible, the character of the natural shoreline and riparian zones should be retained or restored.

Municipal and county jurisdictions within the watershed should also adopt the NYSDEC Interpretive Guidance and consider modifying existing codes and regulations to require alternatives to shoreline hardening, whenever feasible. Revitalization of the eastern waterfront and the ongoing West Shore Road seawall reconstruction project present immediate or near-term opportunities to implement such alternative approaches. A watershed-wide inventory of hardened shoreline areas should be performed to identify and prioritize areas for alternative shoreline stabilization and tidal wetland restoration.

Action 4-4: Develop and Implement a Strategy for Wetlands and Shoreline Restoration Projects

Develop and implement a strategy to identify and implement freshwater and tidal wetland and shoreline restoration projects within the watershed, first by identifying potential sites and then prioritizing the sites through a screening evaluation that considers ecological benefits, site challenges, potential stakeholders, funding sources, and successes and lessons learned from other similar restoration efforts on Long Island.

Subwatershed	Potential Wetland and Shoreline Restoration Projects
Oyster Bay Harbor	West Shore Road seawall reconstruction
Oyster Bay Harbor	Eastern Waterfront redevelopment
Beaver Brook	Shu Swamp Nature Preserve
Centre Island	Restoration of the Spartina intertidal zone between Centre Island Beach and Mill River Rod and Gun Club to create nesting and hatchling habitat for diamondback terrapins
Mill Neck Creek	Cleanup and re-use of former Mill Neck Bay Marina
Mill River/Oyster Bay Harbor	Mill River/Beekman Creek
Mill River	Mill Pond
Tiffany Creek	Tiffany Creek
Mill River	Muttontown Preserve, pond adjacent to Chelsea Mansion
Mill River	Site of the proposed Oaks at Mill River development

Subwatershed	Potential Wetland and Shoreline Restoration Projects
White's Creek	White's Creek
Mill River	Corner of Mill River Road and Glen Cove/Oyster Bay Road
Mill Neck Creek	Wetlands behind commercial area and amusement park on Bayville Avenue

The Coastal America Corporate Wetlands Restoration Partnership, through its New York Chapter, is one potential funding source for wetland restoration projects for which conceptual designs have been completed. The program is an innovative private-public initiative aimed at preserving, restoring, enhancing and protecting aquatic habitats throughout the United States by bringing together corporations, federal and state agencies, non-profit organizations and academia.

In general, priority wetland restoration projects should be implemented by identifying "seed" funding for the initial design phases, followed by the development of subwatershed plans with more detailed designs, which will increase the chances of state and federal funding for these projects.

Action 4-5: Reduce Wildlife Predators

Feral domestic species and wildlife predators can reduce populations of beach and ground-nesting birds and other marine and terrestrial organisms in shoreline and inland areas. Management recommendations should be developed to address common predators such as Norway Rats (a common predator of diamondback terrapins) and feral cats. Consider expanding Trap-Neuter-Return (TNR) programs for feral cats within the watershed municipalities in addition to the Keep-Your-Cat-Indoors program advocated by the Huntington-Oyster Bay Audubon Society. A TNR program is currently active in the Town of Oyster Bay.

Objective 5: Protect and Restore Forests and Watershed Tree Canopy

The Oyster Bay/Cold Spring Harbor watershed contains a relatively high percentage of forested land (approximately 45%) compared to other nearby coastal watersheds on Long Island. These lands consist of deciduous and coniferous forest cover, which is associated with open space and wooded portions of low-density residential properties. Forest cover provides numerous benefits at both the site and watershed scales. In addition to providing habitat for terrestrial and aquatic wildlife, watershed forest cover also reduces storm water runoff and flooding, improves regional air quality, reduces stream and channel erosion, improves soil and water quality, and reduces summer air and water temperatures (USDA Forest Service, 2005).

Despite the healthy forest cover that exists in the watershed and existing land clearing and tree protection ordinances of several of the watershed municipalities, homeowner clearing of residential properties and land development/redevelopment activities continue to threaten forests and watershed tree canopy. The following actions are recommended to protect and enhance forested areas and tree canopy within the watershed.

Action 5-1: Refine Watershed Tree Canopy Analysis

Tree canopy is defined as the layer of tree leaves, branches, and stems that cover the ground when viewed from above. Tree canopy is a useful parameter because it provides such benefits as rainfall interception, pollutant removal, and reduced temperatures due to shading of streams and impervious surfaces, and can be measured using remote sensing and/or field techniques. Many communities across the United States have assessed the tree canopy in their community and developed tree canopy goals as numerical targets to guide urban watershed forestry planning efforts.

A planning-level watershed tree canopy analysis was conducted for the development of the State of the Watershed Report. Forest cover was estimated based on relatively coarse-resolution satellite land cover data for the watershed, which is limited in its ability to capture individual trees or stands of trees which are common in developed areas. A refined tree canopy analysis should be conducted using high-resolution aerial imagery and GIS analysis techniques to refine the existing tree canopy estimates for the watershed and individual subwatersheds. The results of the refined analysis can assist in targeting target priority areas for additional tree protection and reforestation efforts.

Action 5-2: Establish Tree Canopy Goals and Protection Strategies

Quantitative tree canopy goals should be established for the watershed and individual subwatersheds based on the findings of the refined analysis described in Action 5-1. A plan to achieve those goals should be developed and could include:

- Land acquisition, conservation easements
- Revisions to site development regulations and zoning to encourage tree retention and maintenance, restrict tree removal, and require landscaping and parking lot shading
- Reforestation of public lands, beginning with priority sites
- Encouraging large trees wherever possible
- Encouraging reforestation of private land by developing education, stewardship and incentive programs. For larger parcels, work with a forester to developing specific goals and objectives specific to the subject property.
- Review existing municipal land clearing regulations and ordinances. Municipalities that do not currently have regulatory requirements for tree protection should amend their regulations for consistency with those that have specific requirements for removal permits, protection during construction, and replacement requirements. Model codes and regulations should be developed for this purpose (see Sustainable Land Use and Open Space goal).
- Encourage maintaining and improving native tree cover.

Action 5-3: Implement Reforestation Projects

Identify priority parcels for reforestation based on watershed field inventories and refined tree canopy analysis results. Work with the municipalities and property owners to implement priority reforestation projects in the watershed, which can demonstrate the importance of trees and vegetation for terrestrial and aquatic wildlife habitat and as a critical component of green infrastructure and related water quality benefits.

Action 5-4: Encourage Native Tree Species

Encourage native rather than non-native species, such as the Norway Maple and Ailanthus, and educate the public, municipalities, and landowners about the importance and identification of native tree species. Work with the municipalities to require the use of native tree species in land development and redevelopment projects and to use native tree species in municipal projects. The Cornell Cooperative Extension office in Nassau County can recommend native species for use in the watershed.

Objective 6: Plan for Climate Change and Sea Level Rise

Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise. Climate change will produce a sea level rise around Long Island of up to 4.5 feet by 2080 (NYS Sea Level Task Force). Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined affects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al., 2007).

An objective of this plan is to promote climate change adaptation strategies to address anticipated sea level rise and associated impacts on human and natural communities in the estuary complex.

Action 6-1: Identify At-Risk Resources and Areas

The Nature Conservancy is leading a coastal resilience project that intended to provide planners and other decision-makers on Long Island with tools to assess reasonable future impacts of flooding from sea level rise and storms. The mapping tool developed for the project is an interactive decision support tool that explores future flooding scenarios and anticipated impacts on ecological resources (such as tidal wetlands, bird habitat, and submerged aquatic vegetation), infrastructure, and socioeconomic resources. A watershed-wide assessment is recommended to identify resources and areas within the watershed that are potentially at-risk from predicted sea level rise and storm surge scenarios.

Action 6-2: Develop Climate Change Adaptation Strategies

The watershed municipalities and counties should develop climate change adaptation strategies to guide decision-making regarding natural resource protection and land use management. The impacts of sea level rise and coastal hazards should be considered in future coastal planning and restoration efforts. Appropriate local strategies should be guided by the recommendations of the New York State Sea Level Rise Task Force Final Report issued in December 2010. Watershed municipalities and counties should consider organizing a workshop series, such as the Groton, Connecticut Coastal Climate Adaptation Workshops, which was supported by USEPA's Climate Ready Estuaries Program.

3.4 Sustainable Land Use and Open Space

Goal: Ensure that development within the watershed is sustainable, promote sustainable land use practices to protect natural resources, and expand access to upland and aquatic open spaces without adversely impacting water quality and natural resources.

Summary – Sustainable Land Use and Open Space

Timeframe:
C = completed
O = ongoing
S = short-term
M = mid-term
L = long-term

Responsibility:
(subject to change)
● lead ○ assist

Estimated Cost (thousands):
$ = 0 – 10
$$ = 10 – 50
$$$ = 50 – 100
$$$$ = 100+

	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens and Volunteers	Other Partners	Estimated Cost
Objective 1: Promote Sustainable Development													
Action 1-1: Remove Potential Barriers to Sustainable Development	S/M	○	○	○	●	●	●	●	○				$$
Action 1-2: Develop and Implement Model Codes and Regulations	S/M	●	○	○	●	●	●	●	○				$$$
Action 1-3: Incorporate WAP into Municipal Plans	S	○			●	●	●	●	○				$
Objective 2: Maintain and Improve Open Space													
Action 2-1: Preserve or Protect Additional Open Space	O	●	●	●	○	○	○	○	○			○[1]	$$$$
Action 2-2: Work with Owners to Protect Undeveloped Private Property	O	○	○	○	○	○	○	○	●	○		○[1]	$$$
Action 2-3: Pursue Multiple Sources of Financing	O	●	○	○	○	○	○	○	○			○[1]	$$
Action 2-4: Ensure Consistency with County Acquisition Criteria	C	●	○	○					○				$
Action 2-5: Create a "Green" Map	M	○			●	●			●		○	○[3]	$$
Objective 3: Increase Public Access													
Action 3-1: Encourage Water Related Use of Theodore Roosevelt Park and the Western Waterfront	O	○			●				○				Varies
Action 3-2: Create a Water Trail	M	○			●	●			●			●[2]	$$$$
Action 3-3: Delineate and Enforce Watercraft Low-Speed Zone	M	○			●	●			●				$
Action 3-4: Include Public Access In Waterfront Redevelopment	S	○			●	●	●	●	○			○	$$$
Action 3-5: Incorporate Outreach Signage	S	●			○	○	○		○			○	$$

[1] North Shore Land Alliance, The Nature Conservancy, private property owners
[2] Hempstead Harbor Protection Committee
[3] Long Island North Shore Heritage Area

Objective 1: Promote Sustainable Development

Sustainable development or smart growth includes a range of development and conservation strategies that help protect natural resources and make communities more attractive, economically stronger, and more socially diverse. Sustainable development practices have a number of benefits including lessening the environmental impacts of development with techniques that include compact development, reduced effective impervious surfaces and runoff generation, safeguarding of environmentally sensitive areas, mixing of land uses, transit accessibility, and better pedestrian and bicycle amenities. Sustainable or smart growth approaches can benefit developed areas through infill redevelopment and redevelopment of underutilized sites.

An objective of this plan is to promote sustainable principles in ongoing and future development and redevelopment in the watershed, and to ensure that growth is appropriate and incorporates measures to minimize impacts on surface and groundwater resources.

Action 1-1: Remove Potential Barriers to Sustainable Development

The watershed municipalities should consider modifying local land development codes, ordinances, and land use plans to remove common barriers to implementing sustainable development principles. General recommendations include:

- Adjust parking requirements to reduce unnecessary impervious cover
- Modernize street standards
- Designate and support preferred growth areas and development sites
- Use green infrastructure to manage stormwater
- Establish a water budget based on site conditions before development

Action 1-2: Develop and Implement Model Codes and Regulations

Municipal land use codes and regulations can shape the development patterns within a watershed and play a significant role in protecting water quality and other natural resources at the watershed scale. These commonly include municipal comprehensive plans, zoning regulations, subdivision regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by municipality within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements.

An opportunity exists for the municipalities within the Oyster Bay/Cold Spring Harbor watershed to strengthen existing regulatory mechanisms and go beyond the required MS4 stormwater management requirements, while also updating and improving upon existing land use regulations and land use planning strategies to help protect and restore water quality and other valuable natural resources in the estuary complex and its watershed.

The Oyster Bay/Cold Spring Harbor Protection Committee, working with Nassau and Suffolk Counties, should develop model codes and regulations to strengthen local land use regulatory controls and better protect water quality and related natural resources within the Oyster Bay/Cold Spring Harbor watershed. The models should be developed by building upon the many successful example local regulations that already exist on Long Island, elsewhere in New York State, and nationally. Specifically, local model codes and regulations should be developed for:

- **Stormwater Management** – New York State requirements generally do not mandate a stormwater management permit for site disturbances involving less than one acre, except for certain projects involving other environmental permits. However, municipalities can regulate site disturbances involving less than one acre due to the cumulative, adverse impacts to water quality from unmanaged runoff on smaller sites. The following construction and post-construction stormwater management standards should be addressed, beyond those currently required by NYSDEC:

    - Construction stormwater runoff:
        - Thresholds for requiring an erosion and sediment control plan
        - Recommended erosion and sediment control methods
        - Pre-construction inspection for all erosion control, tree protection and limits of disturbance protection
    - Post-construction stormwater management:
        - Applicability and exemptions
        - Low Impact Development (LID) standards, incentives, and design calculations
        - Green infrastructure approaches and standards
        - Redevelopment/retrofit standards, including applicability and exemptions
        - Impervious cover limits

- **Septic System Replacement and Maintenance** – The watershed municipalities rely on the County Health Departments for design guidelines and the approval of on-site wastewater disposal systems. Once constructed and operational, on-site wastewater disposal systems are no longer regulated by the County Health Department and are only inspected if a failure complaint is submitted to the County. The Towns and Villages also do not have requirements for ongoing inspection or maintenance of existing systems. The following issues should be addressed by the model codes and regulations:

    - Septic System replacement standards (new houses and major renovations)
        - Thresholds for requiring new systems to meet county standards
        - Block structures
    - Setbacks and clearances (County Department of Health Standards)
    - Piping standards (size, green pipe)
    - Inspection and maintenance requirements

- **Municipal and Private Roadway Standards** – The design, construction, and maintenance of municipal and private roads can have a major impact on the water quality of the harbor complex and its watershed. The model codes and regulations should address the following issues related to municipal and private roads:

    - Private roadway standards
        - Minimum design standards
        - Minimum maintenance standards
            - Sweeping
            - Catch basin cleaning
            - Pothole repair
            - Repaving
            - Provisions for municipality to intervene
    - Municipal roadway standards
        - Design
            - Stormwater standards
        - Maintenance
            - Drainage
            - Sweeping
            - Snow removal and de-icing

- **Steep Slopes, Tree Removal and Protection** – Disturbance of long, steep slopes tends to cause soil erosion. The potential for soil erosion is significantly increased on slopes of 25% or greater. Development on steep slopes also results in a larger disturbance footprint than development on flatter slopes. Development on steep slopes should be avoided where feasible. Similarly, removal of trees can have a cumulative adverse effect on watershed hydrology, water quality, and other important factors. Limiting development on steep slopes and preservation and protection of trees and the urban tree canopy can be accomplished through regulatory mechanisms. The model codes and regulations should address the following issues:
    - Steep slopes
        - Area subtracted from lot area
        - Prohibition of development on slopes
        - Retaining wall standards and limits
            - Permit requirements
            - Height setback limitations
    - Trees
        - Removal permit
        - Protection during construction
        - Replacement requirements

- **Model Code and Regulation Implementation** – Recommendations should be provided for each of the above topics relative to the implementation of model codes and regulations within a municipality. The recommendations for implementation should include:
    - Site plan requirements
        - Erosion control plan
            - Limits of disturbance on site plan
            - Prepared by qualified professional
            - Tree removal and protection
        - Stormwater management plan
            - Drywells

        - Connections
        - LID components
    - Septic systems
        - Assessing proposed expansions to existing systems
        - Threshold of expansion/renovation for replacing entire system with county compliant system
- Inspection schedules and checklists
    - Pre-construction inspection for erosion control, tree protection and limits of disturbance
    - Site plan review checklist
- Development of permit application forms, instruction sheets, and review procedures (checklist and flowchart)

A guidance document should also be developed on how to implement the model codes and regulations, including how to incorporate the models into existing codes and regulations, adopting new codes or regulations based on the models, responsibilities for administering and enforcing new or modified regulatory mechanisms, and other administrative procedures.

Other topics that could be addressed through model codes and regulations include riparian and wetland buffer protection, fish passage design provisions, aquifer protection, and reducing the presence of feral domestic species and wildlife predators on beach and ground-nesting birds.

The models would provide the watershed municipalities with a set of effective, uniform example codes and regulations that are consistent with the existing state and county regulatory and legal framework, but can also be tailored to the individual characteristics and needs of each municipality. The models would also promote consistency between overlapping and adjacent jurisdictions, which is consistent with a watershed-based approach. Once the models are developed, the watershed municipalities should undertake the process of reviewing their municipal land use regulations, identifying barriers and opportunities for implementing the recommended models, and incorporating the models into their land use regulations.

Action 1-3: Incorporate WAP into Local Land Use Plans

The watershed municipalities should incorporate this Watershed Action Plan into their respective local land use planning documents.

Objective 2: Maintain and Improve Open Space

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds.

As described in the State of the Watershed Report, approximately 10% of the harbor complex watershed consists of protected open space that is primarily conservation land and public parks (see *Figure 3-1*). In addition, recreational open space (golf courses, beaches, and private institutional open space) accounts for another 5% to 10% of the watershed area. Additional privately-held natural open space exists on already subdivided parcels and large estates.

A goal of this plan is to manage, maintain, and improve existing open space and continue to protect/acquire open space that meets resource protection and recreational goals. Critical to achieving this goal is collaboration between the counties and municipalities, the North Shore Land Alliance, The Nature Conservancy, and state and federal agencies with open space responsibilities.

Action 2-1: Preserve or Protect Additional Open Space

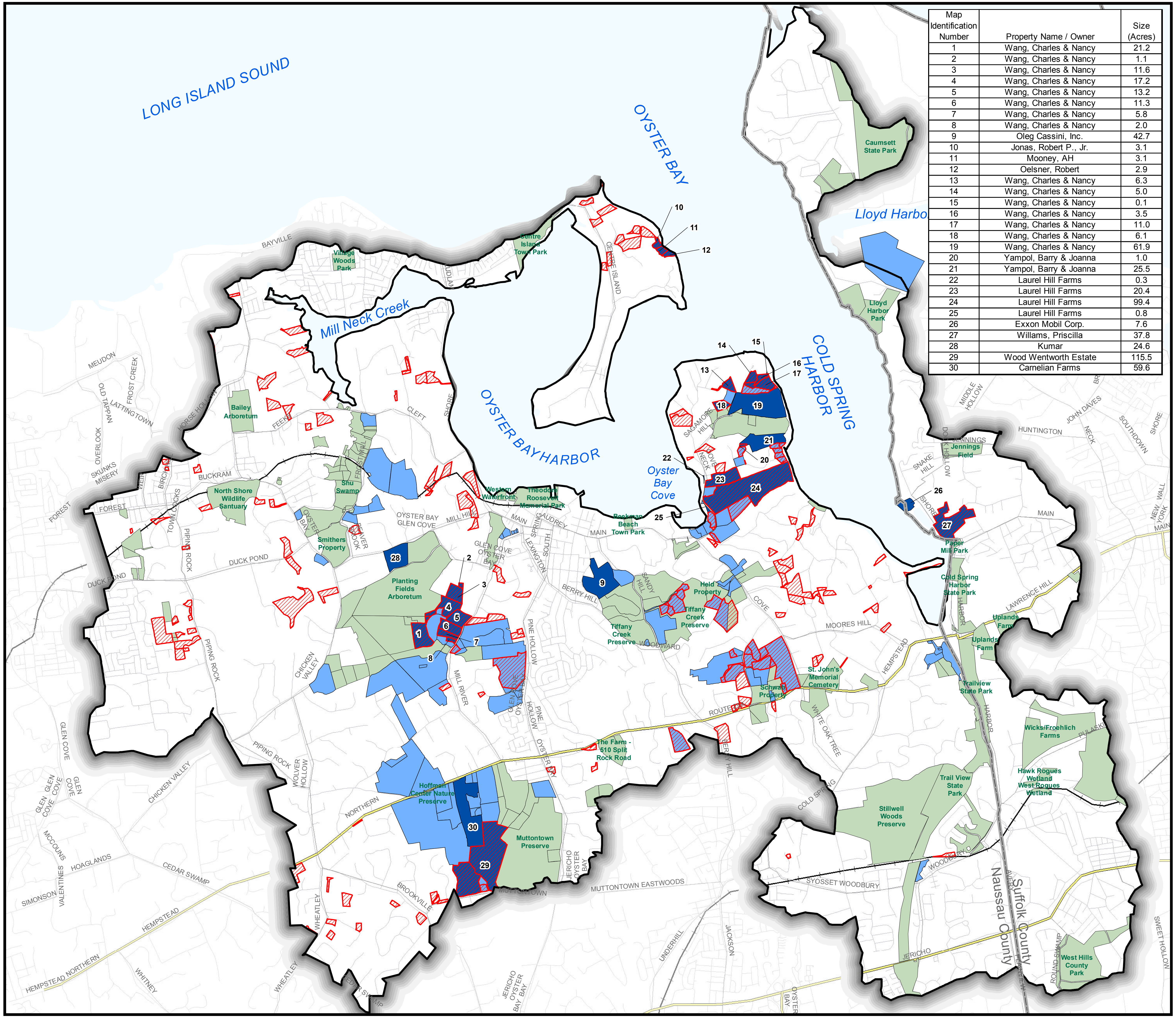
There are several common methods that undeveloped land can be preserved and protected as open space. These include outright purchase through Municipal Bond Acts or other means, conservation easements, restrictive covenants, purchase or transfer of development rights, tax lien procedures, and land donations. Regardless of the mechanism, critical to the success of protecting open space land is the ability to readily leverage financing when windows of opportunity arise to acquire or preserve significant parcels.

The watershed municipalities, Nassau and Suffolk Counties, NYSDEC, and the North Shore Land Alliance have identified specific properties within the watershed for acquisition or preservation. These priority parcels are summarized and shown in *Figure 3-1*. The figure also identifies parcels targeted for potential acquisition or preservation in the event that these parcels become available in the future. As shown in *Figure 3-1*, the priority parcels and parcels targeted for potential future acquisition or preservation would significantly enhance the existing protected open space in the watershed by creating larger, more contiguous tracts of protected open space land.

The watershed municipalities, counties, NYSDEC, and the North Shore Land Alliance should continue ongoing efforts to preserve and/or acquire unprotected open space as recommended in this plan and by local, county, and state-wide open space plans. Recommended actions include:

- Open space acquisitions should protect natural resources, protect water quality, preserve farmland, and provide for active recreational uses, historic sites and parks.

- Proposed open space acquisitions should be evaluated based on a set of criteria that considers the environmental and physical characteristics of each property proposed for acquisition. In general, priority for open space protection should be given to properties that meet one or more of the following environmental criteria, in addition to multiple public benefits:
  - **Size** – Larger parcels provide greater opportunity for contiguous undeveloped areas to benefit wildlife, water quality and provide recreation.
  - **Water Resources –** Parcels that provide buffers for rivers and streams and associated riparian communities, headwater streams, and coastal areas.



Map Identification Number	Property Name / Owner	Size (Acres)
1	Wang, Charles & Nancy	21.2
2	Wang, Charles & Nancy	1.1
3	Wang, Charles & Nancy	11.6
4	Wang, Charles & Nancy	17.2
5	Wang, Charles & Nancy	13.2
6	Wang, Charles & Nancy	11.3
7	Wang, Charles & Nancy	5.8
8	Wang, Charles & Nancy	2.0
9	Oleg Cassini, Inc.	42.7
10	Jonas, Robert P., Jr.	3.1
11	Mooney, AH	3.1
12	Oelsner, Robert	2.9
13	Wang, Charles & Nancy	6.3
14	Wang, Charles & Nancy	5.0
15	Wang, Charles & Nancy	0.1
16	Wang, Charles & Nancy	3.5
17	Wang, Charles & Nancy	11.0
18	Wang, Charles & Nancy	6.1
19	Wang, Charles & Nancy	61.9
20	Yampol, Barry & Joanna	1.0
21	Yampol, Barry & Joanna	25.5
22	Laurel Hill Farms	0.3
23	Laurel Hill Farms	20.4
24	Laurel Hill Farms	99.4
25	Laurel Hill Farms	0.8
26	Exxon Mobil Corp.	7.6
27	Willams, Priscilla	37.8
28	Kumar	24.6
29	Wood Wentworth Estate	115.5
30	Carnelian Farms	59.6

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

☐ Oyster Bay/Cold Spring Harbor Watershed

🟩 Protected Open Space

▨ Developable Land

Parcels Recommended for Acquisition or Preservation

■ Priority Parcel

■ Potential Acquisition/Preservation Parcel (if available in the future)

N
W E
S

0 0.5 1 2
Miles

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Open Space Properties: Town of Oyster Bay and Huntington, Nassau and Suffolk County GIS, NYSDEC, and the North Shore Land Alliance
ArcMap Document Path: J:\GIS\P2005\1349\A31\Acquisition.mxd

Figure 3-1
Open Space Acquisition/Preservation

  - **Wetlands and Wildlife Habitat** – Parcels that provide upland buffers around high quality wetlands and habitat areas that supports, enhances or protects biodiversity.
  - **Floodplain Protection** – Parcels in floodplain areas to provide habitat, protect or improve water quality, and preserve natural flood storage or function (to the 500-year flood level).
  - **Streamflow Protection** – Parcels that provide protection of groundwater recharge areas and headwater streams or parcels whose protection would prevent fragmentation of large forest tracts.
  - **Recreation** – Parcels that provide water and land-based recreational opportunities including swimming, fishing, boating, hunting, other water-access, or could accommodate multi-use trails as part of an existing or planned greenway, trail or linear park or provide connectivity of existing trail systems.

- Plan and provide for public access to open space areas, and connect existing open spaces to avoid open space fragmentation.

- Assess, improve, and restore parcels already acquired. Develop management plans for the use of acquired parcels.

- Update open space planning documents at least every five years.

- Ensure that citizens and elected officials are aware of the difference between properties acquired for public access and those acquired for preservation of natural resources.

Action 2-2: Work with Property Owners to Protect Undeveloped Private Property

Friends of the Bay and the Protection Committee should continue working with large property owners to permanently protect more sensitive portions of their properties with conservation easements, which can qualify for a state tax credit under Title 3 of Article 49 of the Environmental Conservation Law (See Action 1-2 of the Habitat Protection and Restoration goal).

Action 2-3: Pursue Multiple Sources of Financing

A variety of open space preservation techniques should be pursued. Financing for open space acquisitions should be leveraged through a coordinated effort between the public and private sectors. Seek alternative funding sources and approaches for open space acquisition such as state grants, limited market rate development on a parcel to help fund the acquisition of the remainder of the parcel as open space, and transferring development rights from sensitive locations to locations better suited for development.

Action 2-4: Ensure Consistency with County Acquisition Criteria

The Nassau County and Suffolk County open space and parkland acquisition evaluation factors were reviewed for consistency with the environmental criteria identified in this plan. The County evaluation factors and acquisition criteria are consistent with the criteria identified in this plan. Future updates to the County open space planning documents and policies should remain consistent with the goals of this plan.

Action 2-5: Create "Green" Map

Work with the Long Island North Shore Heritage Area (LINSHA) to create a watershed-wide "green" map of environmental features as well as related cultural and historical amenities. Promote awareness and appropriate use of existing open space by publicizing parks, trails, community gardens, and historic landscapes as well as educational events on open space parcels.

Objective 3: Increase Public Access

An objective of this Watershed Action Plan is to increase public access to waterways and open space areas in the watershed to enhance recreational opportunities as well as public appreciation and stewardship of the estuary complex, while balancing the interests of competing uses. General recommendations to achieve this objective are:

- Where appropriate, enhance access to the harbor and waterways at existing public open spaces
- Public access areas should not adversely affect sensitive resources
- Incorporate LID and other sensitive design elements into access area designs, and include these recommendations in local comprehensive planning documents

Action 3-1: Encourage Water Related Use of Theodore Roosevelt Park and the Western Waterfront

Encourage water dependent or water related uses of Theodore Roosevelt Memorial Park and the Western Waterfront area. These areas are ideal yet under-utilized locations for public access to the waterfront. Water-dependent or water-related uses could include additional recreational opportunities such as boating or fishing, which should be coordinated with the proposed water trail (see Action 3-2 below) and local land use plans including the Town of Oyster Bay Eastern Waterfront Community Vision and Revitalization Plan.

Action 3-2: Create a Water Trail

The Town of Oyster Bay, in cooperation with Friends of the Bay, and the Hempstead Harbor and Oyster Bay/Cold Spring Harbor Protection Committees, proposes to create a blueway or water trail that would extend from Hempstead Harbor to Oyster Bay Harbor and Cold Spring Harbor. The blueway will increase water-related recreational opportunities within Oyster Bay/Cold Spring Harbor and along the shoreline, and increase public access to the waterfront. The blueway will also provide new facilities for hand-launched boats (canoes, kayaks, etc.).

A blueway, also known as a blue trail or water trail, is the on-water equivalent of a hiking trail. It is intended to provide kayakers and small boats such as sailboats, rowboats and canoes with information on routes, points of interest, destinations and amenities. One of the primary goals of the blueway is to connect the harbor to the surrounding land by including information on land-based destinations and points of interest such as historical landmarks, parks, walking trails, restaurants and local businesses. Ultimately, the Oyster Bay/Cold Spring Harbor Blueway will connect to a series of blue trails throughout Long Island and is specifically intended to connect to the planned Hempstead Harbor Blueway.

The project will identify trail heads for kayakers and small boats. Some of the potential sites for trailheads in the area include the Town of Oyster Bay municipal parks on Long Island Sound, village beaches in Bayville and Sea Cliff as well as in Glen Cove, Theodore Roosevelt Park and Tappen Marina, and various private marinas located throughout the area. Trailheads and access points should incorporate environmentally-sensitive design elements. The project will also include appropriate signage and maps indicating the historic, cultural and ecological significances in the trail areas and vicinity.

Action 3-3: Delineate and Enforce Watercraft Low-Speed Zone

A low-speed zone currently exists along the harbor, limiting watercraft speeds to 5 miles per hour within 200 feet of the shoreline. Delineation of the existing 200-foot low-speed zone is recommended using buoys or similar markers. Buoys could be installed as part of the proposed water trail project. Enforcement and boater education regarding the importance of adhering to low speeds along the shoreline is also recommended.

Action 3-4: Include Public Access in Waterfront Redevelopment

Waterfront development and redevelopment projects should include public access where feasible, with the goal of providing continuous land-side public access along the waterfront from Beekman Beach to White's Creek and beyond. Permanent shore-side easements should be encouraged for waterfront development and redevelopment projects.

Action 3-5: Incorporate Educational Signage

Educational signage, interpretive stations, maps, and online resources should be included in the design of new or modified public access to waterways and open space areas. Educational signage and informational resources should provide information about the history and natural environment, including water quality and ecological resources, of the estuary complex. Public spaces provide multiple opportunities for education, such as the Western Waterfront, which includes native plantings, LID elements, brownfields cleanup, and water access.

3.5 Education and Outreach

Goal: Promote stewardship of the Oyster Bay/Cold Spring Harbor estuary complex and watershed through education and outreach.

Summary – Education and Outreach

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term Responsibility: (subject to change) ● lead ○ assist Estimated Cost (thousands): $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Objective 1: Improve Awareness of Marina and Boating Practices													
Action 1-1: Enforce No Discharge Zone and Educate Boaters	S/O	●	●	●	●	●		○	○				$$$
Action 1-2: Maintain Funding for Pumpout Facilities and Programs	O	○			●	●		○	○			●1	$$$
Action 1-3: Provide Education on Marina and Boating-Related BMPs	O	●	○	○	●	●		●					$$$
Objective 2: Expand School and Institutional Education Programs													
Action 2-1: Identify Target Schools for Educational Programs	S	○			●	●	●		○				$
Action 2-2: Develop a Watershed Curriculum	M	○			●	●	●		○			●	$$
Action 2-3: Develop a Place-Based Toolkit	M	○			●	●	●		○				$$
Action 2-4: Establish a Stewardship Work Program	M	●			○	○	○		○				$$
Action 2-5: Support Institutional Watershed Education Programs	S	●							●		●	●	
Objective 3: Conduct Outreach for Golf Courses, Parks, and Institutional Land Owners													
Action 3-1: Develop and Host Workshop Series	M	●	○	○	○	○	○	○	○				$$
Action 3-2: Promote Golf Course Environmental Stewardship Certification	M	●	○	○	○	○	○	○	○				$
Objective 4: Conduct Homeowner Outreach													
Action 4-1: Provide Outreach on Septic System Maintenance	M/O	●	●	●	●	●	●	●	○				$$
Action 4-2: Promote Rooftop Disconnection	M/O	●	○	○	●	●	●	●	○		○		$$
Action 4-3: Promote Sustainable Lawn and Landscape Maintenance	M/O	●	●	●	●	●	●	●	○	○			$$
Action 4-4: Promote Backyard Habitat	M/O	●							●	○	○		$$
Action 4-5: Foster Neighborhood Stewardship and Homeowner Incentives	L	●	○	○	○	○	○	○	○		○		$$
Action 4-6: Provide Outreach and Education for Horse Owners	M	●							●	○			$$

Summary – Education and Outreach

Timeframe: C = completed O = ongoing S = short-term M = mid-term L = long-term Responsibility: (subject to change) ● lead ○ assist Estimated Cost (thousands): $ = 0 – 10 $$ = 10 – 50 $$$ = 50 – 100 $$$$ = 100+	Timeframe	Protection Committee	Nassau County	Suffolk County	Town of Oyster Bay	Town of Huntington	City of Glen Cove	Villages	Friends of the Bay	Conservation Districts	Citizens & Volunteers	Other Partners	Estimated Cost
Action 4-7: Increase Watershed Stewardship Signage	M	●	○	○	○	○	○	○	●		○		$$
Objective 5: Provide Outreach to the Business Community													
Action 5-1: Conduct Outreach for Targeted Businesses	M/O	●							○				$$
Objective 6: Improve Awareness of Municipal Practices													
Action 6-1: Develop Watershed-Wide Drainage Infrastructure Mapping	M	●	○	○	○	○	○	○	○				$$$
Action 6-2: Encourage Inter-Municipal Coordination and Sharing of Resources for Street Sweeping and Stormwater System Maintenance	O	○	●	●	●	●	●	●					$$
Action 6-3: Improve Municipal Facility Housekeeping	S/O	○	●	●	●	●	●	●					$$$$
Action 6-4: Provide Annual Municipal Pollution Prevention Training	O	●	○	○	○	○	○	○		○			$$
Action 6-5: Provide Training for Designers and Municipal Reviewers	S/O	●	○	○	○	○	○	○		●			$$
Action 6-6: Require Training for Municipal Building Inspectors	S/O	●	○	○	○	○	○	○		●			$$

[1] New York State Environmental Facilities Corporation and NYSDEC

Six primary target audiences were identified as having the greatest potential to affect long-term change and protect/improve water resource conditions in the estuary complex – school-age children; marinas and boaters; golf courses, parks, and institutional land owners; homeowners and the general public; businesses; and municipalities.

Education and outreach recommendations that are tailored to each of these audiences are described in the following sections. The recommended education and outreach actions are intended to capitalize on the wealth of resources and programs that already exist within the watershed and elsewhere on Long Island. Watershed public outreach and educational programs should therefore coordinate with existing local, county, and state-sponsored educational programming. Public education and outreach is also a key required element of the MS4 stormwater management programs of the watershed municipalities.

The Friends of the Bay website for the Watershed Action Plan and proposed Information Resource Center (see *Section 3.1*) will continue to serve as a clearinghouse for watershed information, watershed-based education and outreach materials, past and upcoming events, and opportunities for public involvement.

Objective 1: Improve Awareness of Marina and Boating Practices

Marina and boating-related activities, including vessel waste disposal, boat maintenance and storage, and stormwater runoff from marinas, can directly impact the water quality of the estuary complex. Ongoing education of boater owners, marinas, and related waterfront boating facilities is a critical element in promoting stewardship of the estuary and its watershed.

Action 1-1: Enforce No Discharge Zone and Educate Boaters

In October 2008, The Oyster Bay/Cold Spring Harbor complex was declared a federal No-Discharge Zone (NDZ) for vessel sewage. The federal designation, in addition to the related Town Code, prohibits the discharge of sewage (whether treated or untreated) from vessels, providing an additional level of protection to address water quality issues associated with sewage contamination in marine waters. The Town of Oyster Bay provides floating pumpout stations (barges), stationary (dockside) pumpout stations, and a pumpout boat at several locations throughout the estuary complex for vessel sewage disposal.

Friends of the Bay and the Oyster Bay Power Squadron maintain signs at local marinas. The signs contain contact information for the pumpout boat, the locations of pumpout stations, and a notice that the harbor complex is a NDZ. Continued enforcement of the No Discharge Zone and public education regarding the effects of boat waste on local waterbodies are essential if the water quality benefits of the NDZ designation are to be realized. Recommended actions include:

- Maintain reminders of the NDZ and pumpout facility locations at existing boat launches, and install reminders at future boat launches associated with the proposed Oyster Bay/Cold Spring Harbor water trail (see Sustainable Land Use and Open Space goal). Create a Smartphone or Web App indicating pumpout facility locations.
- Consider, with the approval of the Coast Guard, installing buoys in mooring areas and at the mouth of the harbor noting the requirements of the NDZ and the locations of pumpout facilities
- Provide links on the Watershed Action Plan website and proposed Information Resource Center to websites with boating-related BMPs and information on the NDZ designation
- Provide links to the Watershed Action Plan website and proposed Information Resource Center from the websites of local boating groups, such as the WaterFront Center, Oyster Bay Marine Center, Sagamore Yacht Club, Bridge Marina, Seawanhaka Yacht Club, and watershed municipalities

Action 1-2: Maintain Funding for Pumpout Facilities and Programs

Maintain funding for the Town of Oyster Bay vessel sewage pumpout facilities and program.

Action 1-3: Provide Education on Marina and Boating-Related BMPs

- Disseminate educational messages concerning the proper use and maintenance of marine sanitation devices and the implementation of other boating and marina operational pollution prevention practices to boaters and marina operators.
- Promote the use of stormwater BMPs at marinas and boat storage and maintenance facilities in the watershed following guidance contained in New York Stormwater Runoff Best Management Practices for Marinas: A Guide for Operators developed by Suffolk County and the New York Sea Grant Extension Program, Cornell Cooperative Extension and similar guidance documents. Encourage these facilities to join a Green Marina program.

Objective 2: Expand School and Institutional Education Programs

The Town of Oyster Bay Environmental Resources Department has developed comprehensive educational programs for school-age children in the Town of Oyster Bay, providing environmental education to between 3,000 and 5,000 children annually, including several schools in the watershed. Such programs should be used as a model for new or expanded educational programs for schools throughout the Oyster Bay/Cold Spring Harbor watershed that don't currently provide comprehensive, watershed-based programs.

Action 2-1: Identify Target Schools for Educational Programs

Work with the Town of Oyster Bay Environmental Resources Department and the various watershed school districts to identify specific schools and grade levels that would benefit from new or expanded watershed or related environmental education programs.

Action 2-2: Develop a Watershed-Based Curriculum

Using existing educational materials available through the Long Island Sound Study, New York Sea Grant, NYSDEC, the NY-NJ Harbor Estuary program, County Soil and Water Conservation Districts, and other groups, develop a watershed-based K-12 curriculum that emphasizes the ecology of the estuary complex and the inter-relationship between the estuary complex and its watershed. Ensure that the curriculum builds on the previous years' lessons and is aligned with New York State education standards.. The curriculum could combine lessons, field activities, classroom experiments, and regional networking into learning activities that build shared scientific knowledge and stewardship experiences. Individual curricula could be tailored to specific age groups. The program should focus on issues of relevance in the watershed, including public education requirements of the MS4 permit and pathogen TMDL such as the impacts of pathogens and other point and nonpoint source pollutants on waterbodies and management/restoration techniques to address these problems.

Action 2-3: Develop a Place-Based Toolkit to Accompany the Curriculum

Work with K-12 educators within the watershed as well as with area higher-education teacher training programs to build a place-based educational "toolkit" to accompany the watershed-based curriculum. The "toolkit" could include recommendations for field research and documentation (photographs and GIS mapping) that can link into an online network, allowing for both internal and external (public) postings. Activities would provide opportunities for students to experience the watershed resources first-hand by getting their feet wet and hands dirty during each school year. Guidelines for learning activities would conform to state curriculum standards.

Action 2-4: Establish a Stewardship Work Program

Establish a formal program for high school and college students to participate in watershed stewardship efforts such as beach and stream cleanups, invasive species removal, trail and park maintenance, and ecological restoration projects.

Action 2-5: Support Institutional Watershed Education Programs

Support watershed and related educational programs by existing and new educational and recreational institutions, such as the Theodore Roosevelt Sanctuary, Cold Spring Harbor Fish Hatchery, Cold Spring Harbor Whaling Museum, The WaterFront Center, and the Long Island North Shore Heritage Area.

Objective 3: Conduct Outreach for Golf Courses, Parks, and Institutional Land Owners

Management and maintenance practices at golf courses, parks, and institutional facilities with large intensively managed lawn areas can have a significant impact on the water quality within the Oyster Bay/Cold Spring Harbor watershed and estuary. Large institutional land owners, like homeowners in the watershed, therefore play an important collective role in protecting water quality.

Action 3-1: Develop and Host Workshop Series

Friends of the Bay or the Oyster Bay/Cold Spring Harbor Protection Committee should develop and host a series of seminars or hands-on workshops to discuss best practices and local resources regarding management and maintenance practices at golf courses, parks, and institutional facilities. Topics could include:

- Integrated Pest Management (IPM)
- Turf management and low fertilizer usage
- Grass clippings management
- Leaf/brush waste management
- Parking lot and road maintenance (deicing, snow management)
- Drainage system maintenance (catch basins, storm drains, stormwater BMPs)
- Water quantity and flooding issues
- LID and green infrastructure approaches

A wealth of local, state, county, and national resources and educational materials already exists on many of these topics. Workshop content should be developed in coordination with the SUNY Old Westbury green campus initiatives, the Sustainability Institute at Molloy College, NYSDEC, New York Sea Grant, Long Island Sound Study, and the County Soil and Water Conservation Districts.

Provide funding and/or project assistance incentives for facility managers who complete the program. Also encourage awareness and involvement of students and faculty in campus management decisions, including annual or bi-annual volunteer service events.

Action 3-2: Promote Golf Course Environmental Stewardship Certification

As recommended in the Mill River Watershed Study and Public Stewardship Program, encourage and work with area golf courses to obtain certification in the Audubon Cooperative Sanctuary Program for Golf Courses, which is an education and certification program that helps golf courses protect the environment but preserve the heritage of the game of golf. Using existing educational materials and resources developed by Cornell University Extension Service, the U.S. Golf Association, and others, provide education and outreach to golf course members, boards, and superintendents.

Objective 4: Conduct Homeowner Outreach

An objective of the Watershed Action Plan is to build awareness of land stewardship and management practices and reduce nonpoint source impacts associated with residential land use, which comprises approximately 64 percent of the watershed land area. Homeowner education and outreach efforts should be tailored to the most common types of residential activities in the watershed that pose a risk to water quality. These activities include failing or malfunctioning septic systems, lawn and landscape maintenance, fertilizer and pesticide use, alteration of backyard riparian areas, rooftop runoff connections to the storm drainage system, pet waste, and horse stabling activities.

Action 4-1: Provide Outreach on Septic System Maintenance

Much of the watershed area is served by on-site wastewater disposal systems, including septic systems and cesspools. Many of these systems are old and not inspected frequently or maintained properly, and failing systems have a high potential to impact surface water and groundwater quality. Maintenance of these systems is the responsibility of the homeowner, which emphasizes the need for homeowner education on the importance of septic system maintenance.

As required by the MS4 Permit, local municipalities should disseminate educational materials and messages for septic systems including homeowner responsibility for septic system maintenance, how septic systems function and proper care, specific septic system maintenance procedures and recommended frequencies, and action to take when system failure or malfunction are suspected. The NYSDEC, Cornell Extension Service, USEPA, and the County Soil and Water Conservation Districts have extensive educational materials on septic management.

In addition to public education, a successful septic management program also requires strengthened local septic system regulations to require new and replacement systems to meet minimum design standards and to require periodic septic system inspection and maintenance. Training for municipal building inspectors on enforcement of septic system regulations and design standards is also recommended. These related recommendations are described in *Section 2* of this plan.

Action 4-2: Promote Rooftop Disconnection

Residential areas in the watershed contribute significant quantities of rooftop runoff to the storm drainage system. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

Downspout disconnection (also referred to as "roof leader disconnection") is a cost-effective on-site option for reducing the volume and cost of stormwater that requires public management. Downspout disconnection has a number of economic and environmental benefits to the municipality and the property owner. The major benefits include:

- Reduces volumes of flows conveyed and resulting loads to watercourses
- Reduces the volume of flow to the municipal storm drainage system (MS4)
- Increases infiltration and groundwater recharge
- Provides options to reuse rainwater

Individual rooftop retrofits target a small area, requiring the participation of many homeowners to make a measurable difference across a watershed. As a result, a coordinated effort is required for widespread participation in such a program, which typically includes a combination of targeted education, technical assistance, and financial subsidies to homeowners or the business community. Examples of effective local downspout disconnection programs are presented in *Urban Stormwater Retrofit Practices* (CWP, 2007).

Recommended actions include:

- Encourage disconnection of rooftop runoff from the storm drainage system and impervious areas to reduce the quantity of runoff by redirecting the runoff to pervious areas, through the use of dry wells, compost-amended soils (in areas with poorly-drained soils), or through the use of rain barrels or rain gardens.
- Disseminate educational materials on designing, constructing or installing, and maintaining residential rain gardens and rain barrels. The Nassau County Soil and Water Conservation District has developed brochures and has installed two rain gardens and barrels at the Town of Oyster Bay Animal Shelter.

- Consider rain barrel incentive program options for residents and business owners for those who purchase a rain barrel or subsidized give-away programs, through grant funding or other revenue sources.

Action 4-3: Promote Sustainable Lawn and Landscape Maintenance

Promote sustainable lawn care and landscape maintenance practices. Educate homeowners about the impacts of lawn care practices on water quality and encourage the use of residential lawn care BMPs such as reducing or eliminating fertilizer and pesticide usage through the use of slow release fertilizers and fertilizer application timing; utilizing alternative landscaping that decreases maintenance; soil testing and non-chemical lawn care measures; as well as increased awareness of the fertilizer laws in effect in Nassau and Suffolk Counties.

Extensive educational materials are available on these topics, including a local brochure developed by the New York State Department of State, in conjunction with New York Sea Grant, entitled "A Guide to Sound Gardening in the Oyster Bay-Cold Spring Harbor Outstanding Natural Coastal Area." Other sources of information include the New York State IPM Program, county IPM programs, the County Soil and Water Conservation Districts, and the EPA GreenScape program. The North Shore Land Alliance and Sustainability Institute are other sources of information and educational materials on sustainable lawn and landscape maintenance practices. Homeowner lawn and landscaping outreach programs could be integrated with the Good Water Citizen program for organic gardening.

Also work with and provide outreach to local landscapers regarding alternative landscaping and lawn care practices. Potential outreach programs could include:

- Identifying and promoting sustainable landscape provider certification programs
- Developing a placard campaign to identify lawns that implement preferred practices
- Develop a sustainable lawn care recognition program, with landscapers and homeowners highlighted on a rotating basis, or institute an alternative landscape competition

Action 4-4: Promote Backyard Habitat

Encourage the creation of backyard habitat in residential areas near stream corridors, including the importance of maintaining healthy vegetated buffers to streams, ponds, and wetlands, and recognize the efforts of the public. Take advantage of existing programs, such as Audubon's backyard program and Together Green program, programs from the Long Island Sound Study and New York Sea Grant.

Action 4-5: Foster Neighborhood Stewardship and Homeowner Incentives

Foster a neighborhood approach for the restoration and conservation of streams, ponds, and shoreline areas by providing educational materials and technical guidance. A neighborhood stewardship approach encourages neighbors to "self-organize" around shared interests, such as removing invasive species and restore native vegetation that serves as habitat for migratory birds. Homeowners are often willing to undertake environmental improvement projects – and assist with the labor – yet recognize the need for technical guidance.

Consider homeowner incentive programs such as the BLUE® Certification Program, which certifies peoples' homes as watershed-friendly after the owner agrees to follow a handful of simple practices that reduce stormwater runoff and pollutant sources. BLUE® incentivizes and motivates people to take action and includes follow-ups to ensure that they continue to follow the practices. The BLUE® program has been implemented successfully for Lake Champlain, Vermont.

Action 4-6: Provide Outreach and Education for Horse Owners

Provide educational materials developed by the NYS Soil & Water Conservation Committee's Agricultural Environmental Management program on BMPs for commercial and residential horse pastures and stables in the watershed. Consider the formation of a Horseowner's Advisory Council to help disseminate educational information on manure management and other horse-related BMPs, as recommended in the Mill River Watershed Study and Public Stewardship Program. Alternatively, the Protection Committee could assume this responsibility.

Action 4-7: Increase Watershed Stewardship Signage

Stewardship signage can be an effective way of educating the public on the importance of preserving natural resources and common ways in which they may be impacting these resources. The general public is often unaware of the cumulative effects of their every-day activities. Signage can play an important role in making the connection between every-day activities and their sometimes harmful results. Educational signage can take the form of kiosks in public areas, storm drain markers or stencils, anti-dumping signs, proper pet waste management signs, and roadside/stream side signage (examples include "adopt a stream/roadway" programs).

Storm drain marking and other watershed stewardship signage is already present in many areas of the watershed. Storm drain marking or other forms of stewardship signage could be expanded to other areas of the watershed, targeting commercial and additional residential areas that are currently under-served. Interpretive educational signage is also recommended in highly-visible public areas of the watershed such as municipal facilities (schools, town offices, parks, libraries, etc.), in public access areas along the harbor, and along the proposed water trail.

Objective 5: Provide Outreach to the Business Community

Advance the business community's awareness of the estuary and its watershed through targeted education and outreach.

Action 5-1: Conduct Outreach for Targeted Businesses

Focus education and outreach efforts on the types of businesses in the watershed whose activities have the potential to impact water quality (e.g., light industry, commercial retail centers, landscaping companies, restaurants, golf courses, and commercial equine facilities). The education and outreach programs could consist of a variety of printed and electronic media, seminars and workshops, and training opportunities such as a training and certification program for local landscapers in the use of environmentally-sensitive lawn care practices.

Objective 6: Improve Awareness of Municipal Practices

Municipal operations and facilities such as public works yards, street and bridge maintenance, winter road maintenance, stormwater system maintenance, vehicle and fleet maintenance, parks and open space maintenance, municipal building maintenance, and marine operations can impact water quality by contributing pollutants to the storm drainage system or directly to surface waters or groundwater. Improving the awareness of municipal employees about the potential impact of their operations on the water quality and environmental resources of the estuary complex and its watershed is also a key objective of this plan.

Action 6-1: Develop Watershed-Wide Drainage Infrastructure Mapping

Develop GIS mapping of the drainage infrastructure throughout the entire watershed. While each municipality/MS4 is required to map their respective stormwater outfalls and associated drainage infrastructure, a single consistent drainage infrastructure map does not exist for the entire watershed. The mapping should identify municipal jurisdictions, traditional and non-traditional MS4 areas; areas that drain directly into surface waters with no treatment; areas where stormwater treatment or infiltration occur via recharge basins, dry wells or leaching catch basins; and areas that drain directly to sensitive resources, such as shellfish beds and unique habitat areas. The drainage infrastructure maps would provide a tool for enhanced inter-municipal coordination relative to the MS4 stormwater management requirements.

Action 6-2: Encourage Inter-Municipal Coordination and Sharing of Resources for Street Sweeping and Stormwater System Maintenance

Improve municipal street sweeping, catch basin cleaning, and overall stormwater infrastructure maintenance programs in the watershed through inter-municipal coordination and sharing of resources, such as street sweeping and catch basin cleaning equipment. These efforts could be coordinated through the Oyster Bay/Cold Spring Harbor Protection Committee.

Action 6-3: Improve Municipal Facility Housekeeping

The watershed municipalities should review the current compliance of their respective facilities (public works/maintenance facilities, parks, schools, public safety facilities, etc.) in the watershed with pollution prevention BMPs and applicable regulatory requirements. "Good housekeeping" at municipal facilities should serve as demonstration sites for comparable private operations, many of which are also subject to stormwater pollution prevention and other similar state and federal regulatory programs (oil pollution prevention, hazardous waste, air emissions). Examples of good practices should be recognized and modeled. The Protection Committee should provide guidance (e.g., visits, group training, and/or printed materials) and develop incentives to encourage local businesses to adopt these model practices.

Action 6-4: Provide Regular Municipal Pollution Prevention Training

Municipalities should provide regular pollution prevention and good housekeeping training for all municipal employees whose activities potentially impact stormwater and water quality. The training should include municipal personnel with responsibility for public works, parks and recreation, building maintenance, marine operations, and water/wastewater. Training should be performed for employees as specified in the MS4 permit and for new hires as necessary. Municipalities should also consider periodic refresher training.

Action 6-5: Provide Training for Designers and Municipal Reviewers

Implementation of the proposed model codes and regulatory modifications described under the Sustainable Land Use and Open Space goal of this plan requires effective education and outreach to both designers (developers, architects, engineers, contractors, etc.) and reviewers (municipal land use commissions and boards, planners, etc.) of land development projects. Suggested training topics include construction erosion and sediment control and post-construction stormwater standards, LID and green infrastructure, and the NYSDEC's 5-step process for designing, reviewing, approving, and inspecting development projects of an acre or more. The NYSDEC, County Soil and Water Conservation Districts, and programs such as Nonpoint Education for Municipal Officials (NEMO) are existing or potential sources of outreach training for municipalities and designers.

Action 6-6: Require Training for Municipal Building Inspectors

Building inspectors in New York State must complete 24 hours of continuing education each year. Existing training programs typically do not address stormwater, LID, green infrastructure or erosion and sedimentation control methods. Watershed municipalities should consider establishing a required watershed-wide training program to address these topics. Additionally, training should also be required on septic system inspections, design standards for new and replacement systems, and enforcement of septic system regulations.

4 Site-Specific Project Concepts

Site-specific restoration or retrofit concepts were developed to address issues at selected sites that were identified during the watershed field inventories. These concepts meet many of the goals, objectives, and specific actions identified in previous sections of this plan. The site-specific project concepts presented in this section are intended to serve as potential on-the-ground projects for future implementation. They also provide examples of the types of projects that could be implemented at similar sites throughout the watershed. It is important to note that the concepts presented in this section are examples of potential opportunities, yet do not reflect site-specific project designs. Property owners and other affected parties are responsible for evaluating the ultimate feasibility of these and similar site-specific concepts.

Preliminary, planning-level costs were estimated for the site-specific restoration concepts presented in this section. These estimates are based upon unit costs derived from published sources and the proposed concept designs. Capital (construction, design, permitting, and contingency) and operation and maintenance costs were included in the estimates, and total annualized costs are presented in 2011 dollars based on the anticipated design life of each restoration concept. A range of likely costs is presented for each concept, reflecting the inherent uncertainty in these planning-level cost estimates. A more detailed breakdown of the cost estimates is included in *Appendix C*.

4.1 South Street Greening

South Street Greening

Objectives:	Runoff reduction Infiltration Pollutant reduction Public outreach Streetscape
Estimated Cost:	$420,000 –$ 890,000

The segment of South Street that continues north from its intersection with Audrey Avenue and East Main Street to Bay Avenue, is lined with a variety of land uses, including dense downtown commercial uses at the southern end near the intersection, residential uses along the east side, light industrial uses along the west side, and heavy industry at the northern end. The area is densely developed and highly urbanized with sparse tree canopy and high impervious cover. During large storms, the storm drainage system in parts of the downtown are overwhelmed, and stormwater runs off along the roadways in uphill (upgradient) areas to this segment of South Street, and ultimately discharging to White's Creek across from the Long Island Railroad rail yard. This mixed-use, heavily-developed area is likely a significant source of stormwater pollutant loads. Streetscape improvements have been recommended for South Street in the Town of Oyster Bay Eastern Waterfront Community Vision and Revitalization Plan.

A "green street" retrofit of South Street would address stormwater management and streetscape improvement objectives. One potential concept (*Figures 4-1 and 4-2)* consists of reducing the amount of effective impervious cover along South Street to reduce runoff volumes, pollutant loads, and peak flow rates, as well as infiltrating and treating stormwater through the use of other green infrastructure practices. This concept maintains on-street parking and integrates stormwater management and streetscape improvements using green infrastructure approaches.

Figure 4-1. South Street Green Street Retrofit Concept Plan

The proposed South Street green street retrofit concept includes the following elements.

Pervious pavement at the intersection of South Street, Audrey Avenue, and East Main Street. Pervious pavement could be installed in the intersection to reduce impervious cover and to intercept and infiltrate some of the stormwater that may bypass roadway catch basins during large storms. Pervious pavement has also been shown to treat stormwater, removing sediment, metals, and nutrients. Pavement materials that could be used include pervious asphalt and pervious concrete. Open-jointed block pavers could also be considered, but may not be appropriate given the high traffic volumes at the intersection.

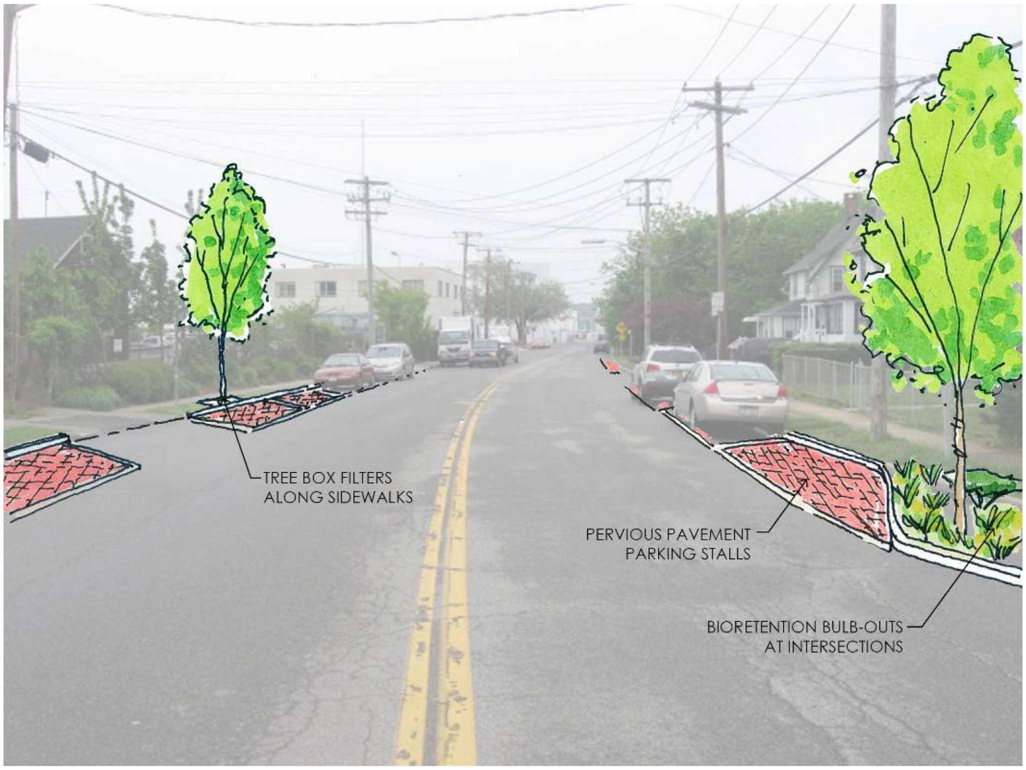


Figure 4-2. South Street Green Street Retrofit Concept Visualization

Pervious pavement in on-street parking stalls. South Street is approximately 45 feet wide with one travel lane in each direction and the remainder used for on-street parking. The outer 10-feet of roadway width between intersections could be replaced with pervious pavement, such as pervious concrete, pervious asphalt, or open-jointed block pavers. These areas would be available for parking but, unlike conventional asphalt pavement, would reduce infiltrate stormwater and reduce roadway runoff volumes and pollutant loads. *Figure 4-3* shows a typical detail of a green street parking bay.

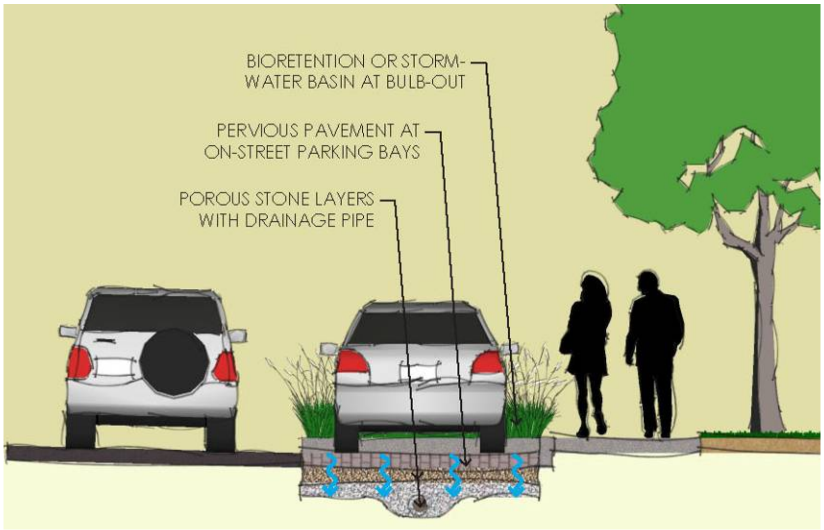


Figure 4-3. Typical Green Street Parking Bay

Bioretention bulb-outs at intersections. Near intersections, where on-street parking is discouraged to maintain site distance for turning vehicles, bioretention bulb-outs could be used to capture, treat, and infiltrate or filter stormwater from remaining impervious portions of South Street. Bulb-outs at intersections can also serve to provide traffic calming. A typical bioretention bulb-out detail is presented in *Figure 4-4*. These bioretention areas would have a soil media layer to temporarily store and treat runoff prior to infiltration into underlying soils or discharge to the storm drainage system in areas with high groundwater or poor soils. The bulb-outs could be planted with attractive, low-growing and low-maintenance native landscape plants with a mulch layer.

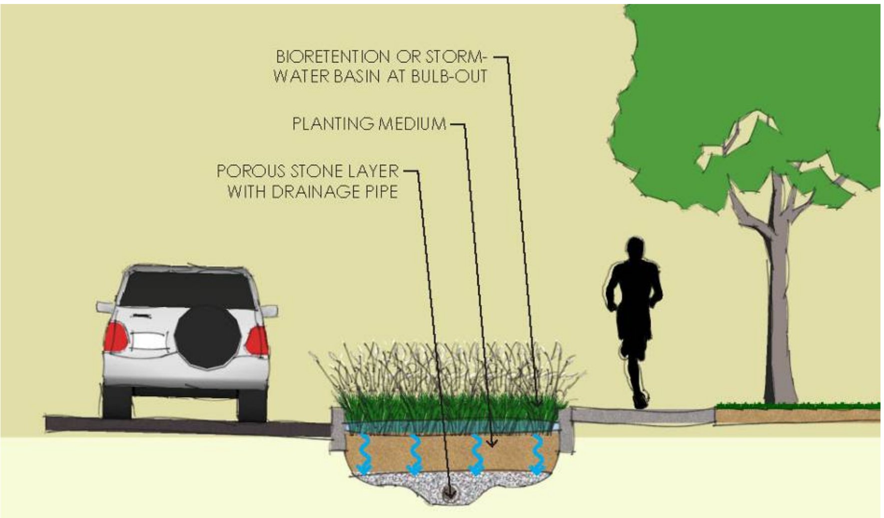


Figure 4-4. Typical Bioretention Bulb-out

Sidewalk tree box filters. Tree box filters could be installed at regular intervals along the South Street sidewalk to accommodate street trees and provide infiltration and treatment of stormwater runoff from adjacent impervious surfaces during small storms. Tree box filters are a form of bioretention, consisting of precast concrete planters with tops that install flush with the sidewalk to provide a continuous walking surface and a side inlet that replaces the curb along the street. The majority of the device is below ground and includes a soil media to support tree growth and for pollutant removal via filtration. The curb inlet allows stormwater to enter the tree box filter. Trash and debris is deposited on top of the soil media and can be removed, while stormwater is treated as it passes through the soil media. The system can be configured to infiltrate the treated stormwater depending on soil and groundwater conditions. A typical schematic of a tree box filter is shown in *Figure 4-5*.

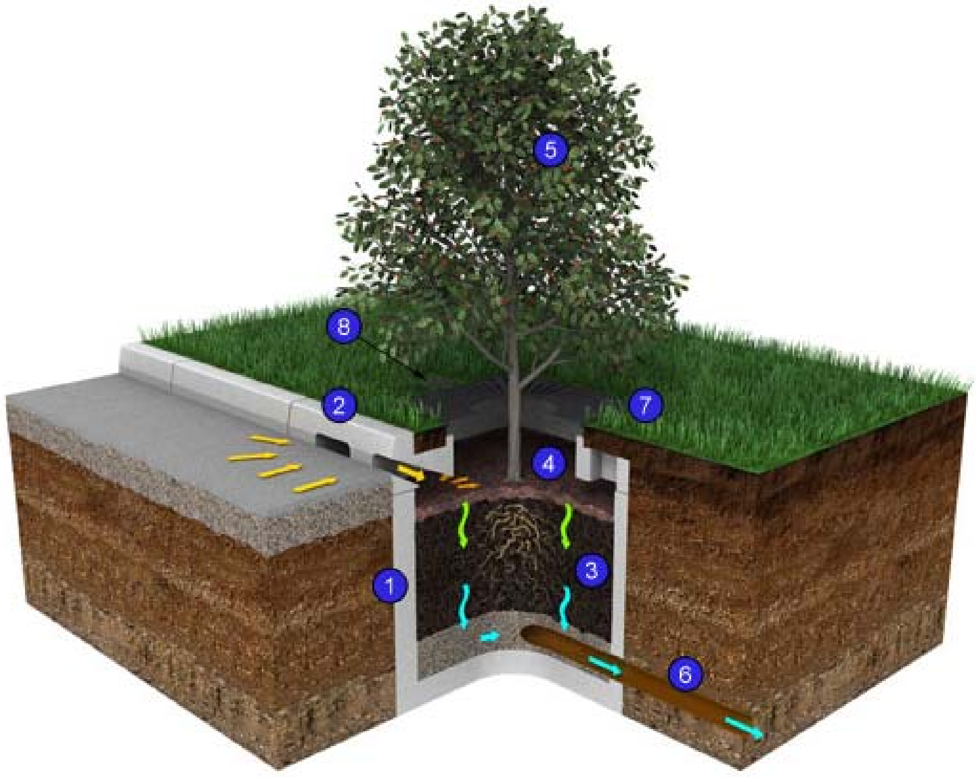


Figure 4-5. Typical Tree Box Filter (Source: Hydro International, Inc.)

4.2 Oyster Bay Railroad Museum LID Improvements

The Oyster Bay railroad station was in service for the Long Island Rail Road from 1889 to 1999, and has since been designated a New York State Landmark and has been listed in the National Register of Historic Places. The Oyster Bay Railroad Museum is working to restore the structure to house exhibits and become a feature of its facilities. The area south of the former station consists of a poorly-configured impervious area at the intersection of Maxwell, Audrey, Hamilton, and Railroad Avenues and provides parking for the adjacent residences and businesses. Two walking entrances to Theodore Roosevelt Memorial Park (Roosevelt Park) are also located in this area. These entrances formerly provided direct access to the park from the train station, but now are underused. Improvements to this area have been recommended in the Town of Oyster Bay Eastern Waterfront Community Vision and Revitalization Plan.

Oyster Bay Railroad Museum LID Improvements

Objectives:	Runoff reduction Infiltration Pollutant reduction Public outreach
Estimated Cost:	$270,000 – $570,000

Low Impact Development (LID) elements could be integrated into this area, building on the existing concept design proposed in the Eastern Waterfront Community Vision and Revitalization Plan. The proposed enhancements include reconfiguring the railroad museum plaza to formalize parking spaces and pedestrian access, while introducing tree canopy and stormwater quality controls and reducing impervious cover (*Figures 4-6 and 4-7*).

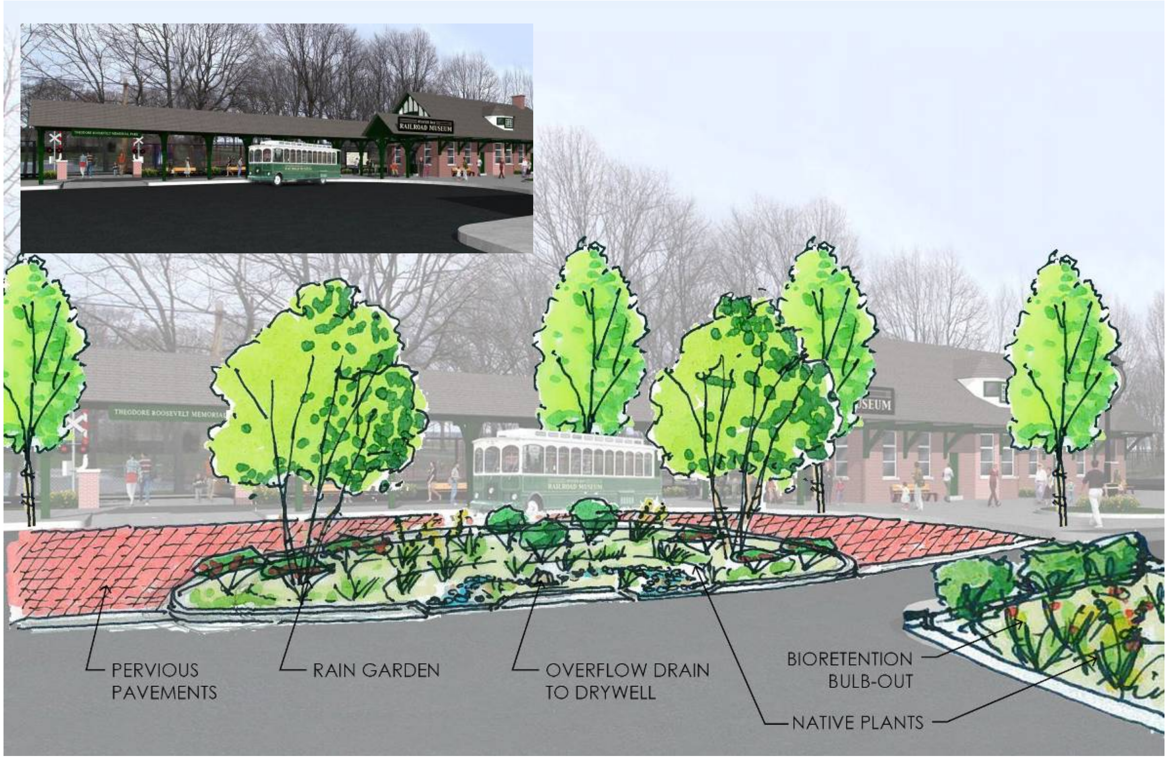


Figure 4-6. Railroad Museum Retrofit Concept Visualization

The parking spaces along the old station platform could be relocated to the south and the existing pavement removed and replaced with pervious asphalt, pervious concrete, or open-jointed block pavers. A rain garden could be incorporated into the island associated with the proposed circular trolley drop-off/turn-around area.

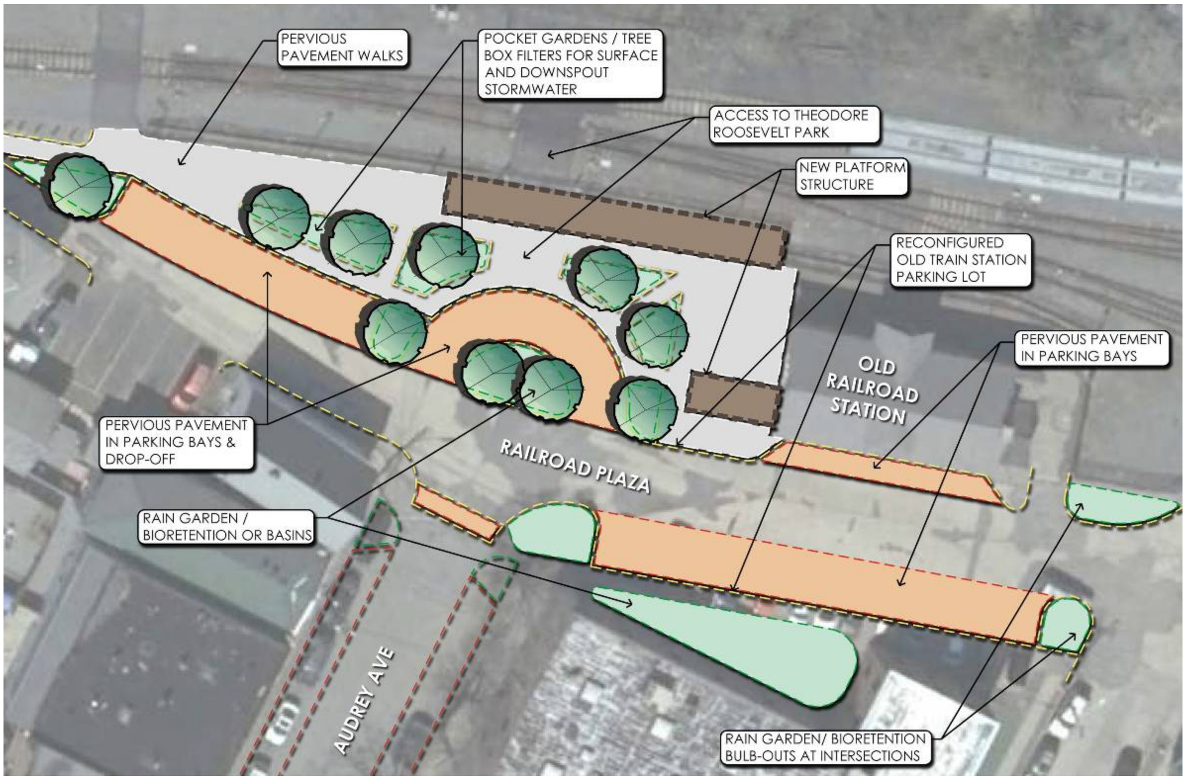


Figure 4-7. Railroad Museum Retrofit Concept Plan

Pervious materials could be used for the walkways surrounding the proposed station platform canopies. Contrasting materials could be used for these areas to represent the newer uses, such as pervious asphalt for the driving areas, and the older configurations, such as pervious concrete or open-jointed block pavers for the walkways. The walkways around the station would connect to the Roosevelt Park entrances.

The proposed enhancements could also include stormwater bulb-outs at the end of parking stalls and bioretention basins at other locations that receive runoff from adjacent roofs and other impervious surfaces. Pocket rain gardens could also be located between walking path areas to provide visual interest. These areas would serve as bioretention areas to manage stormwater and reduce pollutant loads.

4.3 Cold Spring Harbor Municipal Parking Lot LID Retrofit

The municipal parking lot located on the south side of Route 25A in the hamlet of Cold Spring Harbor (Huntington) is a potential candidate for a Low Impact Development retrofit, similar to many of the municipal parking lots in the watershed that ultimately drain to the harbor. The center rows of parking spaces are separated by a center island that consists only of painted hatching on the conventional asphalt surface of the lot. A raised island that contains a sidewalk and shade trees separates the parking lot from Route 25A.

The proposed concept would integrate LID features into the parking lot, without reconfiguring the parking layout or loss of parking spaces. The concept, shown in *Figures 4-8 and 4-9),* consists of retrofitting conventional asphalt parking bays with pervious paving materials, such as pervious concrete, asphalt, or interlocking block pavers, to reduce effective impervious cover and infiltrate stormwater.

Cold Spring Harbor Municipal Parking Lot LID Retrofit

Objectives:	Runoff reduction Infiltration Pollutant reduction Public outreach
Estimated Cost:	$310,000 – $640,000

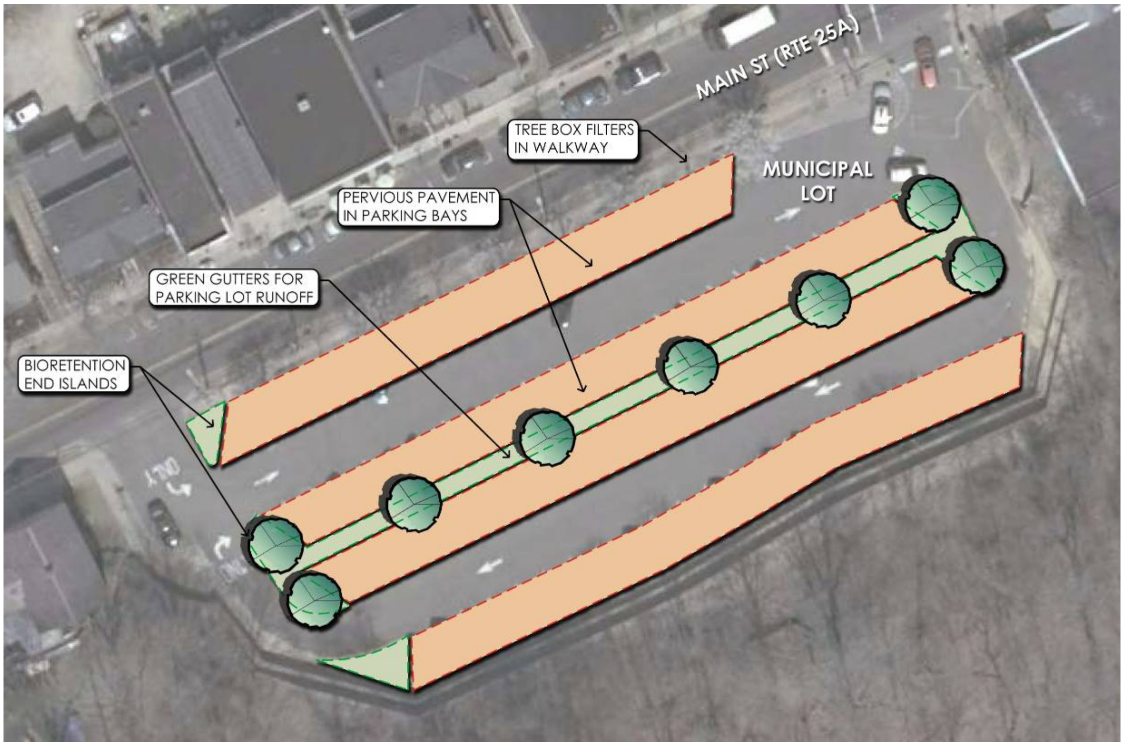


Figure 4-8. Cold Spring Harbor Municipal Lot Retrofit Concept Visualization

The existing painted center island could be converted into a green gutter, and two traffic islands on the downhill side of the parking lot (the west side) could be converted to bioretention areas to manage stormwater runoff. Trees could also be planted within these areas to increase shading of the parking lot and add to the watershed tree canopy.

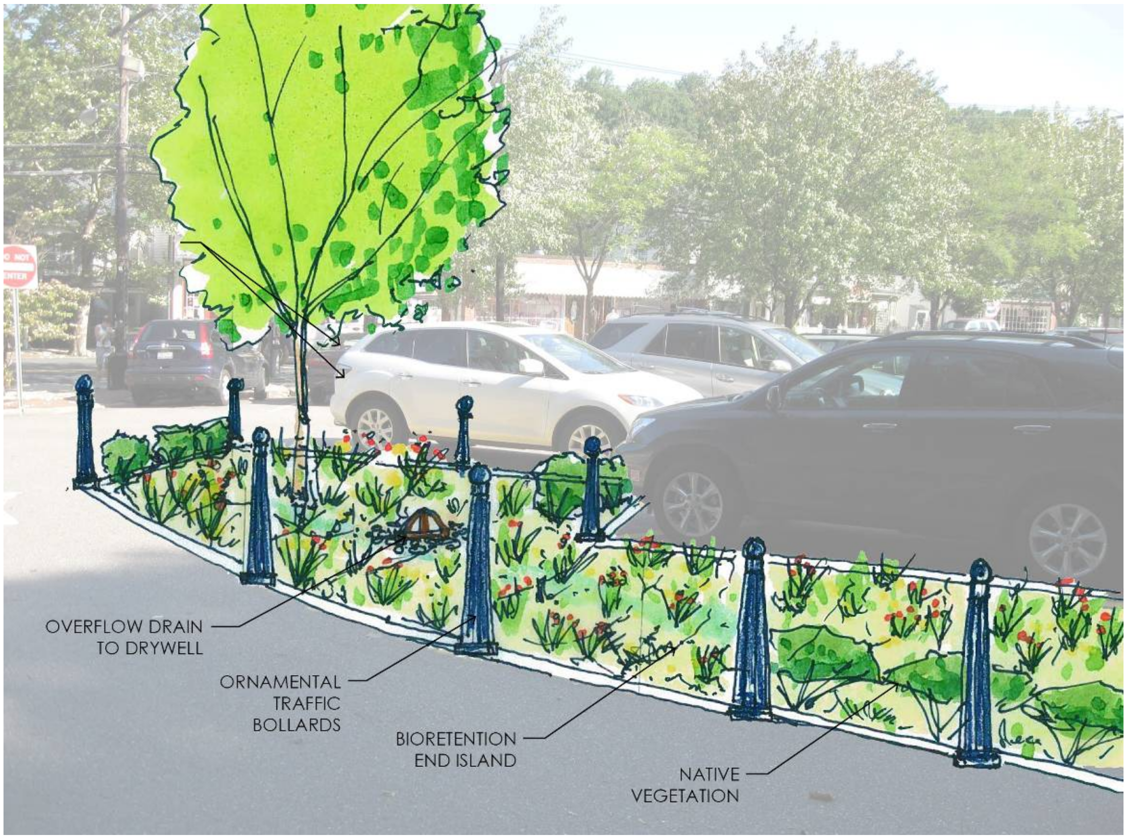


Figure 4-9. Bioretention Parking Island Concept for Cold Spring Harbor Municipal Lot

Green gutters (*Figure 4-10*) help capture and slow stormwater runoff within very narrow and shallow landscaped areas in parking lots or along a street's edge. Green gutters are designed to be very shallow with little or no water retention. The primary purpose of using green gutters is to provide a site design measure using strip of landscaping to help filter out pollutants and slow the flow of water. If underlying soils are slow-draining, an underdrain can be installed below green gutters and other bioretention areas to convey filtered stormwater to the storm drainage system.

Figure 4-10. Typical Green Gutter Cross Section

4.4 Audrey Avenue Green Street

Audrey Avenue Green Street

Objectives:	Runoff reduction Pollutant reduction Public outreach
Estimated Cost:	$770,000 – $1,600,000

The area surrounding Audrey Avenue and Shore Avenue in the Oyster Bay Hamlet is one of the busiest and most densely-developed areas in the watershed. The east-west segment of Audrey Avenue is heavily-traveled and closed every Tuesday evening during the summer for Cruise Night, a popular event where classic and unique cars are showcased. Audrey Avenue is lined with shade trees that are removed and replaced periodically to avoid interfering with the overhead utility lines along the street. This downtown district has high levels of impervious cover and on-street parking throughout. The concept developed for this area (*Figures 4-11 through 4-14*) would maintain on-street parking while reducing impervious cover and providing stormwater treatment.

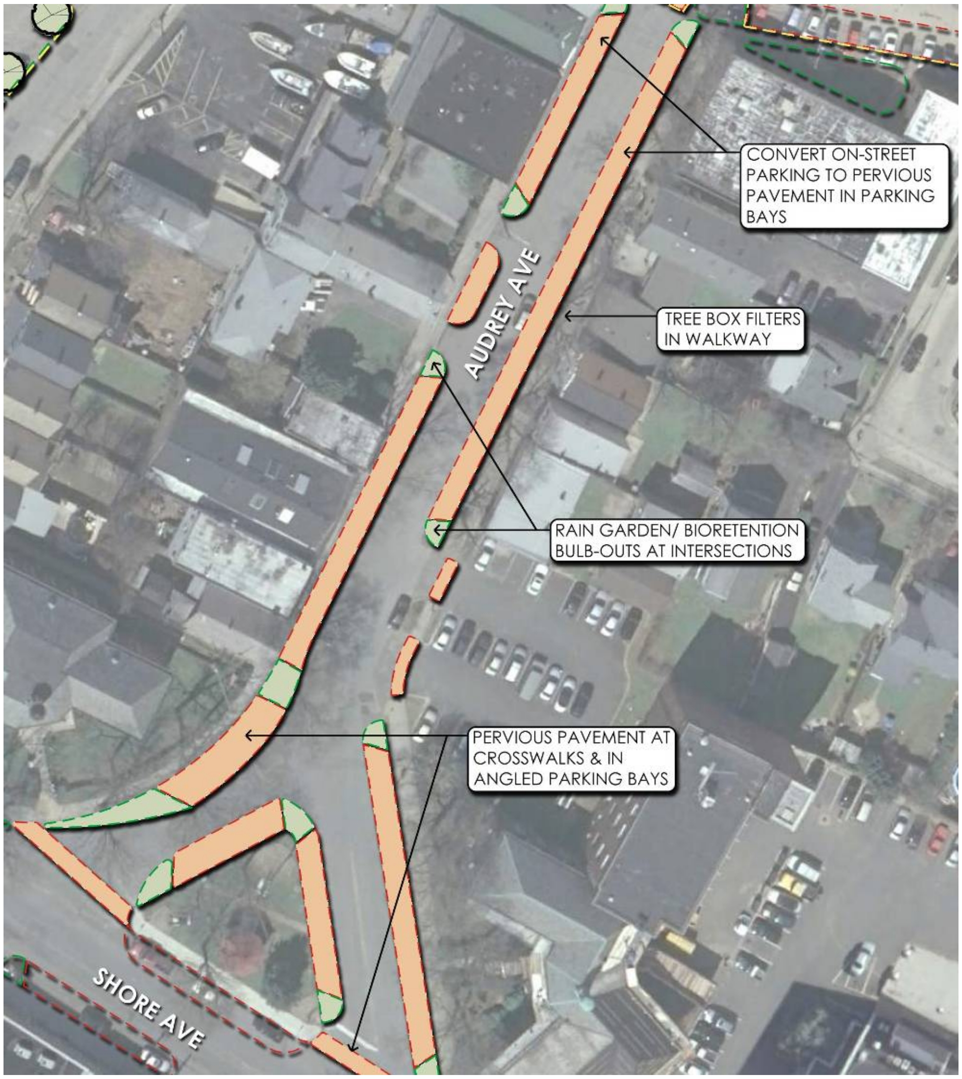


Figure 4-11. Green Street Retrofit Concept Plan for Audrey Avenue

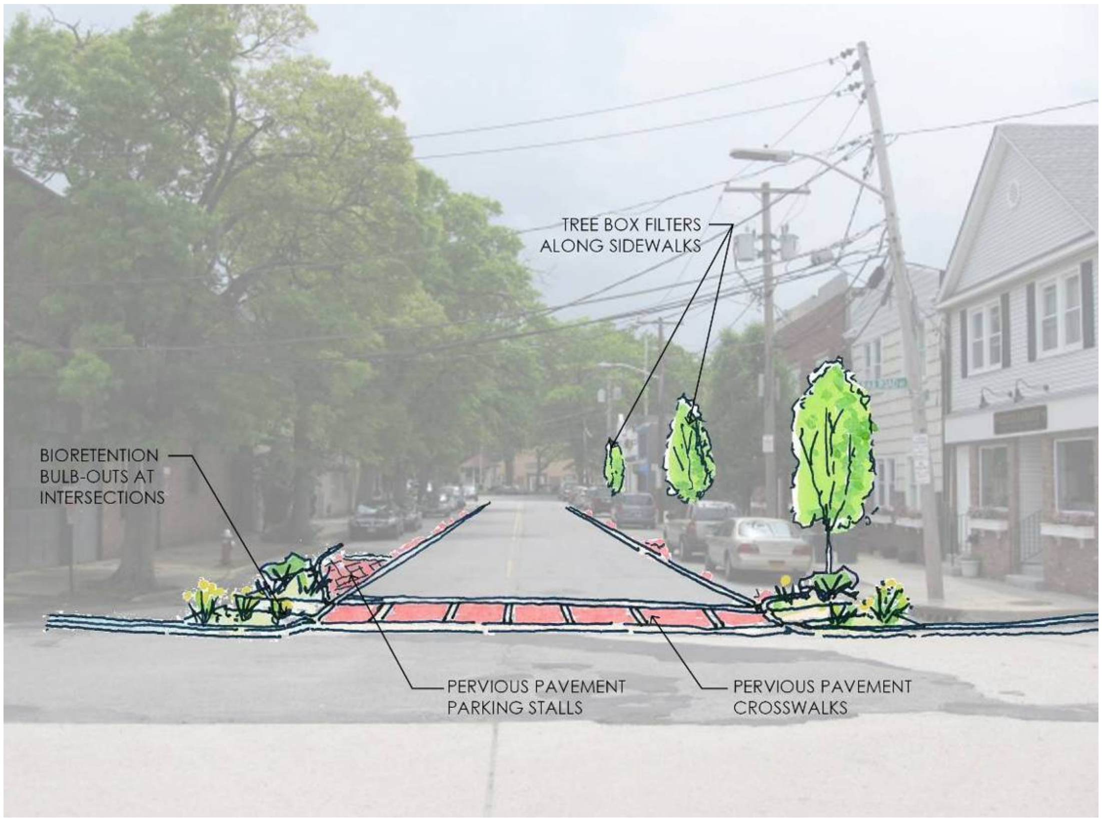


Figure 4-12. View of Proposed LID Measures on Audrey Avenue

Figure 4-13. Green Street Retrofit Concept Plan for Audrey and Shore Avenues

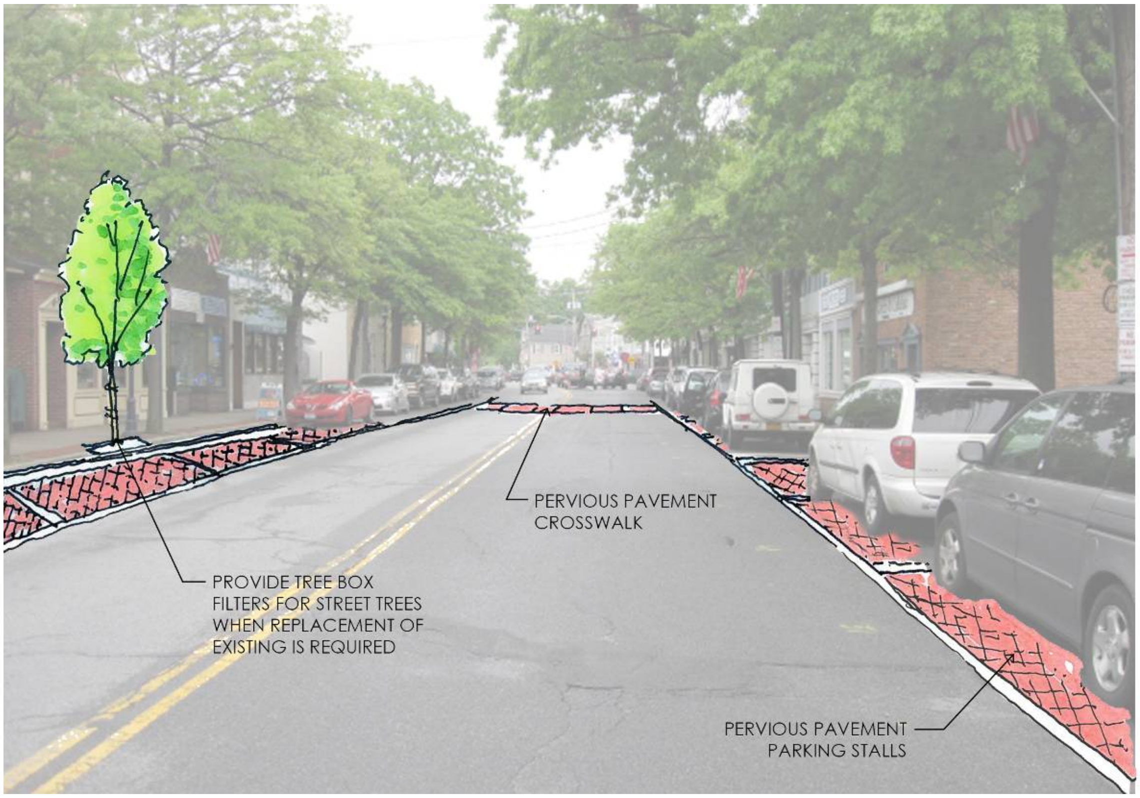


Figure 4-14. View of Proposed LID Measures along Audrey and Shore Avenues

The conventional asphalt on-street parking stalls, consisting of the ten-foot wide outer portion of the street, could be retrofitted with pervious pavement, pervious concrete, or open-jointed block pavers to reduce effective impervious cover and provide stormwater treatment. Curbside areas adjacent to intersections, which are currently marked to prohibit parking, could be converted to bioretention areas. Tree box filters could also be integrated into the sidewalk as the existing trees are replaced.

Other types of curbside LID measures (i.e., green gutters, stormwater planters, bioretention) may not be appropriate due to the heavy pedestrian traffic that occurs during special events (such as cruise night) and likely damage to the vegetation, which would require significant ongoing maintenance.

4.5 Beekman Creek Restoration

Beekman Creek Restoration

Objectives:	Stream Restoration Riparian Restoration Runoff reduction Pollutant reduction Public Access Public Outreach
Estimated Cost:	$1.2 – $2.5 million

Beekman Creek is a small tributary of the Mill River located west of West Shore Road. The headwaters of this creek are located adjacent to a driveway that serves three private residences. These headwaters include deep, well-shaded pools that support a reproducing population of native brook trout. The creek flows west, crosses below the Long Island Rail Road embankment in a large stone arch culvert and then flows east to West Shore Road. The creek then enters a culvert that carries it for the rest of its length. The culvert passes below West Shore Road, the Beekman Beach parking lot, and discharges to the Mill River. Friends of the Bay has proposed a comprehensive, phased restoration of Beekman Creek and the outflow of the Mill River. The proposed restoration plan (Shown in part in *Figure 4-15*) includes the following elements:

Phase 1 – Beekman Creek Restoration. During this phase, the Beekman Beach parking lot would be reduced in size to accommodate a new aboveground stream corridor for Beekman Creek along the railroad embankment. The project would also include an educational and public outreach component. The stream corridor would include a stream channel created from a combination of boulders, cobbles, and gravel, with deep pools at intervals for habitat and a restored riparian area to provide shading and upland habitat.

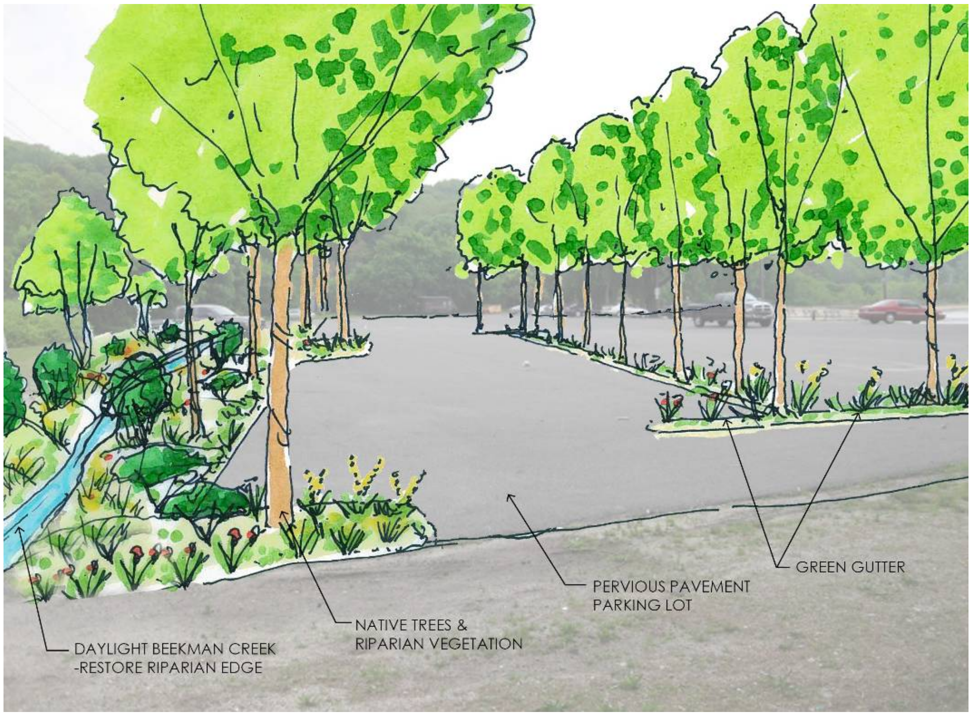


Figure 4-15. View of Proposed Beekman Creek Restoration and LID Concept

LID stormwater management measures could also be implemented in the Beekman Beach parking lot, including a combination of pervious pavement, a green gutter separating parking rows, bioretention areas at the ends of the parking rows, and a water quality swale, all to capture, treat, and infiltrate stormwater runoff. The water quality swale could be constructed as a shallow swale and include a reinforced grass paving system to allow overflow parking during special events. The swale would be separated from the lot with a removable fence. *Figure 4-16* depicts one potential concept for some of the proposed Phase 1 enhancements.

This phase of the project could also include installation of a bottomless arch culvert to convey the creek below West Shore Road to allow for fish and wildlife passage. The project could also include replacement of the private driveway culvert that connects the two headwater ponds. West Shore Road is currently being reconstructed, and stormwater from the road will be directed away from Beekman Creek and treated prior to discharge to the harbor. Phase 1 also includes the first leg of the walking trail.

These improvements would significantly expand the in-stream and riparian habitat available along this watercourse, while also reducing stormwater runoff and pollutant loads to the harbor.

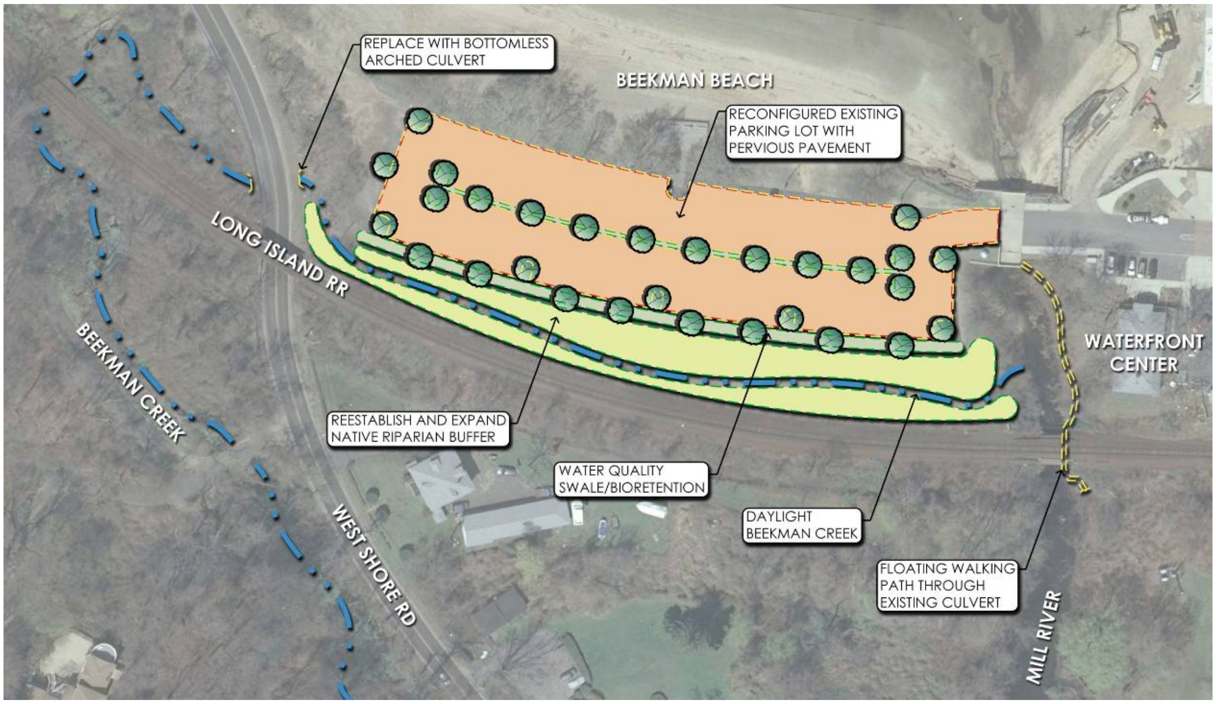


Figure 4-16. Beekman Creek Restoration Concept Plan

Phase 2 – Mill River Outflow. This phase would focus on improving conditions in the outflow from Mill Pond. A walking trail would be established along the lower Mill River that would provide access for the Waterfront Center to the grounds of the old mill and the Mill Pond Dam. The trail would cross below the railroad embankment through the existing culvert on floating platforms. The stream channel would also be improved to provide better in-stream habitat, and invasive species in the riparian area would be removed. Provisions for fish passage are proposed for Mill Pond Dam. One option is to provide a bypass channel around the entire Mill Pond that would carry a portion of Mill River, such that fish travelling up or down the river would not be impacted by warm water conditions within Mill Pond. The remnants of the old mill could also be preserved as part of the project.

Phase 3 – Mill Pond to Glen Cove Road. This final phase would focus on improvements south of Mill Pond. The trail developed during Phase 2 would be extended south to the protected Mill Pond Overlook property. Treatment would be provided for stormwater discharges to Mill River and Mill Pond, and habitat conditions in the pond and river would be improved through stream restoration, dredging of sediment that has accumulated in the pond, and improved management of water chestnut, an aquatic invasive species that has impacted the pond.

4.6 Pine Hollow Shopping Center LID Retrofits

Pine Hollow Shopping Center LID Retrofits

Objectives:	Runoff reduction Pollutant reduction Public Outreach
Estimated Cost:	$610,000 – $1,300,000

A shopping center along Route 106 was selected as a representative commercial LID retrofit that could be applied in similar commercial districts throughout the watershed. The shopping center consists of a main entrance along Route 106, north of which is a commercial shopping plaza and south of which is a chain supermarket. Stormwater runoff leaves the site through a combination of overland flow toward Route 106 and catch basins located in the parking lots. A portion of the area may drain into the recharge basin located directly to the south. Several of the catch basins may be leaching catch basins or drywells that infiltrate untreated stormwater directly into the ground. The proposed concept for this site, shown in *Figure 4-17,* incorporates LID retrofits into the limited available site without adversely impacting the commercial uses of the site. Because the site is privately-owned, implementation of the proposed retrofits would only occur at the time of future redevelopment of the site, as part of the local and county regulatory approval process, or by providing other incentive mechanisms. The proposed concept includes the following:

Tree box filters in the walkway along Route 106. Tree box filters could be installed at regular intervals to accommodate street trees and provide infiltration and treatment of stormwater runoff from adjacent impervious surfaces during small storms. The tree box filters could be oriented to receive runoff from the parking lots, Route 106, or both.

Pervious pavement in parking stalls. The existing conventional asphalt pavement within the parking stalls in the parking lots could be retrofitted with pervious pavement, pervious concrete, or open-jointed block pavers to reduce effective impervious cover and provide stormwater treatment. A typical pervious parking stall is shown in *Figure 4-18*.

Green gutters and bioretention areas along parking stalls. The thin strip between the parking rows could be converted into a green gutter, and the wider island areas at the row ends could be converted to bioretention areas for stormwater treatment and infiltration. Trees could also be planted along the strip to increase shading of the parking lot.

Figure 4-17. Retrofit Concept Plan for a Commercial Shopping Center

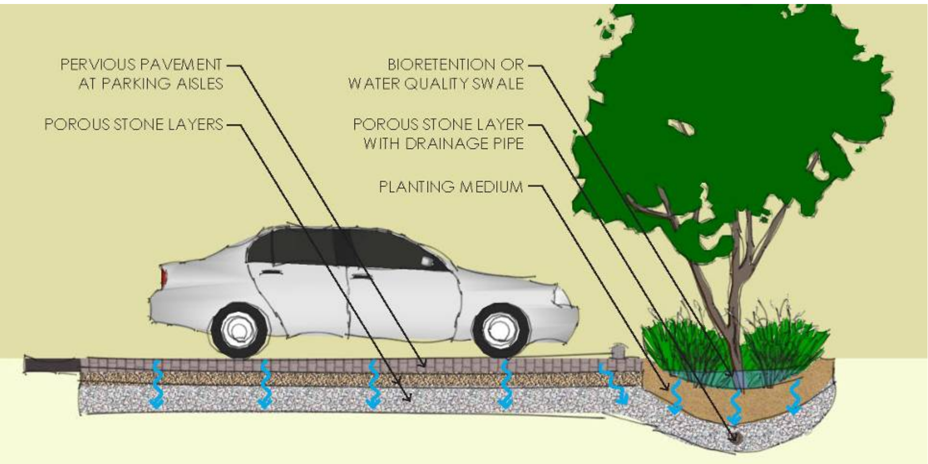


Figure 4-18. Typical Pervious Parking Row Cross Section

Water quality swale. A water quality swale could be integrated along the southern end of the supermarket parking lot to capture, treat, and infiltrate stormwater and convey overflow to the proposed bioretention areas. Water quality swales are grassed, gradually-sloping channels that convey and infiltrate stormwater.

4.7 Fireman's Field Greening

Fireman's Field Greening

Objectives:	Runoff reduction Pollutant reduction Public Outreach
Estimated Cost:	$940,000 – $2,000,000

Fireman's Field is a large paved parking lot and firefighter training area located adjacent to the current Oyster Bay Railroad Station and between Shore Avenue and Maxwell Avenue. The parking lot is lightly used except during special events. The large impervious area generates significant stormwater runoff, resulting in known drainage problems. Improvements to the area have been proposed, including better-defined parking and improved drainage and landscaping.

Figure 4-19 expands on the existing proposed concept for Fireman's Field by incorporating additional LID stormwater management measures similar to those proposed for other concepts that are described in this section.

Figure 4-19. LID Retrofit Concept for Fireman's Field

4.8 Hernan Avenue/Mill Neck Bay Marina Reuse

The former Mill Neck Bay Marina, a listed Class 2 New York State superfund site, is situated at the end of Hernan Avenue along Mill Neck Creek and adjacent to the Oyster Bay National Wildlife Refuge. Few remnants of the marina remain, and soils at the site are contaminated with copper, mercury, arsenic, zinc, lead, and organic compounds from historic site activities. Environmental remediation is necessary before redevelopment of the site can occur.

Hernan Avenue/Mill Neck Bay Marina Reuse

Objectives:	Runoff reduction Pollutant reduction Public Outreach
Estimated Cost:	$150,000 – $320,000

Figures 4-20 depicts a retrofit concept for this site and the adjacent Hernan Avenue. Future redevelopment or reuse of the site should incorporate conservation areas, wetland restoration, and LID stormwater controls. A portion of Hernan Avenue could also be retrofitted with LID stormwater management measures to capture, treat, and infiltrate roadway runoff, which currently discharges directly to Mill Neck Creek without treatment. Since Hernan Avenue is steeply-sloped, a bioretention area along the road's edge could be constructed of multiple cells separated by stone check dams. The existing stormwater outfall pipe at the end of Hernan Avenue could be retrofitted with an underground hydrodynamic separator or similar structural treatment practice.

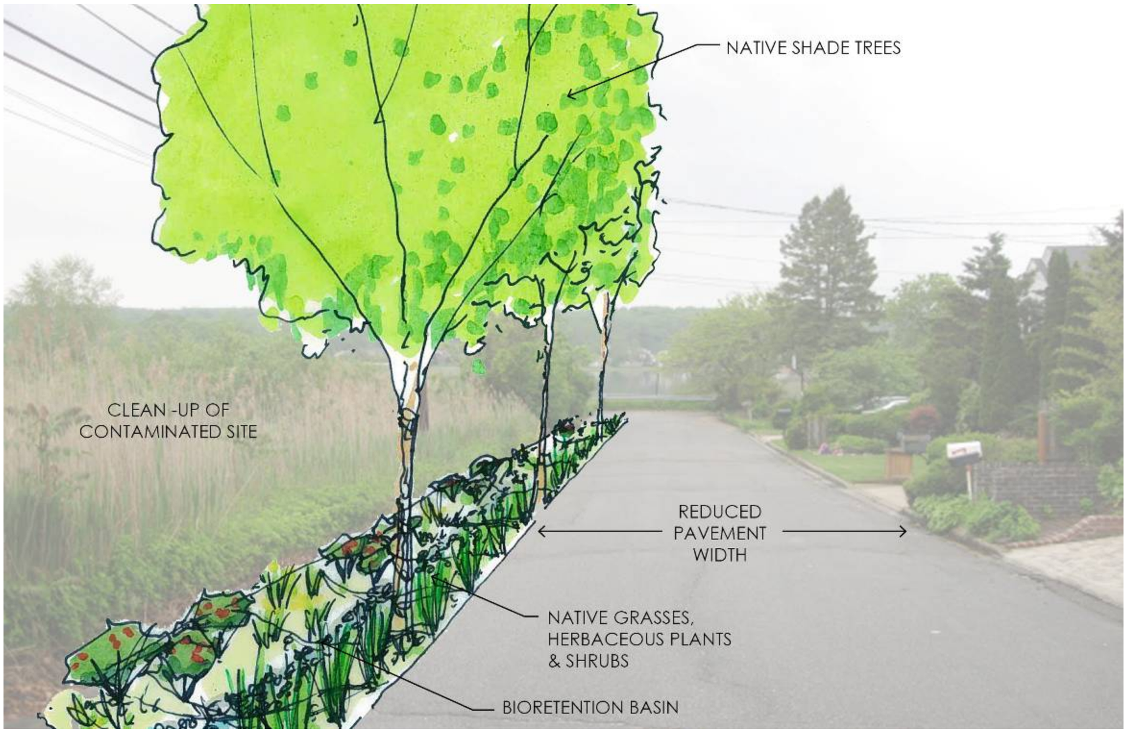


Figure 4-20. Hernan Avenue Bioretention Retrofit Concept

4.9 White's Creek Restoration

White's Creek is a tributary of Oyster Bay Harbor that flows within underground pipes for most of its length. The creek emerges from an underground culvert at Elsie Avenue in Oyster Bay Hamlet and flows in a well-shaded channel for approximately 160 feet. It then enters another culvert, passes below a driveway for a paved outdoor boat storage lot, continuing in the culvert for approximately 200 feet to its final outlet adjacent to the Commander Oil Terminal facility.

White's Creek Restoration

Objectives:	Stream Restoration Riparian Restoration Runoff reduction Pollutant reduction Public Outreach
Estimated Cost:	$860,000 – $1,850,000

The Oyster Bay Eastern Waterfront Community Vision and Revitalization Plan (Eastern Waterfront Plan) calls for converting the outdoor boat storage lot to a public parking facility with drainage improvements and a pedestrian bridge. The Plan also shows a new channel being provided for White's Creek along the north side of the parking lot, replacing the final 200-foot section of culvert. Further upstream, no remnants of the stream's former channel remain, and further daylighting would require significant adverse property impacts and expense.

Additionally, during large storms, the storm drainage system in parts of Oyster Bay Hamlet is overwhelmed, and stormwater runs off along the roadways from upgradient areas, ultimately discharging to White's Creek across from the Long Island Railroad rail yard. A small, undeveloped, triangular-shaped grassed area is located adjacent to where stormwater overflows enter White's Creek during large storms. This grassed area is part of the same parcel as the outdoor boat storage lot but separated from the lot by the creek.

A proposed concept (*Figure 4-21*) was developed to meet the goals presented in the Eastern Waterfront Plan while incorporating additional elements to include stormwater infiltration and treatment, stream restoration, and riparian buffer restoration. The proposed concept consists of the following elements:

Daylight White's Creek. The approximately 200-foot section of culvert below the parking lot driveway could be removed to its end and replaced with a restored stream channel to carry White's Creek. The channel could be created from a combination of boulders, cobbles, and gravel, with deep pools at intervals for habitat and a restored riparian area to provide shading. The existing access to the parking lot could be maintained through the use of a bridge or by maintaining a limited section of the existing culvert. Additionally, the riparian buffer surrounding the creek in the existing aboveground section next to the oil terminal could be reestablished and expanded where possible.

Bioretention for flow from South Street. The triangular grassed area at the intersection of Elsie Avenue and South Street could be converted into a bioretention basin. The existing curb along South Street could be removed to direct runoff into the bioretention basin. The basin could be designed to overflow into White's Creek during larger storms. The bioretention basin could be designed in conjunction with the other LID and green infrastructure concepts proposed along South Street.

South Street greening. As discussed previously, green street retrofits of South Street could significantly reduce stormwater runoff and pollutant load to White's Creek from South Street and upgradient areas.

Parking lot improvements. The existing parking lot could be retrofitted with pervious pavement and bioretention to capture, treat, and infiltrate stormwater. These improvements could effectively eliminate the stormwater contribution of this parking lot to White's Creek during most storms. A pedestrian walk and bridge over the daylighted White's Creek channel could also be incorporated into the design.

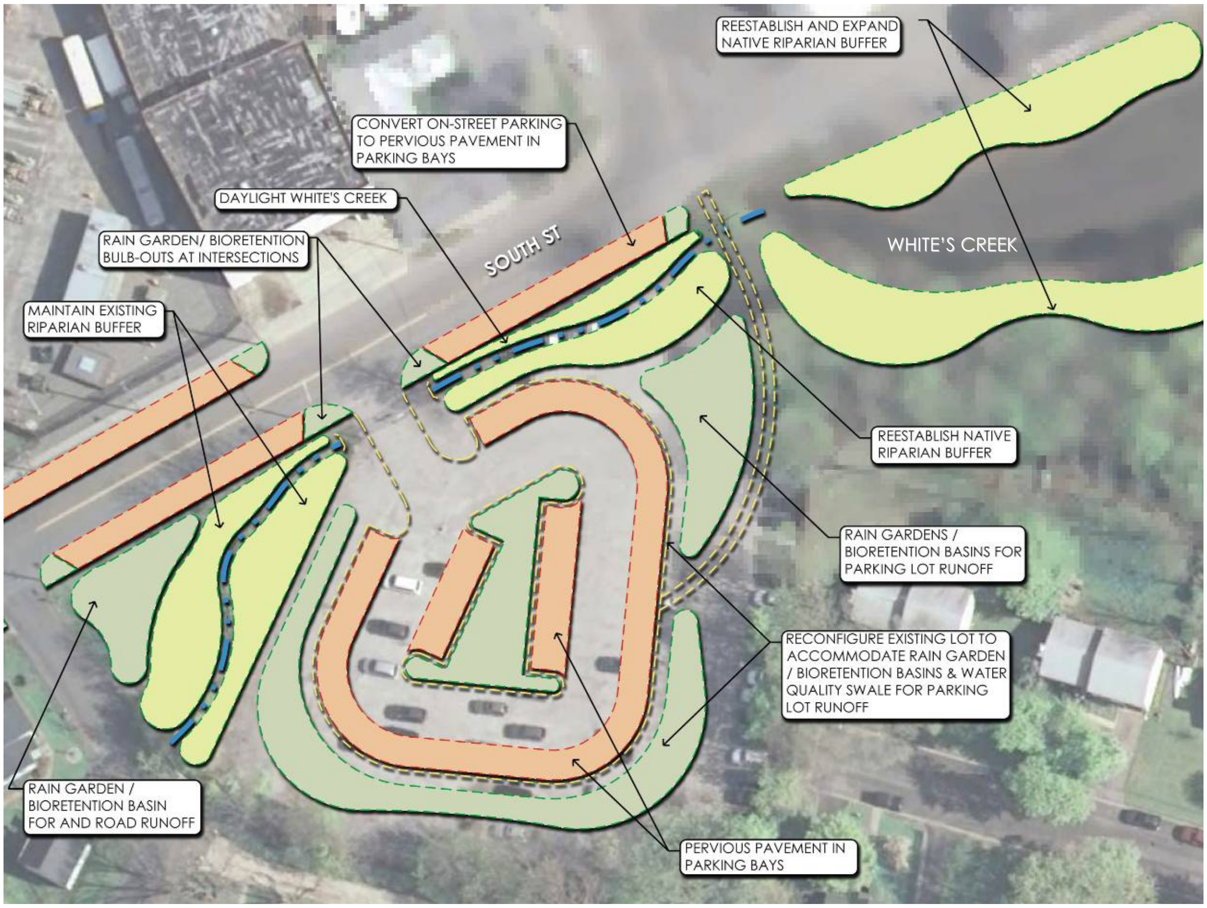


Figure 4-21. White's Creek Restoration Concept

4.10 Oyster Bay Municipal Parking Lot LID Retrofit

Oyster Bay Municipal Parking LID Retrofit

Objectives:	Runoff reduction Pollutant reduction Public Outreach
Est. Cost:	$440,000 – $950,000

The Town of Oyster Bay municipal parking lot located behind a row of buildings on the east side of South Street provides a valuable LID retrofit opportunity (*Figure 4-22*). Currently, the parking lot contains 120 parking spaces along five driving aisles and an additional 45 to 50 parking spaces around the lot's perimeter. The lot currently has parking islands at the end of the rows, which were added to better define the parking configuration. The lot has a gentle downward slope toward the west, with drainage received by two catch basins.

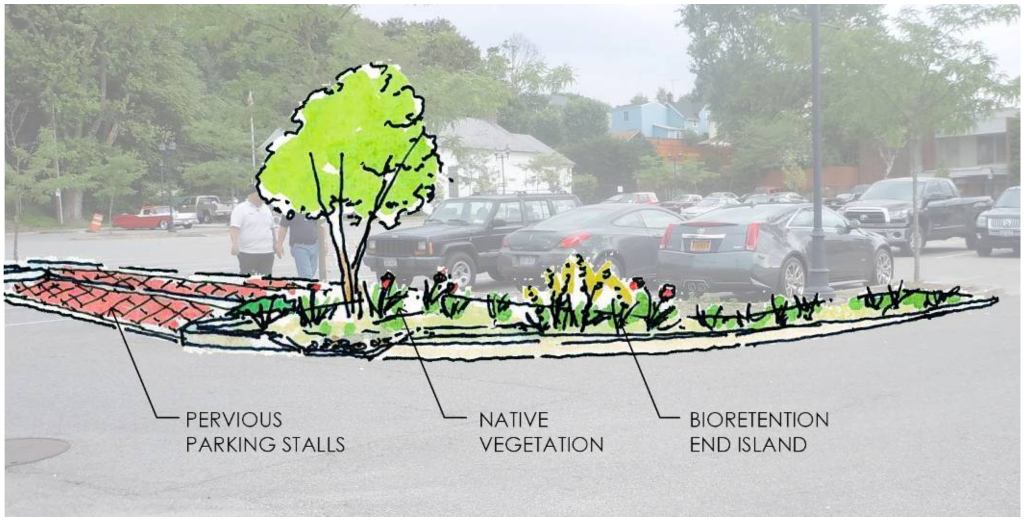


Figure 4-22. LID Retrofit Concept for Oyster Bay Municipal Parking Lot

Water has been observed flowing through the drainage system that passes through these catch basins even during dry weather, suggesting that the drainage system serves as the culvert that carries White's Creek. The parking lot is accessed by pedestrians from South Street through an alley between the Townsend Square building and a commercial building to the south. The alley is wide and consists of a traditional brick walkway. The proposed retrofit concept for this municipal lot, shown in plan view in *Figure 4-24*, includes the following elements:

Pocket gardens in the alley. Pocket gardens could be installed along the brick walkway in the alley connecting the parking lot to South Street (*Figure 4-23*). These pocket gardens would be constructed as bioretention areas, although smaller and perhaps with a more formal planting structure. The gardens would receive runoff from the surrounding walkway and roof leaders. Benches and other landscaping amenities could be included in the design. Educational signage is also recommended at this highly-visible public location, which is located adjacent to the Friends of the Bay office, which could emphasize the connection between stormwater runoff and its impact on White's Creek (flowing below the parking lot) and the estuary complex.

Figure 4-23. Proposed Pocket Gardens and Educational Signage

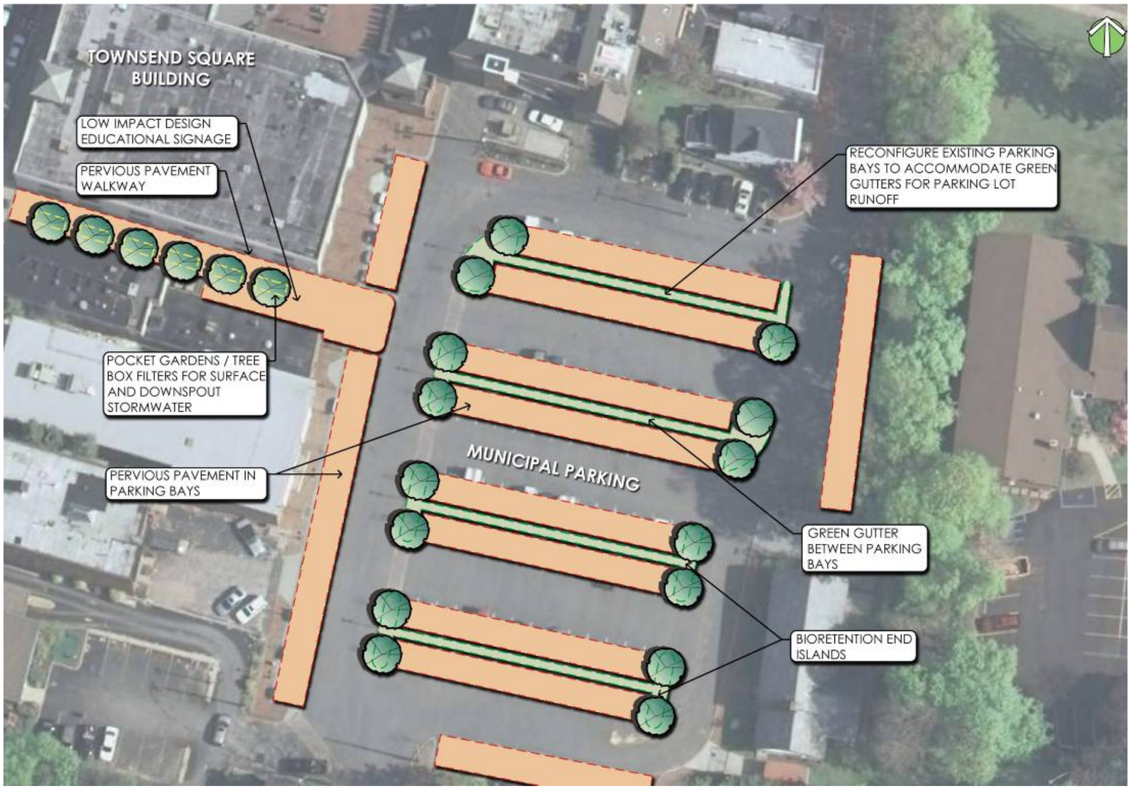


Figure 4-24. LID Retrofit Concept Plan for Oyster Bay Municipal Parking Lot

Pervious pavement in parking stalls. The existing conventional asphalt pavement within parking stalls in the parking lots could be replaced with pervious pavement, pervious concrete, or open-jointed block pavers to reduce effective impervious cover and provide stormwater treatment.

Green gutters and bioretention areas along parking stalls. A thin strip between the parking rows could be converted into a green gutter or similar stormwater planters, and the island areas at the row ends could be converted to bioretention areas for stormwater treatment and infiltration. Trees could also be planted along the green gutter strip to increase shading of the parking lot.

5 Pollutant Load Reductions

Pollutant load reductions were estimated for the watershed management plan recommendations using the Watershed Treatment Model (WTM) pollutant loading model. WTM is a planning-level spreadsheet loading model that was used in the development of the shellfish pathogen TMDL for Oyster Bay Harbor and Mill Neck Creek. WTM is also one of the models recommended by the NYSDEC to verify anticipated load reductions associated with stormwater retrofits required by the MS4 Permit Watershed Improvement Strategy.

Anticipated pollutant load reductions were modeled using WTM for the following Watershed Action Plan recommendations. Other recommended actions identified in this plan could not be quantified due to inherent limitations of WTM and/or the lack of reliable input data or information on the pollutant removal effectiveness of certain practices.

1. **Stormwater Retrofits Using Green Infrastructure/Low Impact Development.** Stormwater retrofits are recommended throughout the watershed and are required by the MS4 Permit to reduce pollutant loads to the estuary complex. Specifically, MS4 pathogen loads to portions of Oyster Bay and Cold Spring Harbor must be reduced between 20% and 95% to meet the requirements of the shellfish pathogen TMDLs that are in place for these waterbodies (NYSDEC, 2003; Battelle, 2007; NYSDEC, 2010). Green infrastructure and Low Impact Development (LID) retrofits were modeled, including bioretention and infiltration, as these are among the more effective stormwater management practices for pathogen reduction. Multiple scenarios were modeled to estimate the effect of varying levels of retrofit implementation across the watershed, including estimates for retrofitting 5%, 25%, 50%, 75%, and 100% of the watershed impervious area (excluding areas served by recharge basins).

2. **Stormwater Management Practices (SMPs) for New Development and Redevelopment.** The Watershed Action Plan promotes effective stormwater management for future development and redevelopment through land use regulatory mechanisms requiring stormwater management practices. Pollutant load reductions were estimated for implementation of stormwater management practices for all future new development and redevelopment in the watershed based on a watershed buildout scenario. The target effectiveness of the proposed stormwater controls were estimated from the *Rhode Island Stormwater Design And Installation Standards Manual* (RIDEM, 2010) as a 30% reduction in nutrients (TN and TP), an 85% reduction in TSS, a 60% reduction in bacteria, and a 25% reduction in runoff volume. The effectiveness reflects system maintenance and design inefficiencies and assumes that 80% of new development requires stormwater management practices.

3. **Riparian and Wetland Buffer Restoration.** Potential pollutant load reductions were estimated for restoration of impacted riparian and wetland buffers in the watershed. The total length of streams within each subwatershed with impacted buffers was estimated based on the vegetated or forested riparian land cover from the land cover data set described in the State of the Watershed Report. Under the modeled restoration scenario, a 100-foot vegetated riparian buffer was assumed for those areas currently with impacted buffers.

4. **Reforestation.** The Watershed Action Plan promotes preservation and enhancement of forest areas and tree canopy. Potential pollutant load reduction benefits were estimated for a watershed reforestation scenario, using the tree canopy goals presented in the State of the Watershed Report as a future target. The reforestation scenario was modeled by converting targeted parcels having institutional and municipal land use, as well as some commercial and residential land use, to forest in the future condition.

5. **Public Education.** Pet waste, lawn care, and other nonpoint source education programs can change behaviors that affect pollutant loads. Pollutant load reductions were estimated for pet waste and lawn care education programs based on the number of dwellings, average fraction of pet-owners, pet-owners who already clean up after their pets, and average fraction willing to change their behavior. Conservative model assumptions were used to avoid over-estimating the load reduction benefits of these programs.

6. **Illicit Discharge Detection and Elimination, Septic System Repairs, and Additional Sewering.** Illicit stormwater connection removal and septic system and cesspool repairs were considered in each subwatershed based on the existing estimated number of households served by septic systems and estimated numbers of illicit connections associated with commercial and residential land uses. The illicit connection removal scenario assumes that 20% of the existing illicit discharges are detected and eliminated. The septic system repair scenario assumes an 80% inspection rate and a 60% repair rate. Although these rates may seem high, the pollutant load reductions are not based on a finite time period, but rather ongoing implementation of the action plan recommendations. If, for example, codes are passed in all jurisdictions requiring inspection and compliance of septic systems at the time of sale of a property, system upgrades would be required as residential properties are sold and implementation rates may well approach these levels. In addition to the septic system repairs and upgrades throughout the watershed, the scenario also included extension of sanitary sewers to Bayville, which is believed to have high failure rates for on-site septic systems considering the high density of development and use of non-conforming cesspools.

A large portion of the watershed is served by recharge basins, which are designed to retain and infiltrate stormwater runoff from developed areas. The recharge basins effectively eliminate the contribution of stormwater runoff to the estuary complex from the areas served by the recharge basins. Therefore, the approximately 1,800 acres of the watershed currently served by recharge basins was excluded from the pollutant loading analysis and load reduction estimates.

Annual average pollutant loads of fecal coliform indicator bacteria (pathogens), total suspended solids (TSS), phosphorus (P), and nitrogen (N) and average annual runoff volume were estimated for 1) existing conditions, 2) future buildout of the watershed without the proposed watershed management recommendations, and 3) future buildout assuming implementation of the proposed watershed management recommendations described in the above scenarios. Note that the existing condition scenario and future buildout scenario (without the proposed watershed management measures) are similar since the watershed is almost completely developed.

Table 5-1 summarizes the anticipated pollutant load reductions for the Watershed Action Plan recommendations for which pollutant loads can be reasonably quantified. The load reduction estimates presented in *Table 5-1* are for the entire Oyster Bay/Cold Spring Harbor Complex watershed. Load reduction summaries by subwatershed are provided in *Appendix D*.

Table 5-1. Anticipated Annual Pollutant Load Reductions

Watershed Management Recommendation	N	P	TSS	Fecal Coliform	Runoff Volume	N	P	TSS	Fecal Coliform	Runoff Volume
	lb/yr	lb/yr	lb/yr	billion/ yr	(ac-in/ year)	%	%	%	%	%
Stormwater Retrofits										
Retrofit 5% of Impervious Area	2,723	905	127,955	44,842	567	2.9%	2.9%	1.9%	3.5%	3.3%
Retrofit 25% of Impervious Area	13,617	4,527	639,777	224,211	2,836	14.4%	14.7%	9.4%	17.3%	16.4%
Retrofit 50% of Impervious Area	27,234	9,054	1,279,555	448,422	5,672	28.9%	29.4%	18.9%	34.6%	32.8%
Retrofit 75% of Impervious Area	40,850	13,581	1,919,332	672,633	8,507	43.3%	44.1%	28.3%	52.0%	49.1%
Retrofit 100% of Impervious Area	54,467	18,108	2,559,109	896,844	11,343	57.8%	58.9%	37.7%	69.3%	65.5%
Stormwater Management Practices for New Development and Redevelopment	203	39	4,473	11,351	9	0.2%	0.1%	0.1%	0.9%	0.1%
Riparian & Wetland Buffer Restoration	795	280	46,041	8,855	134	0.8%	0.9%	0.7%	0.7%	0.8%
Reforestation	478	93	6,362	17,625	41	0.5%	0.3%	0.1%	1.4%	0.2%
Public Education	951	50	0	294	0	1.0%	0.2%	0.0%	0.0%	0.0%
IDDE/Septic System Repairs	25	14	20,949	7,776	0	0.0%	0.0%	0.3%	0.6%	0.0%
Total (with Retrofit 50% of Impervious Area Scenario)	***29,685***	***9,532***	***1,357,380***	***494,322***	***5,856***	***31.5%***	***31.0%***	***20.0%***	***38.2%***	***33.8%***

The estimated pollutant load reductions presented in *Table 5-1* represent the difference in future loads with and without the proposed watershed management controls. The total estimated pollutant load reductions are the sum of the estimated load reductions associated with each of the individual recommendations, including the stormwater retrofit scenario that assumes retrofitting of 50% of the impervious area within the contributing watershed to the estuary complex.

As indicated in *Table 5-1*, retrofitting of 50% of the impervious area in the contributing watershed with green infrastructure/LID practices, in combination with other nonpoint source controls, has the potential to reduce nitrogen and phosphorus loads by approximately 31%, total suspended solids by approximately 20%, fecal coliform by approximately 38%, and runoff volume by approximately 34%. *Table 5-2* provides a summary comparison of predicted pollutant loads and load reductions for the entire watershed, with and without implementation of the watershed management recommendations.

As shown in the pie charts in *Figures 5-1 through 5-5,* stormwater retrofits account for the majority of the anticipated pollutant load reductions for the watershed. Other watershed management recommendations are estimated to have a much smaller effect on pollutant load reductions. The effectiveness of the proposed watershed management recommendations varies by pollutant, although the largest percent reductions are predicted for total suspended solids and fecal coliform.

It is important to note that these pollutant load reductions are presented on a watershed-wide basis. The pollutant load reduction benefits of specific recommendations could be greater in more localized areas. For example, although the predicted impact of illicit discharge detection and elimination, septic system repairs, and extension of sanitary sewers to Bayville is small on a watershed-wide basis, the impact in the Mill Neck Creek subwatershed would be significantly greater, with the recommendation resulting in a predicted 6% load reduction in bacteria in this subwatershed. It should be further noted that a consistent watershed-wide septic system failure rate was used in the model, whereas systems in Bayville could be failing at a higher rate as a result of the small residential lot sizes in the Bayville area and high groundwater..

Table 5-2. Summary of Modeled Pollutant Loads and Load Reductions

Pollutant	Existing Loads	Future Loads without Controls	Future Loads with Controls	Load Reduction
Nitrogen (lb/yr)	92,766	94,246	64,561	31.5%
Phosphorus (lb/yr)	30,475	30,764	21,232	31.0%
Total Suspended Solids (lb/yr)	6,764,959	6,782,458	5,425,078	20.0%
Fecal Coliform (billion/yr)	1,237,987	1,294,292	799,970	38.2%
Runoff Volume (acre-in/year)	17,188	17,314	11,458	33.8%

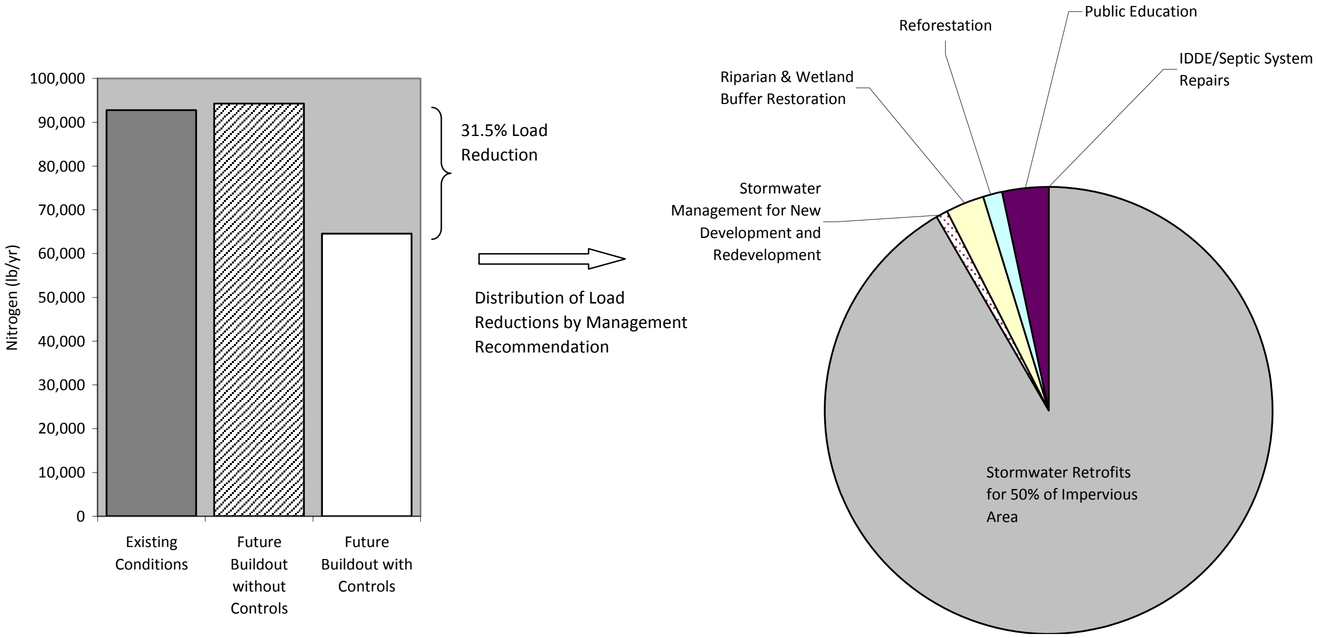


Figure 5-1. Anticipated Existing and Future Nitrogen Loads and Load Reductions

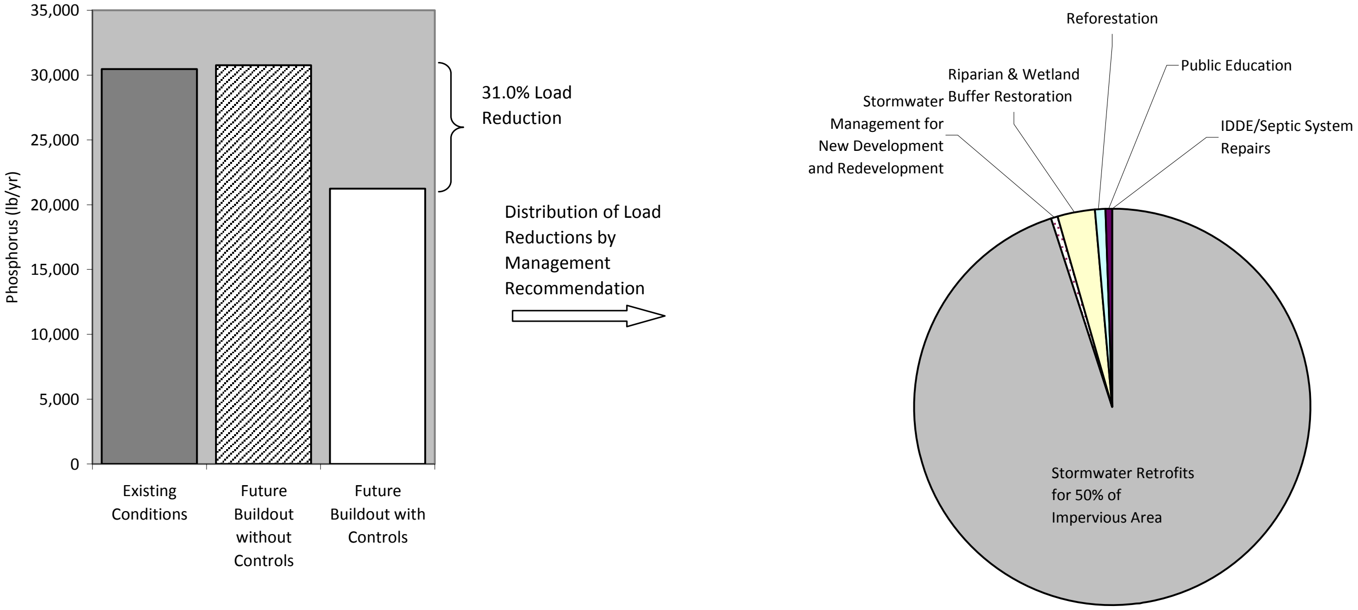


Figure 5-2. Anticipated Existing and Future Phosphorus Loads and Load Reductions

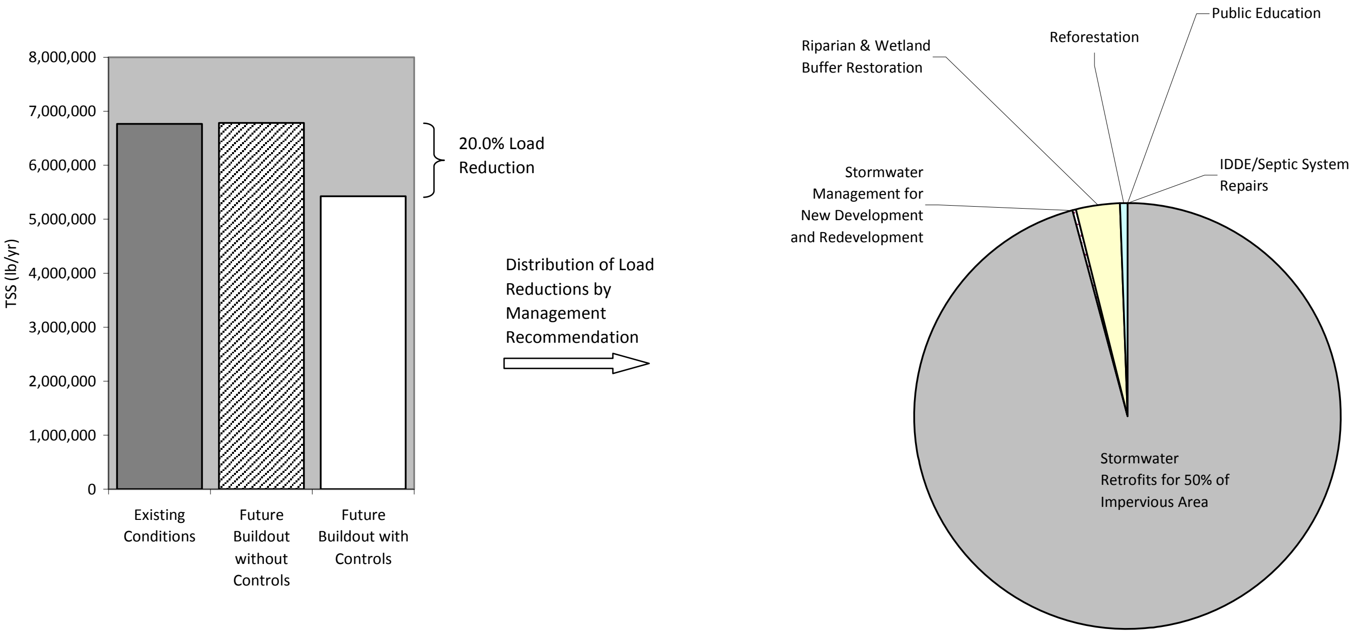


Figure 5-3. Anticipated Existing and Future Sediment (TSS) Loads and Load Reductions

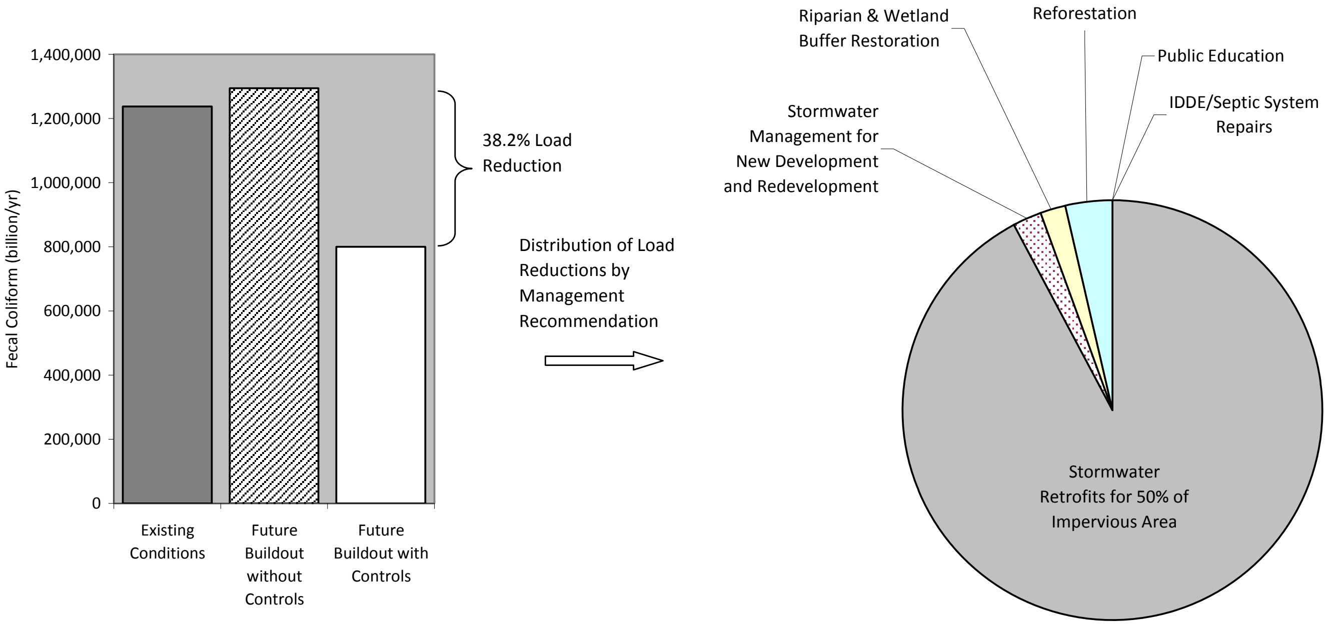


Figure 5-4. Anticipated Existing and Future Fecal Coliform Loads and Load Reductions

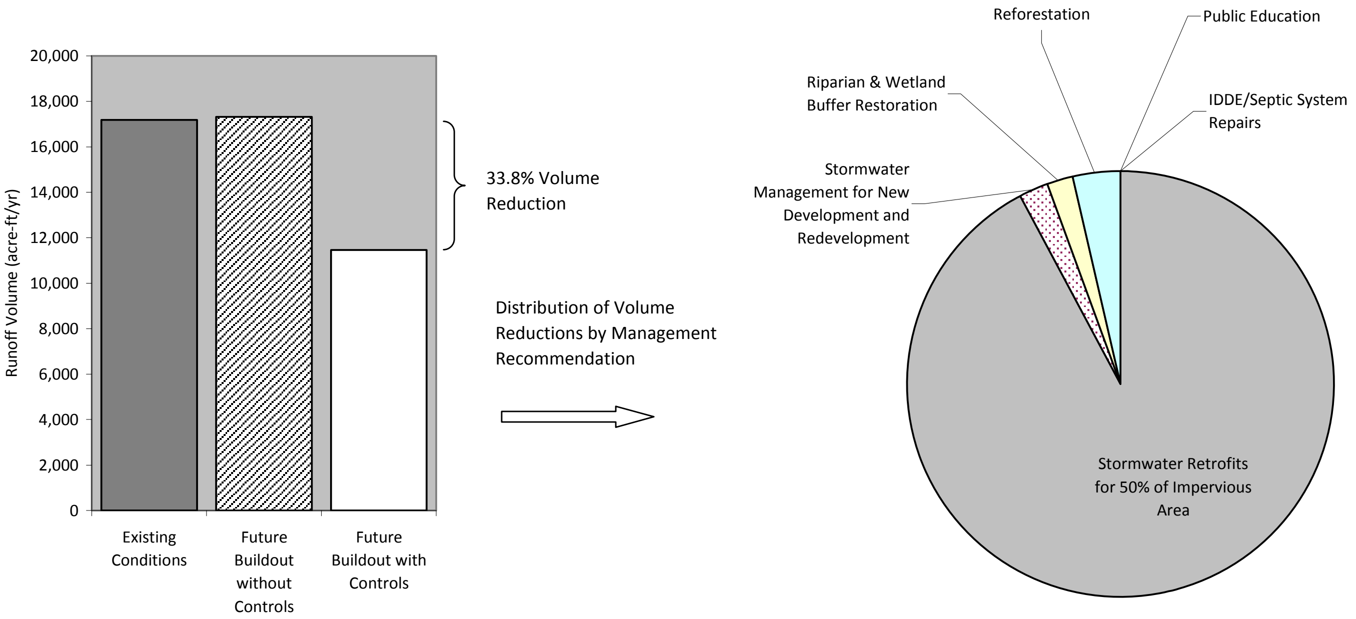


Figure 5-5. Anticipated Existing and Future Runoff Volumes and Volume Reductions

MS4 Permit Target Pathogen Reductions

The SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4 Permit) requires municipalities in the Oyster Bay/Cold Spring Harbor watershed to meet pathogen reduction targets for their regulated MS4s.

Table 5-3. Pathogen Load Reductions for Pathogen Impaired Waters

MS4 Permit Watershed	MS4 Permit Required Pollutant Load Reduction	MS4 Permit Pollutant Load Reduction Deadline	Contributing Subwatersheds (Watershed Action Plan)
Oyster Bay (Harbor 2)	20	03/09/2021	Mill Neck Creek, Center Island
Oyster Bay (Harbor 3)	90	03/09/2021	Oyster Bay Harbor, Mill River
Cold Spring Harbor, and tidal tributaries, Inner	95	09/30/2022	Cold Spring Harbor, Cold Spring Brook
Cold Spring Harbor, Eel Creek	90	09/30/2022	Cold Spring Harbor, Cold Spring Brook

The required pathogen load reductions specified in the MS4 Permit are derived from the *Pathogen Total Maximum Daily Loads for Shellfish Waters in Oyster Bay Harbor and Mill Neck Creek* (NYSDEC, 2003) and the *Final Report for Shellfish Pathogen TMDLs for 27 303(d)-listed Waters*

(Battelle, 2007). The subwatersheds identified in this Watershed Action Plan generally correspond to the MS4 Permit watersheds listed in *Table 5-3*.

Table 5-4. Comparison of MS4 Permit Required and Estimated Pathogen Load Reductions

Contributing Subwatersheds	MS4 Permit Pathogen Impaired Watershed	Required Pathogen Load Reduction	Estimated Pathogen Load Reduction (50% Retrofit)	Estimated Pathogen Load Reduction (100% Retrofit)
Mill Neck Creek	Oyster Bay (Harbor 2)	20%	43%	78%
Center Island	Oyster Bay (Harbor 2)	20%	38%	73%
Oyster Bay Harbor	Oyster Bay (Harbor 3)	90%	36%	70%
Mill River	Oyster Bay (Harbor 3)	90%	37%	68%
Cold Spring Harbor	Cold Spring Harbor, and tidal tributaries, Inner Cold Spring Harbor, Eel Creek	90 – 95%	37%	74%
Cold Spring Brook	Cold Spring Harbor, and tidal tributaries, Inner Cold Spring Harbor, Eel Creek	90 – 95%	44%	80%

Table 5-4 compares the pathogen load reductions required by the MS4 Permit and the estimated pathogen load reductions under the 50% and 100% stormwater retrofit scenarios. As indicated in the table, the predicted load reductions exceed the required 20% load reductions for Oyster Bay (Harbor 2), and in fact would meet the required load reductions under a 25% retrofit scenario. However, predicted pathogen load reductions are well below the required load reductions (90-95%) for Oyster Bay (Harbor 3) and Cold Spring Harbor.

There are several limitations to making comparisons between the required pathogen load reductions in the MS4 Permit and the estimated pathogen load reductions for the proposed watershed management recommendations, including:

- The pathogen load reductions required by the MS4 Permit are for stormwater contributions from the MS4 only (i.e., the point source or waste load allocation in the TMDL), and not from other nonpoint sources in the watershed. The planning-level drainage system mapping that was available for this study does not allow an accurate delineation of the limits of the contributing MS4 to the harbor. The predicted pathogen loads, and therefore load reductions, are based on the entire watershed area (excluding areas served by recharge basins), and are not only attributable to the MS4.

- The watershed boundaries used to generate the pollutant load estimates in the TMDLs are similar, but slightly different, than the subwatersheds delineated for this Watershed Action Plan.

- The inputs, assumptions, and parameters used in the pollutant loading models for the development of the TMDLs may differ from those used in this pollutant load modeling analysis.

- The future condition scenario for the proposed Watershed Action Plan recommendations includes modest development and redevelopment assuming future buildout of the watershed. The required load reductions derived from the TMDL do not appear to explicitly account for future increases in pollutant loads, although a required Margin of Safety is assumed.

Other pathogen reduction technologies or measures may be necessary to meet the pathogen load reductions required by the MS4 Permit. Additional use of treatment train approaches (multiple controls used in series) or design of stormwater treatment practices to meet larger water quality design storms and volumes may also be necessary. Use of a more detailed pollutant loading model such as SWMM or SUSTAIN is recommended to further evaluate anticipated pathogen load reductions under various retrofit scenarios and for different combinations of stormwater management practices.

6 Funding Sources

A variety of local, state, and federal sources are potentially available to provide funding for the implementation of this plan, in addition to potential funds contributed by local grassroots organizations and concerned citizens. *Appendix E* contains a list of potential funding sources. The table is not intended to be an exhaustive list but can be used as a starting point to seek funding opportunities for implementation of the recommendations in this Watershed Action Plan. The information presented in this plan and the associated documentation will support future grant proposals by demonstrating a comprehensive, scientifically-based approach for addressing identified concerns consistent with state and federal watershed planning guidance. The table of potential funding sources is intended to be a living document that should be updated periodically to reflect the availability of funding or changes to the funding cycle, and to include other funding entities or grant programs.

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Appendix A

State of the Watershed Report (on CD)

STATE OF THE WATERSHED REPORT

OYSTER BAY/COLD SPRING HARBOR

November 2009

Prepared For:

Friends of the Bay
Keeping the Oyster in Oyster Bay

In Association With:

Town of Oyster Bay

National Fish and Wildlife Foundation

Long Island Sound Study
A Partnership to Restore and Protect the Sound

RAUCH FOUNDATION

Prepared By:

FUSS & O'NEILL
Disciplines to Deliver

State of the Watershed Report
Oyster Bay/Cold Spring Harbor

Prepared For:

Friends of the Bay

In Association With:

Town of Oyster Bay
Oyster Bay, New York

November 2009

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2005\1349\A30

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Executive Summary

Importance of the Estuary Complex

The Oyster Bay/Cold Spring Harbor Complex (which is comprised of Oyster Bay Harbor, Cold Spring Harbor, Mill Neck Creek, and Oyster Bay) is the cleanest estuary in western Long Island Sound and is a vital ecological, economic, and recreational resource. The approximately 6,000-acre estuary, spanning approximately 40 linear miles of shoreline, is the site of one of the most economically-important shellfisheries in the State, contains a National Wildlife Refuge, State-designated Significant Coastal Fish and Wildlife Habitats, and has been identified by New York State as an Outstanding Natural Coastal Area. Moreover, the Oyster Bay/Cold Spring Harbor Complex is connected to Long Island Sound, an Estuary of National Significance. Oyster Bay is among the 30-plus areas highlighted by the Long Island Sound Study Stewardship Initiative, in New York and Connecticut, for the ecological and/or recreational values that they support.

The harbor complex watershed is an approximately 39 square-mile area located in Nassau and Suffolk Counties. Approximately 80 percent of the watershed is located within the Town of Oyster Bay and its incorporated villages and unincorporated villages and hamlets. A small portion (less than 2 percent) of the watershed is located in Glen Cove, also in Nassau County. The remaining 18 percent of the watershed is within the Town of Huntington and its incorporated villages in Suffolk County. The Oyster Bay/Cold Spring Harbor Complex watershed consists of 14 smaller subwatersheds, from which surface runoff potentially enters the estuary.

Issues Facing the Estuary and Its Watershed

The Oyster Bay/Cold Spring Harbor estuary and its watershed have been facing increasing challenges in recent years. Illegal dumping and polluted stormwater threaten water quality, development pressure is reducing the amount of open space and increasing impervious surfaces in the watershed, and man-made dams and culverts inhibit fish passage along streams. Use impairments to shellfishing, public bathing, fish consumption, habitat/hydrology, aquatic life, and recreation have been identified for parts of the harbor complex. Future uncontrolled development in the watershed will increase the quantity of stormwater runoff to Oyster Bay/Cold Spring Harbor, despite a 2003 New York State Department of Environmental Conservation (NYSDEC) report that highlighted urban runoff as the dominant source of pathogens to the estuary complex (NYSDEC, 2003).

In addition to these findings by the NYSDEC, Defenders of Wildlife announced in October 2005 that the Oyster Bay National Wildlife Refuge (NWR) made their annual list of the ten most endangered Refuges in the country. The Refuges at Risk: America's Ten Most Endangered National Wildlife Refuges 2005 report explains that the Oyster Bay NWR has become threatened by polluted stormwater runoff; habitat destruction; non-sustainable development; and human sewage associated with failing sewer infrastructure, and inadequate on-site septic systems. These human-induced impacts adversely affect the entire Oyster Bay/Cold Spring Harbor Complex.

Portions of the Oyster Bay/Cold Spring Harbor watershed are located within the Oyster Bay Special Groundwater Protection Area, designated a Critical Environmental Area by the NYSDEC. Long Island's drinking water system was designated as the nation's first Sole Source Aquifer, requiring special protection. The Oyster Bay Special Groundwater Protection Area is one of two such state-designated areas in Nassau County for the purpose of maintaining open space for aquifer recharge. Ongoing development, intensification of land use, and everyday activities within the watershed has the potential to adversely impact groundwater and public drinking water supplies.

The Oyster Bay/Cold Spring Harbor Complex is also the site of one of the most economically-important shellfisheries in the State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of the State's hard clam crop from the heart of the National Wildlife Refuge. Most of the waters of Oyster Bay are classified with the highest and best water quality determination for shellfishing – an unusual distinction given its proximity to New York City and the fact that the harbors to the west have been closed for more than 30 years. The detrimental impact of degraded water quality on shellfishing in the estuary complex is evident as Oyster Bay Harbor, Mill Neck Creek, and its tidal tributaries are among the 69 water bodies on the New York State list of impaired waters for shellfish harvesting, and the NYSDEC has decertified all shellfish harvesting areas in Mill Neck Creek and some shellfish harvesting areas in Oyster Bay. The harbor complex is also a highly productive area for marine finfish and an important wintering area for a variety of waterfowl (Cashin Associates, P.C., 2002).

> Oyster Bay/Cold Spring Harbor is one of the most productive shellfish growing areas in New York State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of the State's hard clam crop from the Oyster Bay NWR.

Why a *State of the Watershed Report*?

Friends of the Bay is a leading environmental advocate, committed to the protection of the Oyster Bay/Cold Spring Harbor estuary and its surrounding upland communities. Friends of the Bay is actively involved in water quality protection, watershed and wetlands conservation, land use planning, research, education, and community action and advocacy. Working with the Town of Oyster Bay and other governmental entities, stakeholder groups, and the general public, Friends of the Bay has prepared this *State of the Watershed Report* with two overall objectives:

1. The *State of the Watershed Report* summarizes existing environmental and land use conditions in the watershed. It is a comprehensive document that integrates many environmental indicators to assess the current health of the watershed and potential future threats. The report provides a baseline assessment of watershed conditions, which can be updated periodically to evaluate changes in the watershed and help direct watershed management planning.

2. The *State of the Watershed Report* is the first step in developing a watershed management plan for the harbor complex, following an approach endorsed by the U.S. Environmental Protection Agency and the NYSDEC for developing watershed-based plans. The *State of the Watershed Report* will serve as the basis for the development of a subsequent *Watershed Action Plan*, which will identify prioritized action items to protect and improve the ecological integrity of the estuary and surrounding watershed.

Key Findings

Water Quality

Mill Neck Creek, Cold Spring Harbor, and Oyster Bay Harbor do not meet water quality standards due to elevated levels of pathogenic organisms. Consequently, water quality issues in the harbor complex have focused on elevated pathogen levels, which impact shellfish harvesting in the estuary.

> A landmark groundbreaking occurred in April 2009 for long-awaited upgrades to sewer and water infrastructure to connect the homes in the Birches residential subdivision to the Glen Cove sewage treatment plant. This project will eliminate chronic cesspool overflows to Mill Neck Creek.

NYSDEC has developed Total Daily Maximum Loads (TMDL) for pathogens for the impaired waters in the Oyster Bay/Cold Spring Harbor complex. A TMDL determines the maximum amount or load of a pollutant from both point and non-point sources that a water body can receive and continue to meet applicable water quality standards. Several studies and water quality monitoring programs have identified likely sources of pathogens to the estuary, including:

- Wastewater treatment plants
- Domestic waste disposal using cesspools
- Stormwater discharges
- Freshwater streams
- Boats/marinas/mooring areas
- Wildlife and waterfowl

Water quality monitoring data collected by Friends of the Bay and other groups suggests that the water quality in the harbor, particularly in near-shore areas, is strongly influenced by freshwater sources and activities on the land. One location, in particular, has been identified as a significant contributor of pollutants to the harbor complex. This site is located near the outflow of Mill Pond and the Mill River, which supports a substantial population of waterfowl, and Beekman Creek, which flows under West Shore Road and the Beekman Beach parking lot and eventually discharges to the Mill River and Oyster Bay Harbor. It is suspected that the outflow of Mill Pond and the Mill River, including Beekman Creek, is contributing to elevated levels of bacteria and nutrients.

Wetlands

Freshwater and tidal wetlands provide a multitude of functions including flood and stormwater control, pollution reduction, marine food production, wildlife habitat, recreational opportunities, open space, and aesthetic value. Freshwater wetlands comprise less than 2 percent of the harbor complex watershed. The majority of these wetlands are associated with ponds along Beaver Brook, Mill River, Tiffany Creek, and Cold Spring Brook. Approximately 1,000 acres of tidal wetlands exist within the harbor complex. Extensive areas of coastal shoals, bars, and mudflats occur along Mill Neck Creek, the western and southern shoreline of Oyster Bay Harbor, Inner Cold Spring Harbor, and the northeast shoreline of Centre Island. Most of the shoreline in the harbor complex is fringed by vegetated tidal wetlands of varying width, interrupted by man-made waterfront structures.

Climate Change

Changes in climate are anticipated to occur over the next century. The magnitude of changes in temperature, sea level, and the timing and intensity of rainfall will depend upon future emissions of carbon dioxide and other greenhouse gases driving climate change. Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise of 2-6 feet (Frumhoff et al., 2007). Increases in sea level and frequency of severe storms will result in more inundation of coastal areas, and subsequent increases in shoreline erosion and wetland loss. Inundation of low-lying areas will result in the potential for saltwater to infiltrate into freshwater surface waters and aquifers. Increased flooding and erosion has the potential to negatively impact transportation infrastructure and sewage and septic systems.

> Information on the impact of climate change on Long Island is being developed through a collaborative effort led by The Nature Conservancy (TNC). The TNC Coastal Resilience project is intended to provide planners and other decision-makers with tools to assess reasonable future impacts of flooding from sea level rise and storms.

Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined affects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al., 2007).

Fish and Wildlife

Portions of the Oyster Bay/Cold Spring Harbor Complex and its watershed provide abundant and significant habitat that supports a variety of fish and wildlife. The presence of diverse fish and wildlife habitats and species is indicative of the capacity of the harbor complex and its watershed to support these natural resources, despite the developed suburban landscape that makes up a large percentage of the watershed.

Various estuarine, palustrine, riverine, and upland areas provide habitat to finfish, shellfish, mammals, amphibians, reptiles and birds. The most notable tracts of protected or preserved land (including submerged or tidal areas) within the estuary and watershed include:

- Oyster Bay National Wildlife Refuge
- Charles T. Church/Shu Swamp Nature Preserve
- Sagamore Hill National Historic Site
- Planting Fields Arboretum
- Muttontown Preserve
- Bailey Arboretum
- Stillwell Woods Park
- Tiffany Creek Preserve

Due to the importance of these habitats, the State of New York has designated some of them as Significant Coastal Fish and Wildlife Habitats (SCFWH), which provide living and feeding areas for animals and are also economically important. Three NYSDEC-designated SCFWH areas exist in the watershed: Mill Neck Creek, Cold Spring Harbor, and Oyster Bay Harbor.

The Oyster Bay National Wildlife Refuge (NWR) is a 3,200-acre refuge that is the largest in the Long Island National Wildlife Refuge Complex. Oyster Bay NWR includes the northern three-quarters of Oyster Bay Harbor, the northwestern quadrant of Cold Spring Harbor (approximately 1,000 acres), and all of Mill Neck Creek. The Oyster Bay NWR is well-sheltered from Long Island Sound and, as such, provides excellent winter habitat for a variety of water fowl and shorebirds. It also provides significant nursery and feeding habitat for finfish and substrate for shellfish (USFWS, 2009).

Water Supply

Groundwater aquifers supply drinking water to all of Long Island. Long Island's drinking water system was designated as the nation's first Sole Source Aquifer. To protect these groundwater aquifers, the state designated nine Special Groundwater Protection Areas (SGPAs), as defined in Article 55 of the NYS Environmental Conservation Law. The Oyster Bay SGPA is one of two such state-designated aquifer recharge areas in Nassau County. The Town of Oyster Bay has an Aquifer Protection Overlay District (APO) in addition to the SGPA, adopted in 2004, which affords added protection to groundwater resources.

The Town of Huntington contains portions of two SPGAs, only one of which (West Hills/Melville in the western part of the Town) is located within the Oyster Bay/Cold Spring Harbor Complex watershed. Most of the Town of Huntington's public water supply wells are located outside of SPGAs. Unlike the Town of Oyster Bay, Huntington has not enacted aquifer protection overlay district regulations.

Wastewater

Oyster Bay Hamlet and portions of the Unincorporated Villages of Upper Brookville are served by sanitary sewers that transport sanitary waste to the Oyster Bay District Sewage Treatment Plant (OBDSTP). The treatment plant is located in Oyster Bay Hamlet and discharges treated effluent to Oyster Bay Harbor east of the Mill River outlet.

The OBDSTP has been in service since 1926 and has been upgraded several times. The most recent upgrade occurred in 2006 to provide advanced treatment for nitrogen removal. Nitrogen has been identified as the primary pollutant causing low dissolved oxygen conditions, or hypoxia, occurring throughout much of Long Island Sound's bottom waters each summer. To address this water quality problem, NYSDEC imposed limits to reduce nitrogen discharged from the 12 municipal treatment plants located on the north shore of Long Island. NYSDEC issued a revised discharge permit that required the OBDSTP to reduce nitrogen discharged to Oyster Bay from the treatment plant by 63.8 percent in three 5-year increments by August 2014. The OBDSTP advanced treatment facility is achieving the 2014 nitrogen limits imposed by NYSDEC permit, and the upgrade has reduced the daily nitrogen discharged by as much as 75%.

Much of the harbor watershed is served by individual on-site sewage disposal systems, including cesspools and septic tank systems. Cesspools were the most common method of on-site sewage disposal until about 1973, when the local development regulations were modified to require the use of sanitary sewers.

In October 2008, the Oyster Bay/Cold Spring Harbor Complex was declared a federal No-Discharge Zone for vessel sewage, regulated under Section 312 of the Clean Water Act. The designation prohibits the discharge of sewage from vessels, providing an additional level of protection to address water quality issues associated with sewage contamination in marine waters.

Cesspools and septic systems are a potential source of pollution, including nitrogen, pathogens, and other contaminants, to surface waters and groundwater as a result of system failure (inadequately treating sewage or by creating potential for direct or indirect contact between sewage and the public) or malfunction (typically a slow loss of function that is difficult to detect). Since a large portion of the watershed was developed prior to 1973, failure or malfunction of cesspools and septic systems is believed to be a significant source of pollution to surface water and groundwater.

Stormwater

The stormwater collection and drainage system within the harbor complex watershed consists of drainage infrastructure operated and maintained by the watershed municipalities, including the Town of Oyster Bay, the Town of Huntington, the associated villages, and Nassau and Suffolk Counties. All of these municipal entities are regulated small Municipal Separate Storm Sewer Systems (MS4s) under the NYSDEC State Pollution Discharge Elimination System Phase II stormwater program.

Stormwater within the watershed is discharged to surface waters and to groundwater. A large portion of the watershed drains to surrounding surface waters through numerous outfalls and as overland flow.

Artificial infiltration of stormwater runoff by use of basins or sumps has been practiced on Long Island since the 1930s to recharge collected stormwater back to the groundwater system. In the 1950s, Nassau and Suffolk Counties adopted regulations requiring stormwater to be retained and infiltrated onsite. Subsequently, the use of drywells, recharge basins, and drainage reserve areas became common practice to retain and infiltrate stormwater runoff from roadways in residential, commercial, and industrial areas. Recharge basins are most prevalent in eastern Nassau County and western Suffolk County. Most of these facilities have overflow structures that direct stormwater resulting from extreme rainfall events to either other recharge basins or to drainage facilities that ultimately discharge to surface waters.

Since much of the watershed was developed prior to the adoption of stormwater quality regulatory requirements, most of the existing drainage infrastructure that does not discharge to recharge basins consists of traditional storm drains/catch basin and storm pipes that discharge directly to surface waters without treatment, other than detention to maintain peak rates of discharge. Uncontrolled stormwater runoff from impervious surfaces is a significant source of potential impacts to surface waters within the harbor complex watershed, groundwater supplies, and the water quality of the harbor complex itself.

Through their Phase II stormwater management programs and other planning initiatives, the watershed municipal entities, including Nassau and Suffolk Counties, have developed and implemented a variety of Best Management Practices to address stormwater quality and quantity issues associated with land development and redevelopment projects. The municipalities have also begun to address historical development and nonpoint source pollution impacts in the watershed by identifying potential sites for stormwater retrofits. However, stormwater runoff continues to be a significant threat to the water quality and overall health of the Oyster Bay/Cold Spring Harbor Complex and its watershed.

Impervious Cover

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology. Research has also demonstrated similar effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases. Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. These research findings have been integrated into a general watershed planning model known as the Impervious Cover Model (ICM) (CWP, 2003).

Based on a GIS impervious cover analysis, the overall imperviousness of the harbor complex watershed is estimated at approximately 12.3%, which slightly exceeds the 10% threshold in the ICM where ecological stress and stream impacts become apparent. Impervious cover is generally highest (30% to 70%) in the urbanized areas of Oyster Bay Hamlet and the Villages of Glen Cove, Bayville, Locust Valley, West Hills and the southern portion of Woodbury. Impervious cover in most of the residential areas of the watershed generally ranges from less than 10 percent up to 30%.

Most of the subwatersheds fall into the “impacted” category (impervious cover between 10 and 25%) according to the ICM. Several of the subwatersheds have significantly less than 10% impervious cover, including the Bailey Arboretum and Lloyd Neck subwatersheds. The White's Creek subwatershed has the highest impervious cover (43.3%), which is consistent with the high-density development in Oyster Bay Hamlet and indicative of degraded stream conditions according to the ICM.

Under a watershed buildout scenario, the impervious cover in the overall harbor complex watershed is predicted to increase from 12.3% to 13.6%, but remain well below the ICM non-supporting threshold of 25%. The Cold Spring Harbor and Tiffany Creek subwatersheds are predicted to increase from slightly less than 10% impervious cover to meet or slightly exceed the 10% threshold where ecological impacts become apparent. The largest relative change in impervious cover is predicted in the Oyster Bay Harbor subwatershed, where imperviousness could increase from approximately 14.1% to 17.6%.

Pollutant Loads

A pollutant loading model was used to compare existing nonpoint source pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario.

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario, including the Tiffany Creek, Mill River, Oyster Bay Harbor, and Kentuck Brook subwatersheds. The buildout conditions of the Mill River and Oyster Bay Harbor subwatersheds are projected to result in greater than 5% increase in pollutant loading rates for nitrogen, phosphorus and sediment loads. The projected increase in future pollutant loads is relatively small across the watershed because much of the watershed is already developed or consists of protected open space.

Restoration Potential

A comparative subwatershed analysis was performed for the Oyster Bay/Cold Spring Harbor subwatersheds to identify the subwatersheds with the greatest restoration potential. Subsequent field assessments were performed in priority subwatersheds to evaluate potential pollutant sources and environmental problems, as well as possible locations where restoration opportunities and mitigation measures can be implemented. The findings of these and other recent assessments identified a number of key findings and common issues throughout the watershed, including:

- Overall in-stream habitat in the assessed reaches was mixed, although many of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities.

- Many potential barriers to fish passage were observed throughout the watershed. The impacts of these obstructions on fish passage and the feasibility of fish barrier removal efforts in the harbor complex watershed are currently being investigated through a study led by the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay.

- Segments of some streams in the watershed are buried in underground conduits, providing potential opportunities for daylighting and stream restoration to enhance aquatic and wildlife habitat, improve aesthetics, and provide educational opportunities.

- Stream buffer encroachments are prevalent along stream corridors in or near areas of residential, commercial, and industrial development and roads. Education, signage, stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.

- Residential roofs appear to contribute significant quantities of stormwater runoff to the storm drainage system. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system through the use of rain barrels or rain gardens.

- Lawn-care maintenance practices in residential areas are typically high. Opportunities exist to educate the public about the impacts of lawn care practices on the water quality of the harbor complex and to encourage the use of residential lawn care best management practices.

- Most of the development in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond water quality inlets and detention basins for peak flow control. Parking lots associated with existing commercial development, municipal and institutional land uses, and commuter parking areas are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use Low Impact Development (LID) and green infrastructure retrofits.

- Opportunities exist for stormwater retrofits at roadway stormwater outfalls throughout the watershed. Opportunities also exist for incorporating LID practices into existing roadway upgrades and retrofit projects (i.e., "green streets") to promote stormwater infiltration, streetscape improvements, and traffic calming.

- Relatively isolated areas of moderate to severe streambank erosion were observed along Beaver Brook, Mill River, Cold Spring Brook, Tiffany Brook, and White's Creek, providing opportunities for bank stabilization projects.

- Hotspot land uses and facilities, including several commercial shopping centers, the Town of Oyster Bay highway yard, the LIRR Maintenance Yard, Commander Oil Terminal, and municipal parking lots, discharge stormwater directly to receiving waters with no treatment or attenuation. Opportunities exist for improved pollution prevention and source controls at these facilities.

Looking Ahead

Over the next several months, Friends of the Bay will build upon the findings of the *State of the Watershed Report* to begin the next phase of the watershed planning process, which is to develop a *Watershed Action Plan* for the Oyster Bay/Cold Spring Harbor estuary. Specific tasks include:

- Form a steering committee to guide the development of the *Watershed Action Plan*.

- Work with the steering committee to reach consensus on the specific goals and objectives of the *Watershed Action Plan*.

- Identify and evaluate alternative strategies to address the watershed management goals and objectives, including source controls, public education, regulatory controls, and structural controls.

- Develop a *Watershed Action Plan* for the harbor complex. The plan will be developed consistent with EPA and NYSDEC guidance for the development of watershed-based plans, which includes nine key elements that establish the structure of the plan. These nine elements include specific goals, objectives, and strategies to protect and restore water quality; methods to build and strengthen working partnerships; a dual focus on addressing existing problems and preventing new ones; a strategy for implementing the plan; and a feedback loop to evaluate progress and revise the plan as necessary. Following this approach will enable implementation projects under this plan to be considered for funding under Section 319 of the Clean Water Act.

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1 Introduction

Friends of the Bay has retained Fuss & O'Neill, Inc. to prepare a watershed management plan for the Oyster Bay/Cold Spring Harbor estuary and surrounding watershed. The watershed management plan is being developed in cooperation with Friends of the Bay, the Town of Oyster Bay, and other governmental entities, stakeholder groups, and the general public. The watershed management plan for Oyster Bay/Cold Spring Harbor will be developed in two phases – a *State of the Watershed Report* and a *Watershed Action Plan* – following an approach endorsed by the U.S. Environmental Protection Agency for developing watershed-based plans. The *State of the Watershed Report*, which is the subject of this document, summarizes existing environmental and land use conditions in the watershed. The subsequent *Watershed Action Plan* will identify prioritized action items to protect and improve the ecological integrity of the estuary and surrounding watershed.

1.1 Background

The Oyster Bay/Cold Spring Harbor Complex (which is comprised of Oyster Bay Harbor, Cold Spring Harbor, Mill Neck Creek, and Oyster Bay) is the cleanest estuary in western Long Island Sound and is a vital ecological, economic, and recreational resource. The approximately 6,000-acre estuary is the site of one of the most economically-important shellfisheries in the State, contains a National Wildlife Refuge, State-designated Significant Coastal Fish and Wildlife Habitats, and has been identified by New York State as an Outstanding Natural Coastal Area. Moreover, the Oyster Bay/Cold Spring Harbor Complex is connected to Long Island Sound, an Estuary of National Significance. Oyster Bay is among the 30-plus areas highlighted by the Long Island Sound Study Stewardship Initiative, in New York and Connecticut, for the ecological and/or recreational values that they support.

Despite its close proximity to New York City and the more densely developed surrounding areas of western Long Island, much of the Oyster Bay/Cold Spring Harbor Complex watershed consists of low density residential development, recreational facilities, and open space. The Village of Bayville and the hamlets of Oyster Bay, East Norwich, and Cold Spring Harbor have areas of higher density residential development, while commercial and industrial facilities are concentrated in Oyster Bay hamlet, Bayville, and on the eastern shore of Cold Spring Harbor. Waterfront land uses include existing and former operations of the Jakobsen Shipyard, the Oyster Bay Sewage Treatment Plant, and the Commander and Mobil Oil terminals, as well as public recreational facilities and residential waterfront properties (Cashin Associates, P.C., 2002).

The Oyster Bay/Cold Spring Harbor watershed has been facing increasing challenges in recent years. Illegal dumping and polluted stormwater threaten water quality, development pressure is reducing the amount of open space and increasing impervious surfaces in the watershed, and man-made dams and culverts inhibit fish passage along streams. Use impairments to shellfishing, public bathing, fish consumption, habitat/hydrology, aquatic life, and recreation have been identified for parts of the harbor complex. Future uncontrolled development in the watershed will increase the quantity of stormwater runoff to Oyster Bay/Cold Spring Harbor, despite a 2003 New York State Department of Environmental Conservation (NYSDEC) report that highlighted urban runoff as the dominant source of pathogens to the estuary complex (Pathogen Total Maximum Daily Loads for Shellfish Waters in Oyster Bay Harbor and Mill Neck Creek, Nassau County, New York, September 2003).

In addition to these findings by the NYSDEC, Defenders of Wildlife announced in October 2005 that the Oyster Bay National Wildlife Refuge (NWR) made their annual list of the ten most endangered Refuges in the country. The *Refuges at Risk: America's Ten Most Endangered National Wildlife Refuges 2005* report explains that the Oyster Bay NWR has become threatened by polluted stormwater runoff; habitat destruction; non-sustainable development; and human sewage associated with failing sewer infrastructure, and inadequate on-site septic systems. These human-induced impacts adversely affect the entire Oyster Bay/Cold Spring Harbor Complex.

Portions of the Oyster Bay/Cold Spring Harbor watershed are located within the Oyster Bay Special Groundwater Protection Area, designated a Critical Environmental Area by NYSDEC. Long Island's drinking water system was designated as the nation's first Sole Source Aquifer, requiring special protection. The Oyster Bay Special Groundwater Protection Area is one of two such state-designated areas in Nassau County for the purpose of maintaining open space for aquifer recharge. Ongoing development, intensification of land use, and everyday activities within the watershed has the potential to adversely impact groundwater and public drinking water supplies.

The Oyster Bay/Cold Spring Harbor Complex is also the site of one of the most economically-important shellfisheries in the State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of the State's hard clam crop from the heart of the National Wildlife Refuge. Most of the waters of Oyster Bay are classified SA, the highest and best water quality determination for shellfishing – an unusual distinction given its proximity to New York City and the fact that the harbors to the west have been closed for more than 30 years. The detrimental impact of degraded water quality on shellfishing in the estuary complex is evident as Oyster Bay Harbor, Mill Neck Creek, and its tidal tributaries are among the 69 water bodies on the New York State list of impaired waters for shellfish harvesting, and the NYSDEC has decertified all shellfish harvesting areas in Mill Neck Creek and some shellfish harvesting areas in Oyster Bay. The harbor complex is also a highly productive area for marine finfish and an important wintering area for a variety of waterfowl (Cashin Associates, P.C., 2002).

1.2 Development of the Report

The following tasks were completed in developing this *State of the Watershed Report* for the Oyster Bay/Cold Spring Harbor Complex:

- Reviewed existing data, studies, and reports on the Oyster Bay/Cold Spring Harbor Complex and its watershed.
- Compiled and analyzed available Geographic Information System (GIS) data.
- Consulted with the Friends of the Bay, the Town of Oyster Bay and Town of Huntington, local villages and hamlets, and state agencies regarding available land use information, mapping, and land use planning regulations.

- Identified and delineated subwatersheds within the overall harbor complex watershed.
- Conducted a comparative subwatershed analysis to prioritize watershed field inventories and management plan recommendations.
- Reviewed existing land use regulatory controls.

This report documents current watershed conditions for the following topics:

- Historical and social perspective (Section 3).
- Natural resources including geology and soils, topography, hydrology, wetlands and watercourses, and fish and wildlife resources (Section 4).
- Water quality including classifications and trends based on available monitoring data (Section 5).
- Watershed modifications including dams, water supply, wastewater discharges, and regulated sites (Section 6).
- Land use and land cover (Section 7).
- Pollutant loading (Section 8).

In addition, the results of a comparative subwatershed analysis (Section 9), watershed field inventories (Section 10), and land use regulatory review (Section 11) are also presented.

1.3 Prior Watershed Studies and Planning Documents

The Oyster Bay/Cold Spring Harbor Complex has long been recognized as a unique and highly valued ecological, economic, and recreational resource by the local residents, visitors, and all levels of government. As a result, a large number of prior watershed studies and related land use planning efforts have been undertaken by the watershed municipalities, Nassau County, NYSDEC, Friends of the Bay, and other agencies and stakeholder groups. This State of the Watershed Report incorporates and builds upon the extensive information available from these previous studies and reports to document current conditions and trends in the Oyster Bay/Cold Spring Harbor Complex. The following watershed-related studies have been completed for the harbor complex.

- Oyster Bay Mill Pond Dam Fish Passage Assessment Project, Oyster Bay-Cold Spring Harbor Watershed (Gomez and Sullivan Engineers, P.C., undated);
- Water Quality Data Evaluation, Oyster Bay/Cold Spring Harbor, 2000 – 2006 (Fuss & O'Neill, Inc., January 2009);
- Annual Water Quality Monitoring Program Reports, 1999 – 2008 (Friends of the Bay);
- Mill River Watershed Study and Public Stewardship Program (Cashin Associates, P.C., December 2007);
- Bailey Arboretum Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);
- Francis Pond Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);

- Kentuck Brook Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);
- Mill River Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);
- Tiffany Brook Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);
- White's Creek Subwatershed, Stormwater Runoff Impact Analysis and Candidate Site Assessment Report (Cashin Associates, P.C., October 1, 2007);
- Build-Out and Cumulative Impact: Oyster Bay Hamlet (Cashin Associates, July 2007);
- Pathogen Total Maximum Daily Loads for Shellfish Waters in Oyster Bay Harbor and Mill Neck Creek (NYSDEC, September 2003);
- Oyster Bay/Cold Spring Harbor Complex Harbor Management Plan (Cashin Associates, P.C., June 2002);
- Mill Pond Outflow Study Water Quality Testing Program (Cashin Associates, P.C., 2001);
- Local Waterfront Revitalization Program for Huntington Harbor, Town of Huntington (Cashin Associates, P.C., April 2000);
- Mill River Watershed Study Sampling and Water Quality Testing (Cashin Associates, P.C.);
- Oyster Bay/Cold Spring Harbor Complex Stormwater Management/Coastal Water Quality Improvement Program Report (Town of Oyster Bay, 1995).

1.4 Ongoing Watershed Conservation and Restoration Efforts

There are a number of ongoing and recently completed efforts to maintain the existing high-quality natural resources of the harbor complex and its watershed, as well as to restore or improve the condition of other degraded resources. Many of these efforts are described in the studies and reports identified in the previous section. Notable ongoing or recently completed watershed conservation and restoration efforts are summarized below.

Friends of the Bay continues to be a leading environmental advocate, committed to the protection of the Oyster Bay/Cold Spring Harbor estuary and its surrounding upland communities. Friends of the Bay is actively involved in water quality protection, watershed and wetlands conservation, land use planning, research, education, and community action and advocacy.

Friends of the Bay has been monitoring the water quality within the Oyster Bay/Cold Spring Harbor Complex since 1999. Today, Friends of the Bay conducts weekly monitoring at 19 locations, from April through October, within Oyster Bay, Mill Neck Creek, and Cold Spring Harbor, as well as additional monitoring at selected streams and outfalls to the estuary. The volunteer water quality monitoring program provides high quality data to continue the dissolved oxygen-testing baseline established by Nassau County's Department of Health in 1972, screens for water quality impairments, supports the Total Maximum Daily Load (TMDL) for pathogens that has been established for Oyster Bay and Mill Neck Creek, evaluates long-term water quality trends, documents the effects of water quality improvement programs, and educates and involves citizens and public officials about water quality protection.

In partnership with the Town of Oyster Bay and Nassau County, Friends of the Bay has been working to improve the water quality of Mill Neck Creek. The shellfish beds in this water body have been closed since 1983. The long-term goal is to reopen all 300 acres. To achieve this goal Friends of the Bay and its municipal partners have worked to obtain funding to improve wastewater treatment and stormwater runoff. A landmark groundbreaking occurred in April 2009 for long-awaited upgrades to sewer and water infrastructure to connect the homes in the Birches residential subdivision, located on the west side of Oak Neck Creek in the Locust Valley area, to the Glen Cove sewage treatment plant. This project will eliminate chronic cesspool overflows to Mill Neck Creek. Friends of the Bay has also been providing outreach to residents regarding the importance of conducting routine maintenance of their onsite wastewater treatment systems.

The Town of Oyster Bay, in partnership with Friends of the Bay, has been working to restore, enhance, and protect the Mill River, which is a major tributary to the Oyster Bay/Cold Spring Harbor Complex. The Town of Oyster Bay completed a watershed study and public stewardship plan in December 2007 to characterize the natural resources of the Mill River watershed, develop strategies to mitigate stormwater quality impacts to the Mill River and the harbor complex, and develop a public outreach/education materials and program. Nassau County has also completed subwatershed stormwater studies for a number of the harbor complex subwatersheds, including Mill River, White's Creek, Tiffany Creek, and others. These studies identify specific stormwater improvement projects that can be implemented in each subwatershed to restore and protect water quality within the estuary and its tributaries.

In July 2009, Oyster Bay was named the second case study location for the National Fish and Wildlife Federation Long Island Futures Fund project entitled "Watershed Trading to Improve the LIS Water Quality" (pilot case study is of the Saugatuck River Watershed in Connecticut). It is believed that the introduction of pollutant trading can reduce the overall cost to meet the reduction goal (e.g., 10% of non-point source Total Nitrogen, TN) as well as serve as a solution to the conflict between economic development and environmental protection and connect stakeholders (municipalities, agriculture, industry, etc.) in a watershed approach. The goal of this project is to assist involved entities including states, municipalities, and watershed groups, overcome the multitude of barriers to implementing a successful water pollution control program while accelerating the water quality improvement in the LIS. This project will build on watershed management initiatives, such as this one, to create a baseline for current watershed planning efforts. A guidance manual will be produced at the conclusion of this project, the LIS Trading Guidance Manual, which will serve as a guide for all LIS watershed entities on the technical, policy, regulatory, and administrative issues involved in pollutant trading and the "lessons learned" in the pilot watersheds.

A number of efforts are underway to restore diadromous fish (sea-run brook trout and other species) to the Mill River and other areas of the harbor complex. The Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay recently recently completed a fish passage feasibility study for the Oyster Bay/Cold Spring Harbor Complex, and specifically for the Mill River. Results of these feasibility evaluations will guide the next steps relative to specific fish passage restoration projects and design alternatives.

Friends of the Bay, in cooperation with the Town of Oyster Bay and Nassau County, using Town and County funds (e.g., SEA Fund and other bond funds) successfully acquired the Mill Pond Overlook property for $4.5 million in 2006. The purchase of this 3.6-acre site prevented the adverse affects development of this parcel would have had on the Mill Pond, the National Oyster Bay Wildlife Preserve, and Oyster Bay. The Town is currently in the process of securing $59,000 in grant funding which the Town will match to develop a restoration plan to return the property to its natural state. The site is fenced and not currently open to the public. Under prior ownership, the Mill Pond site had been poorly maintained and an illegal dumping site for the prior owners asphalt business.

The U.S. Fish and Wildlife Service, NYSDEC, and other state and local government agencies, as well as Friends of the Bay, have been working to protect and restore tidal wetlands and coastal habitat within the estuary. One such project, the Centre Island tide gate project, was designed to restore approximately 20 acres of degraded tidal wetland located in the "Eastover Marsh", which had been dissected by a road that restricted the tidal flow to a large section of the marsh. This reduction caused water to stagnate, and Phragmites and other less desirable plant species dominated much of the marsh for years. To increase tidal flow and restore the marsh, two culverts were installed with a self regulating tide gate on one and a traditional flap tide gate on the other, which was the first time a self-regulating tide gate was installed in New York State.

The Oyster Bay/Cold Spring Harbor Complex was declared a federal No-Discharge Zone (NDZ) for vessel sewage, regulated under Section 312 of the Clean Water Act. The designation prohibits the discharge of sewage (whether treated or untreated) from vessels, providing an additional level of protection to address water quality issues associated with sewage contamination in marine waters.

There are also multiple efforts underway at the local, county, and state level to acquire open space within the harbor complex watershed to protect water quality and provide other environmental, recreational, and quality-of-life benefits. The State of New York, Nassau and Suffolk Counties, and the Town of Oyster Bay and the Town of Huntington have identified properties in the watershed for open space acquisition. In February 2008, the Nassau County Legislature acquired most of the 31-acre Smithers Estate in Mill Neck for open space preservation. This important acquisition creates a continuous preserve all the way to the Oyster Bay National Wildlife Refuge, helping to protect water quality and the health of the Oyster Bay/Cold Spring Harbor estuary system.

Other ongoing watershed protection/restoration and related land use planning activities include planning for Oyster Bay's Western waterfront (formerly Jacobson's Shipyard) and eastern waterfront, smart growth initiatives, and other site-specific development proposals.

2 Study Area Description

2.1 Municipal Jurisdictions

The Oyster Bay/Cold Spring Harbor Complex watershed is an approximately 39 square-mile watershed located in Nassau and Suffolk Counties on Long Island (*Figure 2-1*). As shown in *Table 2-1*, approximately 80 percent of the watershed is located within the Town of Oyster Bay and its incorporated villages and unincorporated villages and hamlets. A small portion (less than 2 percent) of the watershed is located in Glen Cove, also in Nassau County. The remaining 18 percent of the watershed is within the Town of Huntington and its incorporated villages in Suffolk County.

Table 2-1. Political Jurisdictions Within the Watershed

County	Town	Village/Hamlet	Area in Watershed (sq. miles)	% of Watershed
Nassau			**31.97**	**81.9%**
	Glen Cove		0.70	1.8%
		Glen Cove	*0.70*	*1.8%*
	Oyster Bay		31.28	80.2%
		Old Brookville	*0.57*	*1.5%*
		Lattingtown	*1.11*	*2.8%*
		Laurel Hollow	*2.95*	*7.6%*
		Woodbury	*2.73*	*7.0%*
		Hamlet of Oyster Bay	*1.27*	*3.3%*
		Cove Neck	*1.32*	*3.4%*
		Muttontown	*2.94*	*7.5%*
		Syosset	*0.68*	*1.7%*
		Bayville	*0.73*	*1.9%*
		Locust Valley	*0.91*	*2.3%*
		Upper Brookville	*3.58*	*9.2%*
		Bayville (Unincorporated)	*0.12*	*0.3%*
		Mill Neck	*2.70*	*6.9%*
		Oyster Bay Cove	*3.79*	*9.7%*
		Centre Island	*1.04*	*2.7%*
		Glen Head	*0.33*	*0.9%*
		Matinecock	*2.66*	*6.8%*
		Brookville	*0.81*	*2.1%*
		East Norwich	*1.04*	*2.7%*
Suffolk			**7.04**	**18.1%**
	Huntington		7.04	18.1%
		Lloyd Harbor	*2.22*	*5.7%*
		Cold Spring Harbor	*2.50*	*6.4%*
		West Hills	*2.19*	*5.6%*
		Huntington	*0.14*	*0.4%*

Within the watershed, the primary jurisdiction lies with the Town of Oyster Bay and the Town of Huntington, each of which has authority to regulate land use and the underwater lands within its boundary and within unincorporated villages and hamlets. The Towns also have authority to regulate over-water use of coastal waters within its boundaries, but which lie outside of the 1,500-foot area of over-water jurisdiction of the incorporated villages. Each town also has a proprietary authority to control the placement of structures on underwater lands within their respective ownerships, including areas within the incorporated villages'

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Legend

- ▭ OB/CSH Watershed
- ═ Primary Highway
- — Secondary Roadway
- ▭ County
- ▭ Town
- ▭ Village

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 2-1
Oyster Bay/Cold Spring Harbor Watershed

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1,500-foot area of over-water jurisdiction. The incorporated villages have authority to regulate land use activities and the use of underwater lands within their respective boundaries, as well as authority to regulate the over-water use of coastal waters within 1,500 feet of their corporate boundaries. For the towns, incorporated and unincorporated villages, there are certain restrictions regarding the use of underwater lands within the Oyster Bay National Wildlife Refuge, which is owned and regulated by the U.S. Fish and Wildlife Service (Cashin Associates, P.C., 2002).

A basic profile of the watershed is provided in *Table 2-2*. Later sections of this document provide more detailed information on these watershed characteristics.

Table 2-2. Profile of the Oyster Bay/Cold Spring Harbor Complex Watershed

Area	39.3 square miles (25,136 acres)
Stream Length	Approximately 7.9 miles
Subwatersheds	14 subwatersheds defined for this study
Jurisdictions	2 Counties (Nassau and Suffolk) 3 Towns 24 Villages/Hamlets
Water Quality	Identified impairments for Mill Neck Creek and its tidal tributaries, Cold Spring Harbor and its tidal tributaries, and Oyster Bay Harbor.
Current Impervious Cover	12.3%
Subwatersheds with the Highest Restoration Potential (Section 9)	Mill Neck Creek Bailey Arboretum Mill River Cold Spring Brook White's Creek
Major Transportation Routes	Jericho Turnpike (State Route 25) Northern Boulevard/N. Hempstead Turnpike (State Route 25A) Pine Hollow Road (State Route 106) Harbor Road (State Route 108)
Significant Natural and Historic Features	Caumsett State Park Cold Spring Harbor State Park Sagamore Hill National Historic Site in Cove Neck Tiffany Creek Preserve Stillwell Woods Muttontown Preserve Roosevelt Memorial Park Charles T. Church/ Shu Swamp Nature Sanctuary Village Woods Park Mill Neck Preserve Centre Island Town Park Beekman Beaches Theodore Roosevelt Audubon Sanctuary Planting Fields Arboretum Bailey Arboretum Cold Spring Harbor Laboratory Cold Spring Harbor Fish Hatchery Raynham Hall

2.2 Estuary

The Oyster Bay/Cold Spring Harbor estuary is located on the north shore of Long Island, spanning approximately 40 linear miles of shoreline and covering approximately 10 square miles (6,400 acres) of open water and intertidal area (Cashin Associates, P.C., 2002). The waterbodies that comprise the estuary are:

- *Oyster Bay Harbor* – the approximately 2,500 acres between the Bayville Bridge and Plum Point on Centre Island. The mapped embayments associated with Oyster Bay Harbor include Beekman Beach, Oyster Bay Harbor proper, and Oyster Bay Cove.

- *Mill Neck Creek* – a tributary to Oyster Bay Harbor, located west of the Bayville Bridge, with an approximately 300-acre watershed.

- *Cold Spring Harbor* – the approximately 1,360 acres located south of a line between Cooper's Bluff in Cove Neck and West Neck Beach in the Village of Lloyd Harbor, including approximately 275 acres within the Town of Huntington. The embayments that are associated with Cold Spring Harbor include Inner Harbor and Cold Spring Brook.

- *Oyster Bay* – the approximately 2,240 acres between Centre Island and the Lloyd Neck peninsula, which connects Oyster Bay Harbor and Cold Spring Harbor to Long Island Sound.

2.3 Watershed

For the purpose of this report, the Oyster Bay/Cold Spring Harbor Complex watershed is divided into 14 subwatersheds, from which surface runoff potentially enters the estuary. The subwatershed delineations are based on information from a variety of sources including previous watershed studies, municipal infrastructure mapping and GIS data, USGS topographic mapping, GIS data provided by Nassau County, and the EPA/USGS National Hydrology Dataset Plus. Subwatersheds were also delineated to facilitate assessment and development of watershed management plan recommendations. The subwatersheds include the area tributary to stormwater recharge basins. *Figure 2-2* depicts the subwatersheds identified in this report, and *Table 2-3* summarizes basic characteristics of the subwatersheds. Brief descriptions of the subwatersheds follow *Table 2-3*.

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Legend

- OB/CSH Watershed
- County
- Town
- Village

Subwatershed

- BAILEY ARBORETUM
- BEAVER BROOK
- CENTRE ISLAND
- COLD SPRING BROOK
- COLD SPRING HARBOR
- KENTUCK BROOK
- LLOYD NECK
- MILL NECK CREEK
- MILL RIVER
- OYSTER BAY HARBOR
- TIFFANY BROOK
- UPPER KENTUCK BROOK
- UPPER WHITE'S CREEK
- WHITE'S CREEK

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 2-2
Subwatersheds

Table 2-3. Oyster Bay Subwatersheds

Subwatershed Name	Area (acres)	Area (square miles)	% of OB/CSH Watershed	Watershed Acronym
Bailey Arboretum	526	0.82	2.1%	BAI
Beaver Brook	4,793	7.49	19.1%	BEA
Centre Island	802	1.25	3.2%	CTR
Cold Spring Brook	4,810	7.52	19.1%	CSB
Cold Spring Harbor	3,004	4.69	12.0%	CSH
Kentuck Brook	1,516	2.37	6.0%	KBR
Lloyd Neck	893	1.40	3.6%	LNK
Mill Neck Creek	1,010	1.58	4.0%	MNC
Mill River	2,159	3.37	8.6%	MRV
Oyster Bay Harbor	1,679	2.62	6.7%	OBH
Tiffany Creek	1,894	2.96	7.5%	TFY
Upper Kentuck Brook	451	0.71	1.8%	UKB
Upper White's Creek	1,310	2.05	5.2%	UWC
White's Creek	289	0.45	1.1%	WCR
Harbor Complex Watershed	**25,136**	**39.3**		

The Centre Island subwatershed (CTR) contains all but the northern edge of the Centre Island peninsula and extends along the southern edge of the land connecting Centre Island to Oak Neck. CTR contains the entire village of Centre Island and the unincorporated village of Bayville. The 802 acre subwatershed is approximately 3.2% of the total watershed area of the harbor complex. The northeastern portions of the watershed discharge to Oyster Bay, while the southern and western portions drain to Oyster Bay Harbor.

The Mill Neck Creek subwatershed (MNC) wraps around Mill Neck Creek, extending from approximately the Bayville Bridge west to the large pond southwest of Factory Pond Lane, and from that pond east to the northern tip of Mill Neck. The subwatershed is located in the villages of Bayville, Locust Valley, Lattingtown, and Mill Neck. The subwatershed is relatively small in area (1,010 acres), but is downstream of approximately 29% of the watershed area contributing to the Oyster Bay/Cold Spring Harbor Complex. Oak Neck Creek is tributary to Mill Neck Creek on the north; the Beaver Lake and Kentuck and Upper Kentuck Brook subwatersheds discharge to Mill Neck Creek on the southern side of the subwatershed; and Bailey Arboretum discharges to the western side of Mill Neck Creek through the large pond southwest of Factory Pond Lane.

The Kentuck Brook (KBR) subwatershed is located within the Town of Oyster Bay and the City of Glen Cove, at the western edge of the watershed contributing to the Oyster Bay/Cold Spring Harbor Complex. Kentuck Brook is a freshwater stream that flows from Glen Cove northeast to the southwest corner of Beaver Lake. This subwatershed is approximately 1,516 acres or 6% of the total watershed area of the harbor complex.

The Upper Kentuck Brook (UKB) subwatershed is located primarily within the Village of Old Brookville in the southwestern corner of the watershed, with the northwest corner of the watershed located in Glen Cove. This southern limit of this 451-acre subwatershed runs approximately parallel to Pound Hollow Road and perpendicular to Brookville Lane and is bounded by Piping Rock Road to the East. This subwatershed discharges to the Kentuck Brook subwatershed near Frost Pond Road.

The Beaver Lake (BEA) subwatershed is located within the Town of Oyster Bay and the Villages of Brookville, Muttontown, Upper Brookville, Matinecock, and Mill Neck. The approximately 4,793-acre subwatershed is nearly 2 miles in length, extending from Cedar Swamp Road (Route 107) in the south to Mill Neck Creek. The downstream portion of the watershed consists of a series of freshwater ponds and wetlands connected by stream segments. The upstream waterbody is Upper Francis Pond, located near the intersections of Oyster Bay road and Mill Hill Road, which discharges to Lower Francis Pond, Shu Swamp, and finally into Beaver Lake. Beaver Lake receives discharge from Kentuck Brook before discharging into Mill Neck Creek.

The Mill River (MRV) subwatershed is located within the Town of Oyster Bay and the Villages of Muttontown, East Norwich, Upper Brookville and Mill Neck and the Hamlet of Oyster Bay in the northeastern portion of Nassau County. The approximately 2,159-acre watershed extends from wetlands in the Muttontown Preserve north under North Hempstead Turnpike (State Route 25A) to Mill Pond, a large pond located between Oyster Bay-Glen Cove Road and West Main Street. The pond also receives drainage from multiple stormwater outfalls and sluices from the encircling roads and outflows under Main Street, discharging through the tidal segment of Mill River into Oyster Bay Harbor (Cashin Associates, P.C., 2007).

The Upper White's Creek (UWC) subwatershed is an approximately 1,310-acre watershed located within the Town and Hamlet of Oyster Bay and the villages of upper Brookville, East Norwich, Muttontown, Syosset, and Oyster Bay Cove. The creek is centered along Route 106, which becomes South Street in the downstream White's Creek (WCR) subwatershed. According to a recent analysis of stormwater runoff in the watershed, the area of the entire White's Creek watershed has been reduced significantly in size by the installation of recharge basins and other drainage infrastructure that contain storm runoff volume from roads, subdivision developments, and commercial and industrial sites. Consequently, the Upper White's Creek subwatershed should provide little or no stormwater runoff (Cashin Associates, P.C., 2007).

White's Creek (WCR) is located downstream of the Upper White's Creek subwatershed and consists of a short section of tidal creek and a narrow segment of freshwater creek. According to the recent stormwater analysis of the subwatershed (Cashin Associates, P.C., 2007), the tidal creek receives drainage from stormwater outfalls located at the northerly end of South Street. Runoff from the majority of the subwatershed, carried in street gutters and a network of underground piping, discharges at these outfalls. The report states that the freshwater segment is a channelized stream located between South Street and White Street that carries runoff from the drainage infrastructure in municipal parking lots and surrounding roadways. The area contributing runoff is approximately 289 acres and is located primarily within the Hamlet of Oyster Bay.

The Tiffany Creek (TFY) subwatershed is an approximately 1,894-acre subwatershed located within the Town of Oyster Bay, within the villages of Oyster Bay Cove, Laurel Hollow, and Cove Neck. Tiffany Creek extends from its headwaters near the intersection of Cove Road and Yellow Cote Road to the outflow into Oyster Bay Cove. According to a recent analysis of stormwater runoff in the Tiffany Creek subwatershed (Cashin Associates, P.C., 2007), the brook is comprised of a short tidal segment and a longer freshwater segment. The tidal segment is influenced by the Oyster Bay Cove tidal changes and receives stormwater runoff from areas northeast of Tiffany Road. The freshwater segment is a partially channelized stream located between Cove Neck Road and Yellow Cote Road and receives surface runoff from adjacent residential properties and nearby roads. At the downstream end of the freshwater segment, there is a small pond located just south of Cove Neck Road.

The Oyster Bay Harbor (OBH) subwatershed consists of the 1,679 acres, extending from the Bayville Bridge in the west to Cove Neck peninsula in the east, that discharge directly to Oyster Bay Harbor. This subwatershed is located in the Town of Oyster Bay and the Villages of Mill Neck, Oyster Bay Cove, Cove Neck, and the Hamlet of Oyster Bay. There are no significant streams in the watershed; Spring Lake in the western portion of the watershed off of Cleft Road is the largest water feature within the subwatershed.

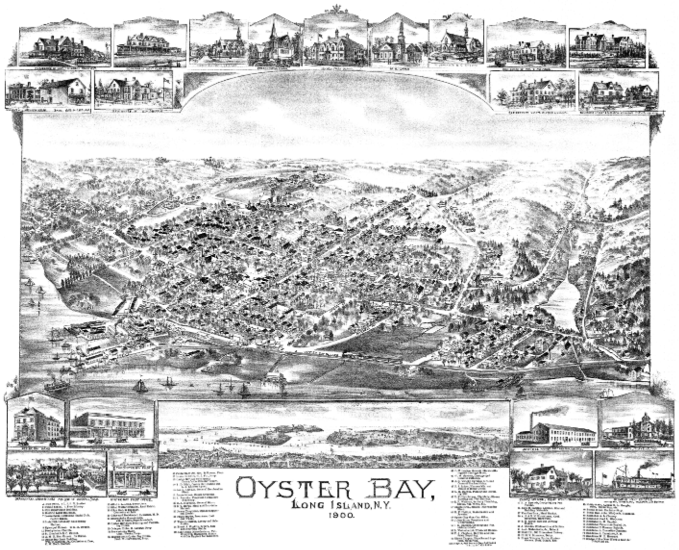
The eastern side of the Cold Spring Brook (CSB) subwatershed is located in the Town of Oyster Bay and the Villages of Syosset, Woodbury, and Laurel Hollow in Nassau County, and the western side of the subwatershed is located in the Town of Huntington and the Villages of Cold Spring Harbor and West Hills in Suffolk County. The subwatershed is approximately 4,810 acres, making it and the Beaver Lake subwatershed the largest in the harbor complex watershed, each comprising roughly 19% of the total watershed area. The headwaters of Cold Spring Brook are located south of Jericho Turnpike. The brook is parallel to Harbor Road before discharging to Cold Spring Harbor downstream of Route 25A (Lawrence Hill Road).

The Cold Spring Harbor (CSH) subwatershed is approximately 3,004 acres, extending from Cove Neck peninsula in the west to Lloyd Harbor in the east, that drain directly into Cold Spring Harbor. The western side of the subwatershed is located in Nassau County in the Town of Oyster Bay and the Villages of Cove Neck, Oyster Bay Cove and Laurel Hollow. The eastern side of the subwatershed is located in the Suffolk County Town of Huntington and the Villages of Huntington and Cold Spring Harbor. Several small streams, running approximately parallel to the shoreline, drain the subwatershed.

Lloyd Neck subwatershed (LNK) is located on the western portion of Lloyd Neck, north of Lloyd Harbor in the Village of Lloyd Harbor in the Town of Huntington. The subwatershed is approximately 3.6% of the watershed area contributing to the harbor complex. While there are no large streams in the watershed, there is a freshwater pond south of Whitewood Point with two mapped tributaries, which drains directly to Oyster Bay.

3 Historical and Social Perspective

3.1 History of the Watershed



The area including the Oyster Bay/Cold Spring Harbor Complex watershed was purchased by colonists from the Native Americans in 1653, with the exception of Lloyd Neck and Centre Island, which were not purchased until 1664 and 1665, respectively. The Oyster Bay/Cold Spring Harbor waterways have attracted merchants and colonization throughout the centuries. During the 17th century, common occupations were related to maritime activities, such as boat builders, carpenters, innkeepers, shipwrights and surveyors. The clay deposits on Centre Island began to be used for brick-making. Commerce and populations increased through the 18th century. By the mid-19th century and the invention of the steamboat, Long Island Sound became a popular summer vacation resort destination (McGee, 1997).

Scientific exploration of Cold Spring Harbor and Oyster Bay began in the early 20th century with the development of a biological laboratory to study the freshwater rivers, springs, tidal flats, and saltwater harbor. The Cold Spring Harbor Laboratory of Quantitative Biology is still in operation more than 100 years later, conducting world-renowned research. The laboratory boasts seven Nobel Prize winners (McGee, 1997).

In the time following World War II, prominent people continued to commute to Oyster Bay from New York City. Business and shopping increased in the area. Current waterfront commerce and activities include: Petro-Commander Oil Corporation, Oyster Bay Marine Center, Frank M. Flower and Sons, three yacht clubs (Seawanhaka Corinthian, Sagamore, and Oak Cliff), and various beaches and a sport club. Commercial oystering remains a prominent industry in Oyster Bay which began in the second half of the 19th century, with underwater shellfish lands leased by the Town of Oyster Bay. The harbor bottom and Mill Neck Creek are important oystering grounds. Prior to World War II, the shellfish in Oyster Bay were plentiful and supported four major oyster harvesting companies and independent baymen. By 1960, the oyster populations began to dwindle and the Flower and Sons Company began a shellfish hatchery to replenish the harbor stock. Today, the Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop and up to 33% of hard clams from the Oyster Bay/Cold Spring Harbor estuary. The continued success of commercial shellfishing in Oyster Bay remains a concern for town and village government due to threatened water quality from development and other activities in the harbor and its watershed (McGee, 1997).

3.2 Population and Demographics

The population and demographics of the Oyster Bay/Cold Spring Harbor Complex watershed reflect the trends within the Town of Oyster Bay and Nassau County, since the Town of Oyster Bay comprises approximately 80% of the total watershed area. Information on the population and demographics of the watershed are based on information from the Nassau County Master Plan, the U. S. Census Bureau, the Long Island Power Authority, and the Long Island Index Report.

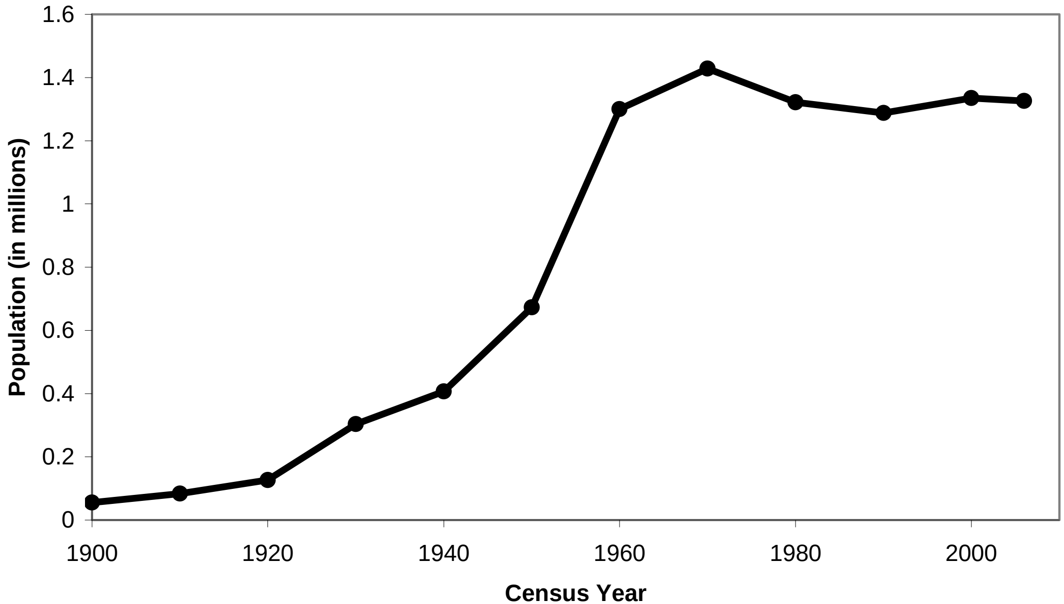
According to the 2008 Nassau County Master Plan Update (Nassau County, April 2009), the County has experienced two periods of major population growth over the past 100 years (*Figure 3-1*). The first occurred in the 1920s as part of the New York area's initial suburban expansion and the second occurred during the 1950s following the passing of the Servicemen's Readjustment Act ("G.I. Bill") and the end of World War II, both of which led to a dramatic increase in single home ownership for returning veterans and their families.

According to data from the U.S. Census Bureau's 2006 American Community Survey, the Town of Oyster Bay population is approximately 299,635. The population is 48.5% male and 51.5% female, with 47.3% of the population between the ages of 25 and 59. Approximately 32.0% of Oyster Bay's population is below age 25, with 20.7% age 59 or older.

The Nassau County population trend from 1900 through 2006 provided by the U.S. Census Bureau depicts two drastic periods of growth on Long Island, in the 1920s and again in the 1950s (*Figure 3-1*). According to a Long Island population study conducted by the Long Island Regional Planning Board, the population of Long Island by 2010 is expected to remain at the present level of 1.3 million people. The population within the harbor complex watershed is also anticipated to remain relatively stable, as there is little remaining developable land in the watershed.

According to the 2000 U.S. Census, the Town of Oyster Bay racial and ethnic characteristics are 86.5% white, 1.8% Black or African American, 7.6% Asian, 0.1% American Indian and Alaska Native, and 6.6% Hispanic or Latino of any race. The Town of Oyster Bay population has a higher percentage of white residents compared to the U.S. population average of 73.9%, and has a notably lower Black or African American and Hispanic or Latino population compared to the U.S. averages of 12.4% and 14.8%, respectively. There is a higher population of Asian residents in Oyster Bay, with a percentage of 7.6%, as compared to the national average of 4.4%.

The average household and family sizes in Oyster Bay are similar to the average U.S. population at 3.0 and 3.4 people, respectively. The median value of single-family owner-occupied homes in Oyster Bay is $556,800, which is considerably higher than the U.S. median $185,200. The median household income is $97,934 (in 2006 dollars) which is more than twice the U.S. median of $48,451. The percentage of families and individuals below the poverty level are less than the U.S. average; 2.4% of families are below the poverty level, compared with 9.8% in the U.S., and similarly 4.1% of individuals as compared to 13.3% in the U.S. are below the poverty level.



Source: U.S. Census Bureau

Figure 3-1. Population Trends in Nassau County

The Long Island Index 2008 Report provides an annual review of the goals of government and residents of Long Island to direct regional planning efforts. The 2007 report highlights the need for more affordable housing for young professionals, empty-nesters and retirees. The report found that a majority of current home-owners on Long Island could not afford to purchase a home in today's market. This project was and continues to be funded by the Rauch Foundation.

3.3 Recreation and Community Resources

The Oyster Bay/Cold Spring Harbor Complex provides many opportunities for recreational activities, such as fishing, swimming, and boating. The National Wildlife Refuge and North Shore Wildlife Sanctuary provide significant opportunities for nature observation. Recreational boating is an important activity in the harbor complex, with a 750-vessel mooring area in Oyster Bay Harbor managed by the Town of Oyster Bay. Freshwater fishing is popular in Mill Pond. There are also many public parks, preserves and beaches within the Oyster Bay/Cold Spring Harbor Complex, including:

- Caumsett State Park,
- Cold Spring Harbor State Park,
- Sagamore Hill National Historic site in Cove Neck,
- Tiffany Creek Preserve,
- Stillwell Woods,

- Muttontown Preserve,
- Roosevelt Memorial Park,
- Charles T. Church/Shu Swamp Nature Sanctuary,
- Village Woods Park,
- Mill Neck Preserve ,
- Centre Island Town Park,
- Beekman Beach.

A number of country clubs and golf courses exist in the watershed including the Cold Spring Harbor Country Club, Pine Hollow Country Club, Muttontown Golf and Country Club, Mill River Country Club, Brookville Country Club, Piping Rock Country Club, and Nassau Country Club.

4 Natural Resources

4.1 Geology and Soil

Long Island is formed largely of two spines of glacial moraine. Oyster Bay/Cold Spring Harbor is on the northern moraine, which directly abuts the North Shore of Long Island at points and is known as the Harbor Hill moraine. The moraine consists of gravel and loose rock left behind during the two most recent pulses of Wisconsin glaciation around 19,000 BC. The glaciers melted and receded to the north, resulting in the difference between the North Shore beaches and the South Shore beaches. The North Shore beaches are rocky from the remaining glacial debris, while the South Shore's are crisp, clear, outwash sand (Mills, 1974).

The underlying bedrock is composed of the Monmouth Group, Matawan Group and Magothy Formation of the Coastal Plain Deposits. The surficial geology in the watershed is composed of till and till moraine along the coast, which can be of variable texture (boulders to silt) and permeability. Outwash sand and gravel is present inland from the till deposits composed of coarse to fine gravel with sand. Patches of Kame deposits are present in the watershed, consisting of coarse to fine gravel and/or sand (NYS Museum, 2000).

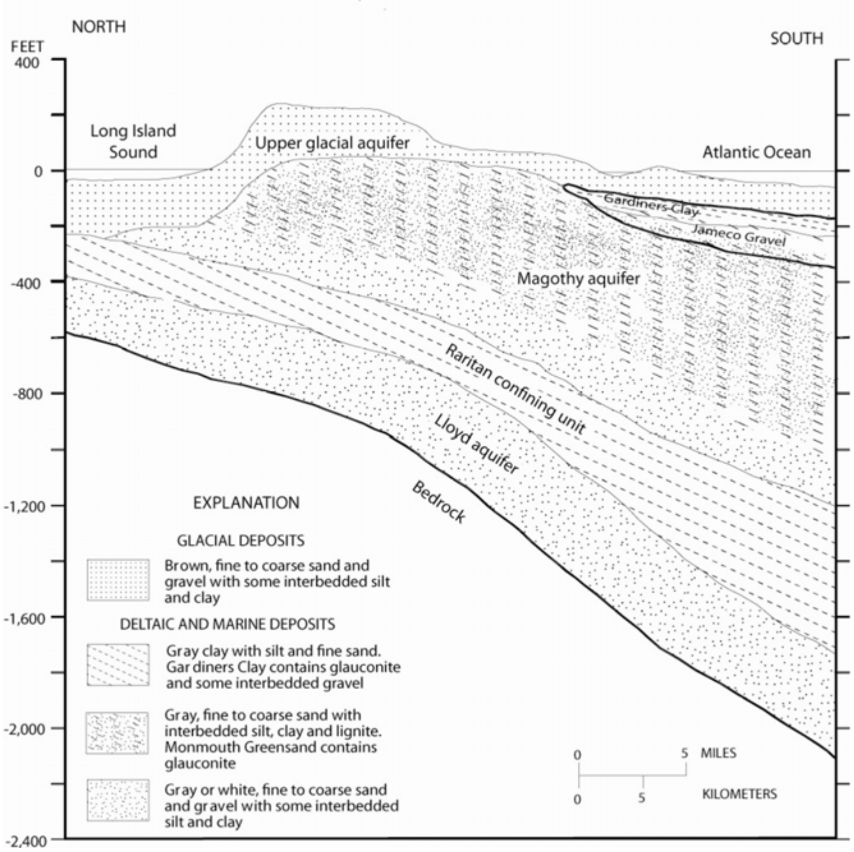


Figure 4-1. Hydrogeologic Cross Section of Long Island Near the Nassau-Suffolk County Border (McClymonds and Franke, 1972)

The regional surficial sediment distribution in Long Island Sound exhibits textural trends which are related to sea-floor geology, bathymetry, and the effects of currents. In general, gravelly sediments are dominant in easternmost Long Island Sound, where tidal currents are strong, and in areas characterized by glacial tills. Sand occurs across the east-central Sound and along most of the nearshore margins. Sand-silt-clay is predominant in Oyster Bay/Cold Spring Harbor (USGS, 2007).

The unconfined groundwater aquifer in the harbor complex watershed is the Upper Glacial Aquifer which extends from Long Island Sound south to the Atlantic Ocean (*Figure 4-1*). The unconfined aquifer is underlain in the Oyster Bay area by several deeper freshwater aquifers. Beneath the Upper Glacial Aquifer, the North Shore Aquifer is confined by the North Shore confining Raritan clay unit. The Lloyd aquifer is confined between the Raritan clay unit and the bedrock formation (Nassau DPW, 2005). Monitoring in the Oyster Bay area has detected significant saltwater intrusion into the Upper Glacial Aquifer and less extensive intrusion into the deeper confined Lloyd Aquifer (USGS, 2004).

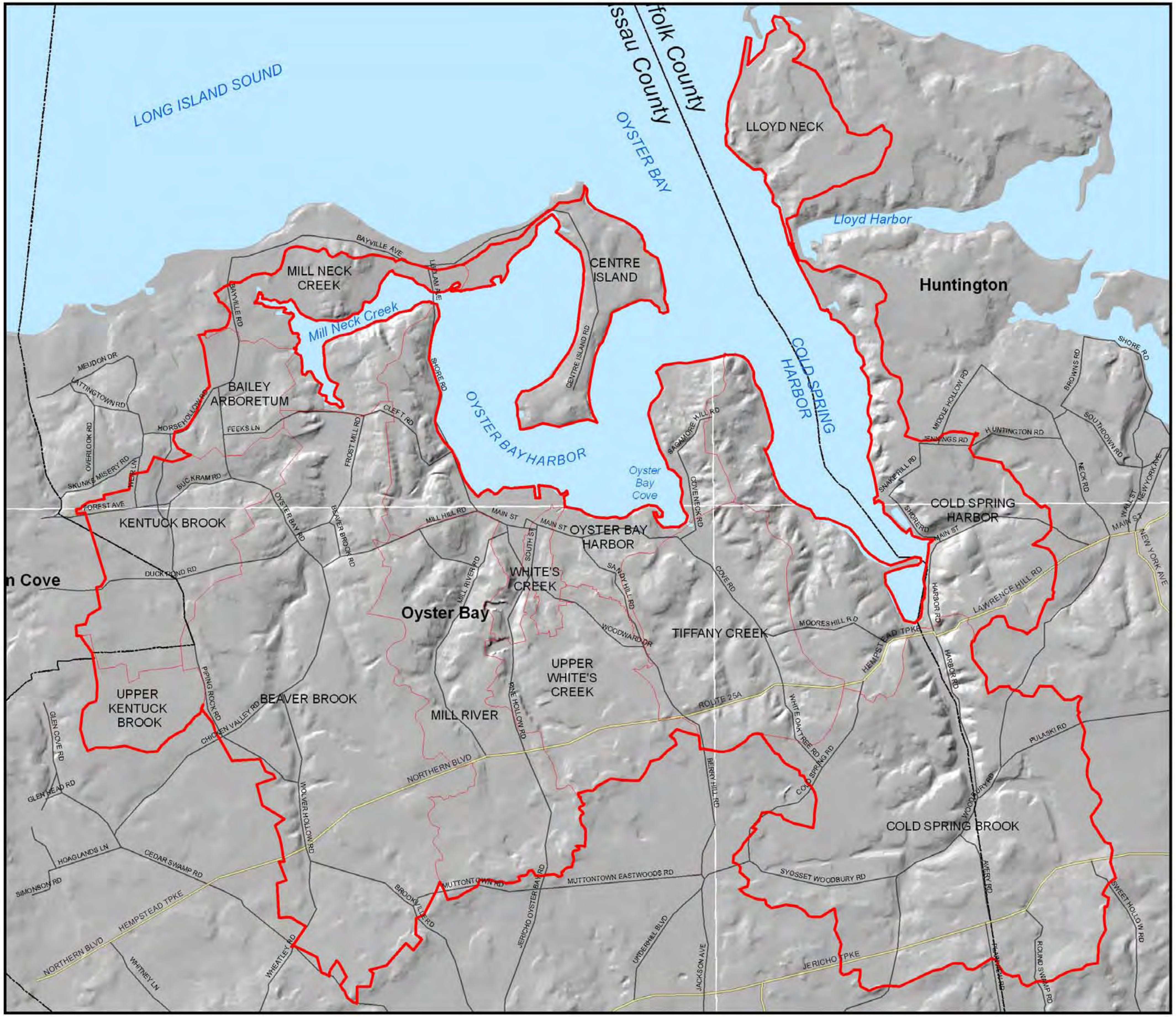
4.2 Topography

The topography of the area within the Oyster Bay/Cold Spring Harbor Complex watershed is generally characterized by long, narrow stream valleys surrounded by gentle (1-2%) to steeply (25% or more) sloping hills that transition into broader areas of gently sloping topography *(Figure 4-2)*. Based on U.S. Geological Survey topographic mapping of the area, elevations in the southernmost, upper, portions of the watersheds are typically 200 feet above mean sea level (MSL) with some elevations as high as approximately 350 feet MSL in the Cold Spring Harbor watershed near High Hill in Huntington. Elevations near the watershed's outlets to the estuary are typically less than 10 feet MSL, with some sandy rocky bluffs of 20 to 80 feet MSL elevation adjacent to narrow beach areas (NYDEC, 2003).

4.3 Surface Hydrology

Surface hydrology on Long Island is primarily limited to small streams since the land area is relatively small, and fresh water runoff reaches the ocean without forming large rivers (Mills, 1974). This is also true of the Oyster Bay/Cold Spring Harbor Complex watershed, where the surficial hydrology is dominated by smaller headwater streams and associated impoundments.

The small streams and creeks on Long Island are primarily fed by base flow or groundwater. The distribution and timing of flows is therefore relatively stable year-round. *Figure 4-3* shows the seasonal pattern of mean monthly streamflow in Mill Neck Creek (USGS Stream Gage 01303000, at Beaver Lake 30 feet upstream from Cleft Road in Mill Neck) and Cold Spring Brook (USGS Stream Gage 01303500, at Cold Spring Fish Hatchery 270 feet upstream from State Highway 25A) for the period of record. Normalized by drainage area, the streamflow data in *Figure 4-3* are presented in units of cubic feet per second per square mile (CFSM). The highest streamflow generally occurs during March and April, while seasonal low-flows typically occur during late summer or early fall.



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Oyster Bay/Cold Spring Harbor

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 4-2
Shaded Relief Map

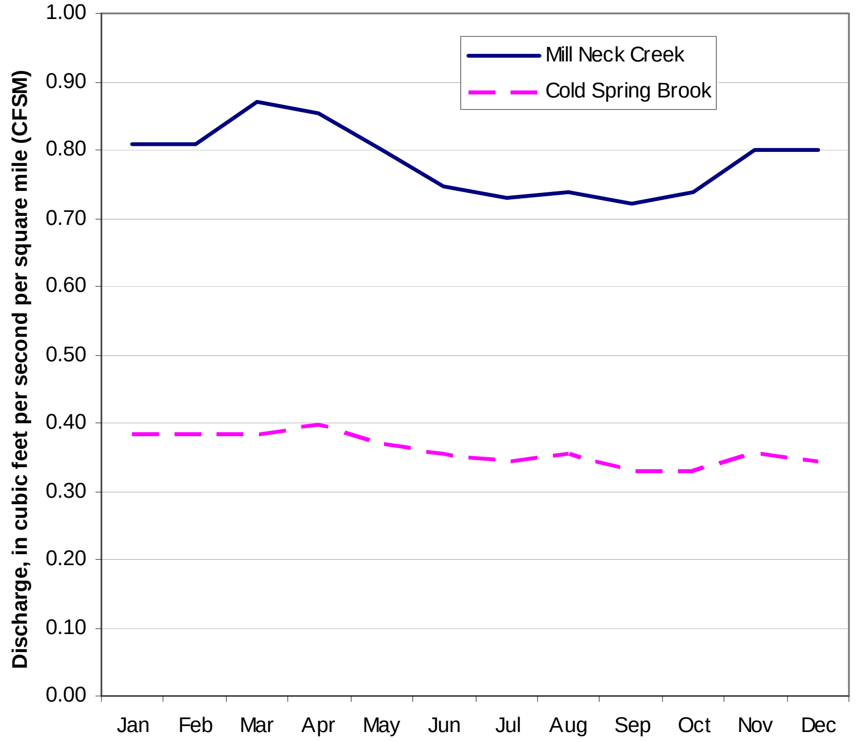

Figure 4-3. Mean Monthly Streamflow of Mill Neck Creek and Cold Spring Brook

As described in Section 2.3, the major surface hydrologic features within the harbor complex watershed are Cold Spring Brook, which feeds Cold Spring Harbor, Tiffany Creek and Mill River, which discharge to Oyster Bay Harbor, and Beaver and Kentuck Brooks, which combine at Beaver Lake before discharging into Mill Neck Creek.

4.4 Flood Hazard Areas

Floodplains, which are areas that would be impacted by floodwaters of some depth, are delineated by the Federal Emergency Management Agency 100-year and 500-year flood zones (FEMA, 1979). Much of the watershed's coastline is subject to inundation and flooding due to wave action (*Figure 4-4*). The 100-year flood zone is typically within 500 feet of the coast and includes residential areas in Bayville and the estuarine complex on the eastern side of Centre Island. Most areas of the watershed lie outside the 500-year flood zone. Portions of Beaver Brook, Mill Pond, Tiffany Creek and St. John's Pond have designated 100-year and 500-year flood zones.

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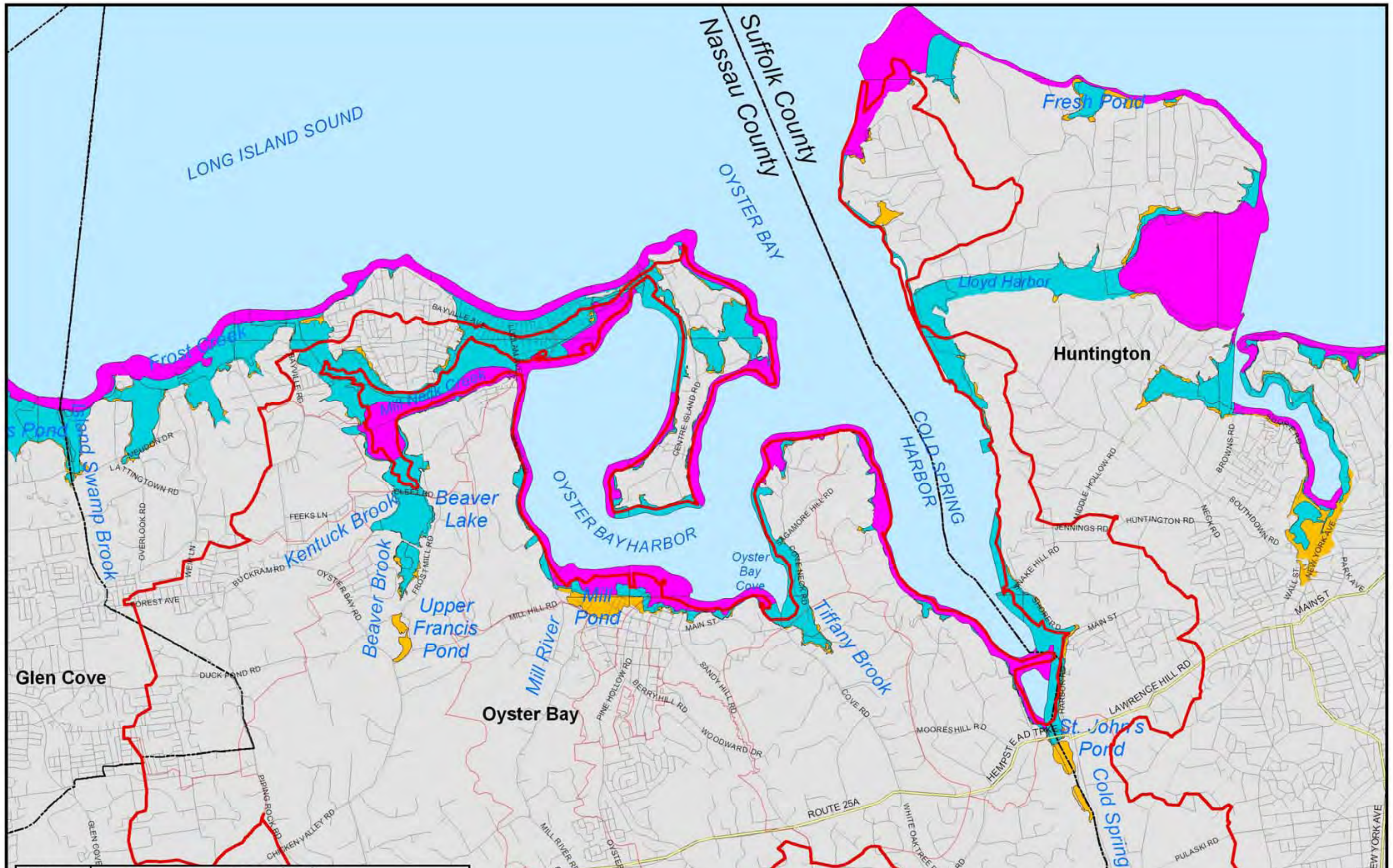
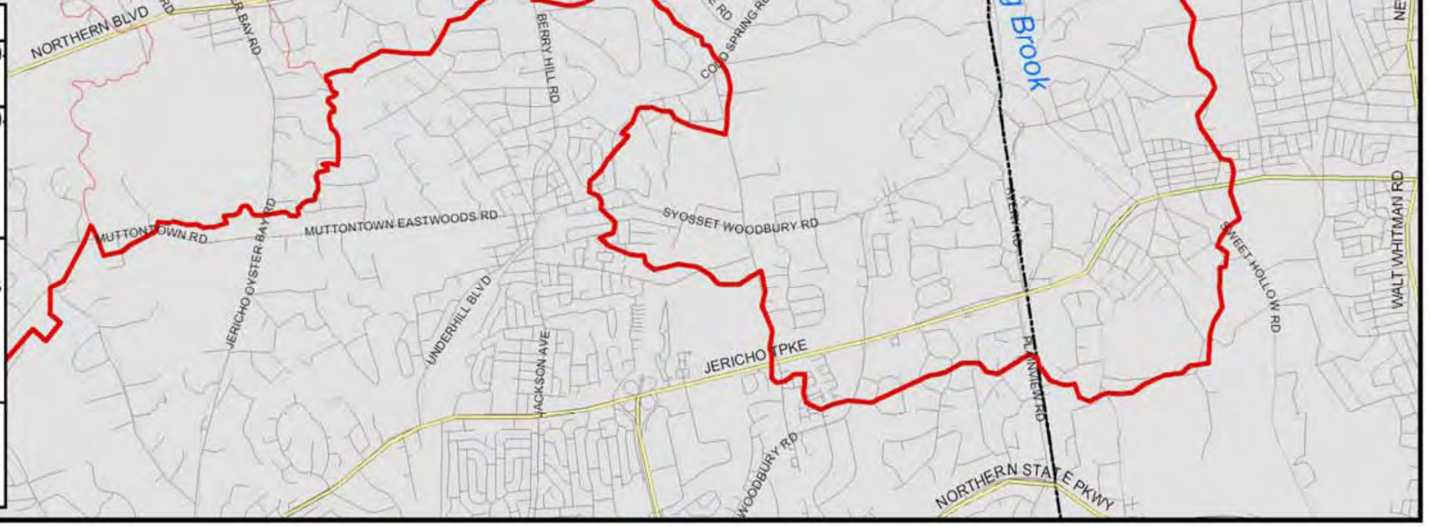


Zone	Description
AE	Special Flood Hazard Area inundated by the 100 year flood; base flood elevations are
VE	Special Flood Hazard Area inundated by the 100 year flood; coastal floods with velocity hazards (wave action); base flood elevations are determined.
X500	*If shaded:* Area of 500-year flood; area subject to the 100-year flood with average depths of less than 1 foot or with contributing drainage area less than one square mile; and areas protected by levees from the base flood.
X	*If unshaded:* Area determined to be outside the 500-year floodplain.



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Legend

🟥	OB/CSH Watershed
☐	Subwatershed
☐	Town
☐	County
🟦	AE
🟪	VE
🟧	X500
⬜	X

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 4-4
Flood Zones

4.5 Climate

Climate in the Oyster Bay/Cold Spring Harbor Complex watershed is similar to other coastal areas in the Northeast, with warm humid summers and cold winters. Climate on Long Island is influenced strongly by the ocean, which results in a relatively mild winter season compared to inland areas and helps to alleviate heat in the summer months. According to the National Oceanic and Atmospheric Administration, there are an average of 7 days between June and September when the afternoon temperature on Long Island exceeds 90 degrees, while farther inland there are 10 to 15 such days. The winter season is relatively mild, with below zero temperatures reported on only one or two days in about half the winters. Temperatures of 10 degrees below zero or colder are extremely rare and there are often extended periods during the winter when no snow cover is present. The freeze-free season is typically from late April/early May to mid- to late-October.

The area typically receives 45-50 inches of precipitation on an annual basis. The seasonal snowfall averages about 30 inches. Almost all of this snow falls between December and March. Coastal low pressure systems, Northeasters, are the principle source of this snow. These weather systems will occasionally produce a heavy snowfall. It is uncommon for the eye of a tropical storm to pass directly over Long Island. Tropical weather systems moving along the Atlantic Coast, however, are capable of producing episodes of heavy rain and strong winds in the late summer or fall.

Changes in climate are anticipated to occur over the next century. The magnitude of changes in temperature, sea level, and the timing and intensity of rainfall will depend upon future emissions of carbon dioxide and other greenhouse gases driving climate change. However, using different emissions scenarios, climate modelers have predicted the following changes to the climate in the Northeast United States as summarized below (Ashton et al., 2007; Fogarty et al., 2007; Frumhoff et al., 2007; Hayhoe et al., 2008; Kirshen et al., 2008).

Over the next several decades, temperatures are anticipated to rise 2.5-4°F in winter and 1.5-3.5°F in summer. By the end of the century, winter temperatures are predicted to rise 5-12°F and summer temperatures 3-14°F compared to current conditions. As a result, days over 90°F will be more frequent, there will be a longer growing season, less winter precipitation falling as snow and more as rain, a reduced snowpack, and an earlier spring snowmelt. In addition, regional sea surface temperatures are expected to rise 4-8°F by 2100.

The Northeast is anticipated to experience an increase in total precipitation of about 10% or 4 inches on an annual basis by the end of the century. Seasonally, winter precipitation is predicted to increase 20-30%, while summer precipitation amounts will remain relatively unchanged. In addition to increased precipitation amounts, more extreme precipitation is expected. Current model predictions include an increase in the precipitation intensity, i.e., the average amount of rain falling on a rainy day, and the number of heavy precipitation events. Precipitation intensity is predicted to increase 8-9% by mid-century and 10-15% by the end of the century. An 8% increase in the number of heavy precipitation events is expected by mid-century, with a 12-13% increase by the end of the century. The resulting hydrologic response will be higher winter and lower summer streamflow.

4.5.1 Climate Change Impacts

Climate change in the Northeastern U.S. is anticipated to result in an increase in the extent and frequency of coastal flooding, a rise in the frequency of severe storms and related damages, and sea level rise of 2-6 feet (Frumhoff et al., 2007). Increases in sea level and frequency of severe storms will result in more inundation of coastal areas, and subsequent increases in shoreline erosion and wetland loss. Inundation of low-lying areas will result in the potential for saltwater to infiltrate into freshwater surface waters and aquifers. Increased flooding and erosion has the potential to negatively impact transportation infrastructure and sewage and septic systems.

Areas of coastline most vulnerable to sea-level rise impacts have been identified by the U.S. Geological Survey (USGS) (Hammar-Klose and Thieler, 1999) through the calculation of a coastal vulnerability index (CVI). Calculation of the CVI depends on past changes in shoreline position, typical wave climates, tidal range, coastal geomorphology and sea-level history. Each region is assigned a CVI from 1 (low-risk) to 5 (high-risk). The assessment indicates a low CVI of 1 for the north shore of Long Island, in contrast to a CVI of 2 or higher for large segments of the south shore of Long Island and other coastal areas of the Northeastern U.S. (*Figure 4-5*). However, it is important to keep in mind that the CVI does not predict future shoreline location or take into account large events such as hurricanes.

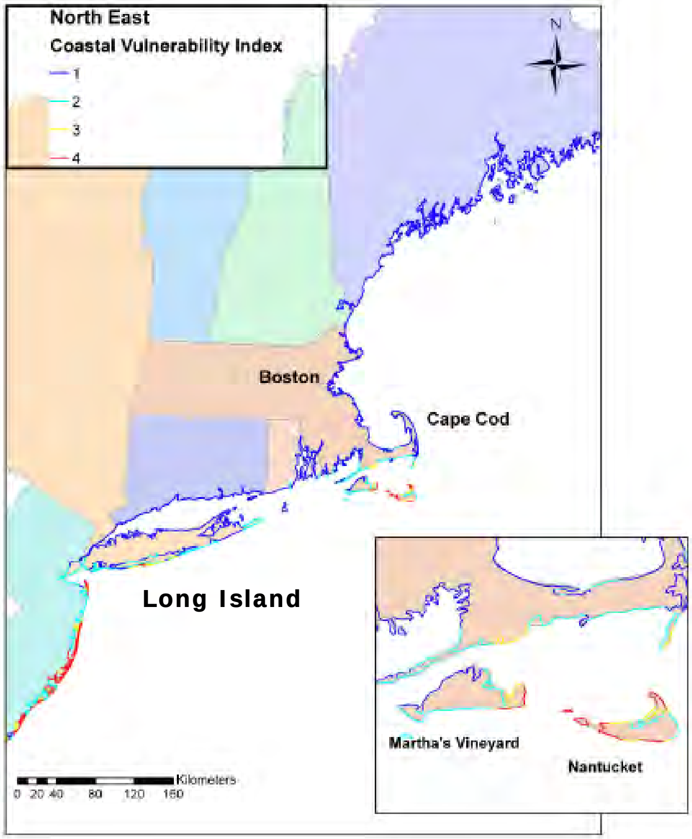


Figure 4-5. Coastal Vulnerability Index (CVI) for the Northeastern U.S.

Coastal wetlands are vulnerable to the effects of sea-level rise, increasing water temperatures, and increased nutrients. If accretion of river-borne sediment and organic matter is unable to keep pace with the combined affects of sea-level rise and land subsidence, coastal marshes will be reduced or disappear. This will impact the ecological services provided by these areas including buffering coastal areas from waves and erosion, filtering nutrients and pollutants, providing wildlife habitat, and providing nursery areas for fisheries. Because hard-clams and oysters depend on wetland-based food chains, impacts to coastal wetlands are anticipated to impact those fisheries (Frumhoff et al., 2007).

It is difficult to predict the ways in which warming of water temperatures will influence other factors that affect marine ecosystems, including nutrient dynamics, ocean circulation, and plankton production. However, commercial fish and shellfish have water temperature thresholds that define conditions suitable for reproduction, growth, and survival. Increased water temperatures over the last decade have already led to declines in lobster landings in Long Island Sound (Fogarty et al. 2007). In addition, warmer water temperatures also appear to facilitate the spread of shellfish disease, the frequency and intensity of harmful algal blooms, and the ability of invasive species to reproduce and spread (Frumhoff et al., 2007).

More geographically-specific information on the impact of climate change on Long Island is currently being developed through a collaboration of The Nature Conservancy (TNC), the National Oceanic and Atmospheric Administration (NOAA), the NASA Goddard Institute for Space Studies, Pace Law School, the University of Southern Mississippi, and the Association of State Floodplain Managers. The TNC Coastal Resilience project is intended to provide planners and other decision-makers with tools to assess reasonable future impacts of flooding from sea level rise and storms. The mapping tool developed for the project is an interactive decision support tool that explores future flooding scenarios and is available at http://maps4.msi.ucsb.edu/. Currently the online tool is only operational for the south shore of Long Island, although plans to include the north shore of Long Island are included in the project.

4.6 Wetlands

Generally, wetlands are lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance.

Wetlands are classified by NYSDEC as either freshwater or tidal, depending on the vegetation they support, which is a function of water salinity and inundation. Freshwater and tidal wetlands provide a multitude of functions including flood and stormwater control, pollution reduction, marine food production, wildlife habitat, recreational opportunities, open space, and aesthetic value.

In New York State, freshwater wetlands are regulated under the Freshwater Wetlands Act (under Article 24 of the Environmental Conservation Law) and are defined and mapped by NYSDEC. Freshwater wetlands are those areas of land and water that support a preponderance of characteristic wetlands plants that out-compete upland plants because of the presence of wetlands hydrology (such as prolonged flooding) or hydric (wet) soils. Freshwater wetlands commonly include marshes, swamps, bogs and fens. *Figure 4-6* depicts the extent and distribution of freshwater wetlands in the Oyster Bay/Cold Spring Harbor Complex watershed. Freshwater wetlands comprise less than 2 percent of the harbor complex watershed. The majority of these wetlands are associated with ponds along Beaver Brook, Mill River, Tiffany Creek, and Cold Spring Brook.

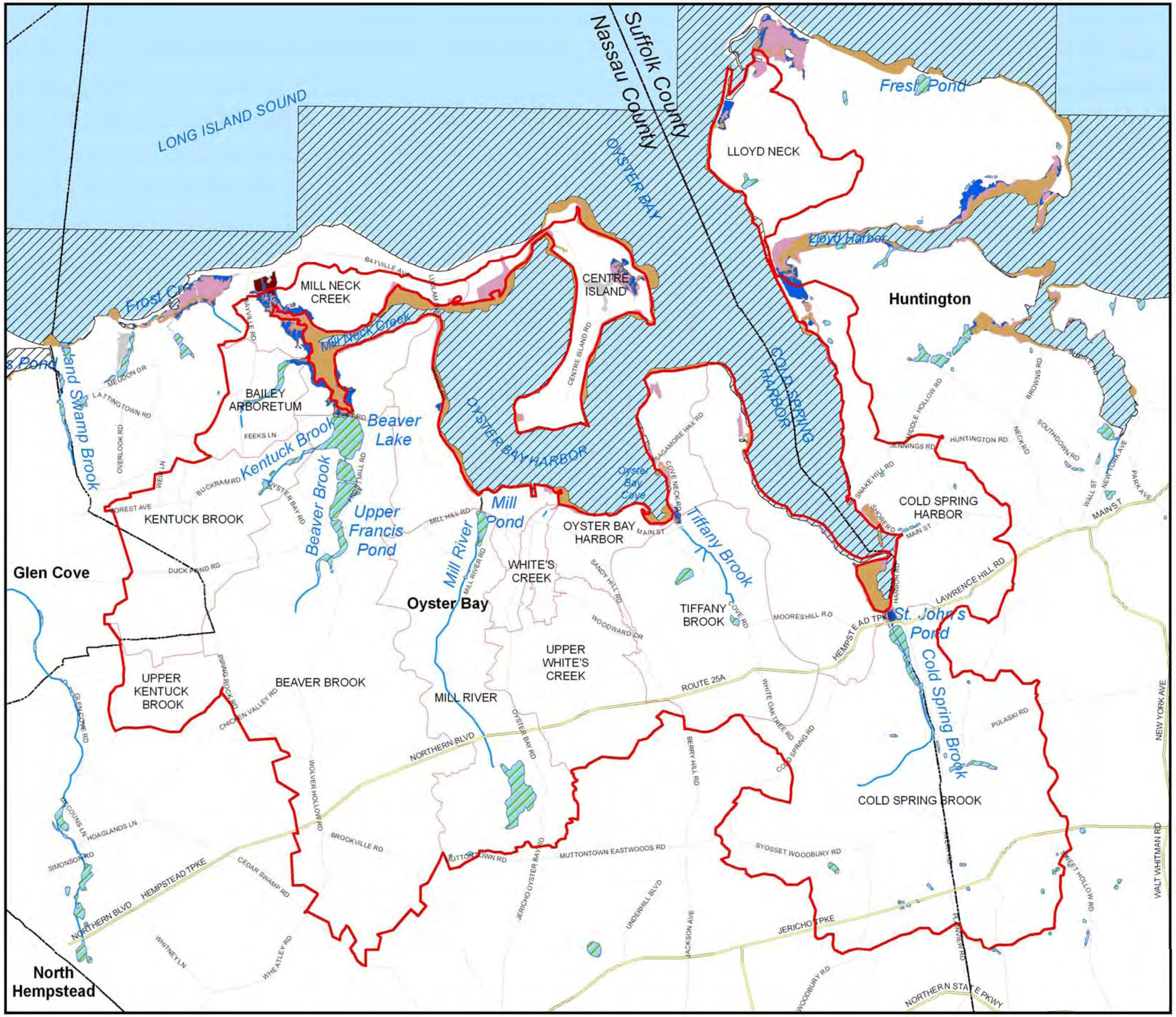
Tidal wetlands are regulated in New York State under the Tidal Wetland Act of 1973. Tidal wetlands are the coastal areas periodically flooded by seawater during high or spring tides or are affected by the changes in water levels caused by the tidal cycle. Salt marshes and mud flats are common types of tidal wetlands found along New York's marine shoreline. Tidal wetlands are classified by the amount of inundation during high and low tides and the type of vegetation. *Table 4-1* summarizes the categories of tidal wetlands, as designated by NYSDEC, which exist within the Oyster Bay/Cold Spring Harbor Complex.

Table 4-1. Tidal Wetland Categories

Category	Description
Coastal Shoals, Bars and Mudflats (SM)	The tidal wetland zone that at high tide is covered by saline or fresh tidal waters, and at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is not vegetated.
Littoral Zone (LZ)	The tidal wetland zone that includes all lands under tidal waters which are not included in any other category. There shall be no LZ under waters deeper than six feet at mean low water.
Formerly Connected (FC)	The tidal wetlands zone in which normal tidal flow is restricted by man-made causes. Phragmites sp. is the dominant vegetation.
Fresh Marsh (FM)	The tidal wetland zone found primarily in the upper tidal limits of the riverine systems where significant fresh water inflow dominates the tidal zone. Species normally associated with this zone include narrow leaved cattail, Typha angustifolia; the tall brackish water cordgrass, Spartina pectinata and/or S. cynosuroides; and the more typically emergent fresh water species such as arrow arum, Peltandra; pickerel weed, Pondederia; and cutgrass, Leersia.
High Marsh (HM)	The normal upper most tidal wetland zone usually dominated by salt meadow grass, Spartina patens; and spike grass, Distichlis spicata. This zone is periodically flooded by spring and storm tides and is often vegetated by low vigor, Spartina alterniflora and Seaside lavender, Limonium carolinianum. Upper limits of this zone often include black grass, Juncus Gerardi; chairmaker's rush, Scirpus sp; marsh elder, Iva frutescens; and groundsel bush, Baccharis halimifolia.
Intertidal Marsh (IM)	The vegetated tidal wetland zone lying generally between average high and low tidal elevations in saline waters. The predominant vegetation in this zone is low marsh cordgrass, Spartina alterniflora.
Dredged Spoil (DS)	All areas of fill material.

Source: http://www.dec.ny.gov/lands/5120.html

Figure 4-6 depicts the extent and distribution of tidal wetlands in the Oyster Bay/Cold Spring Harbor Complex watershed. Approximately 1,000 acres of tidal wetlands exist within the harbor complex. Extensive areas of coastal shoals, bars, and mudflats occur along Mill Neck Creek, the western and southern shoreline of Oyster Bay Harbor, Inner Cold Spring Harbor,



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Legend

- ☐ OB/CSH Watershed
- ▨ NYSDEC Freshwater Wetlands

NYSDEC Tidal Wetlands

- 🟫 Coastal Shoals, Bars, Mudflats
- 🟥 Dredged Soil
- ⬜ Formerly Connected
- 🟦 Fresh Marsh
- 🟦 High Marsh
- 🟪 Intertidal Marsh
- ▨ Littoral Zone
- ☐ County
- ☐ Town
- ☐ Subwatershed
- — Stream/River

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 4-6
Tidal and Freshwater Wetlands

and the northeast shoreline of Centre Island. Most of the shoreline in the harbor complex is fringed by vegetated (IM and HM) tidal wetlands of varying width, interrupted by man-made waterfront structures. Some of the larger areas of vegetated tidal wetlands in the harbor complex are (Cashin Associates, P.C., 2002):

- Marshes along most of the shoreline in Mill Neck Creek,
- Oak Neck Creek, a northwesterly tributary of Mill Neck Creek, which is characterized by NYSDEC as one of the largest undeveloped salt marshes remaining on the north shore of Long Island,
- The Town of Oyster Bay-owned marsh at Goose Point in Bayville,
- Centre Island Marsh, which connects to Oyster Bay,
- Marsh along the entire length of West Shore Road on Oyster Bay Harbor,
- St. John's Marsh at the head of Cold Spring Harbor.

Table 4-2 summarizes the distribution and extent of freshwater and tidal wetlands in the harbor complex subwatersheds. Freshwater wetlands account for approximately 1.7 percent of the harbor complex watershed area, with the majority of these located in the Beaver Brook, Cold Spring Brook, and Mill River subwatersheds. Tidal wetlands account for approximately 1,000 acres within the harbor complex subwatersheds and estuary. Approximately half of the acreage of tidal wetlands is within the estuary, outside of the subwatershed boundaries.

Table 4-2. Freshwater and Tidal Wetlands in the Oyster Bay/Cold Spring Harbor Complex

Subwatershed Name	Freshwater Wetland Acreage (Percent of Watershed)	Tidal Wetland Acreage	Total Wetland Acreage
Bailey Arboretum	22.8 (5.5%)	6.1	28.9
Beaver Brook	168 (3.5%)	0	168
Centre Island	0 (0%)	329.4	329.4
Cold Spring Brook	86.2 (1.8%)	0	86.2
Cold Spring Harbor	10.8 (0.4%)	169.9	180.7
Kentuck Brook	15.3 (1.0%)	0	15.3
Lloyd Neck	6.7 (0.8%)	62.6	69.3
Mill Neck Creek	0 (0.0%)	335.2	335.2
Mill River	108 (5.0%)	0	108
Oyster Bay Harbor	0 (0.0%)	169.4	169.4
Tiffany Creek	16.1 (0.9%)	0	16.1
Upper Kentuck Brook	0 (0%)	0	0
Upper White's Creek	0 (0%)	0	0
White's Creek	0 (0%)	0	0
Harbor Complex Watershed	**433.9 (1.7%)**	**1,072.6**	**1,506.5**

4.7 Fish and Wildlife Resources

Portions of the Oyster Bay/Cold Spring Harbor Complex and its watershed provide abundant and significant habitat that supports a variety of fish and wildlife. Various estuarine, palustrine, riverine, and upland areas provide habitat to finfish, shellfish, mammals, amphibians, reptiles and birds.

The most notable tracts of protected or preserved land (including submerged or tidal areas) within the estuary and watershed include:

- Oyster Bay National Wildlife Refuge,
- Charles T. Church/Shu Swamp Nature Preserve,
- Sagamore Hill National Historic Site,
- Planting Fields Arboretum,
- Muttontown Preserve,
- Bailey Arboretum,
- Stillwell Woods Park,
- Tiffany Creek Preserve.

These tracts of privately and publicly owned land provide valuable habitat or unique natural resources in an otherwise developed residential watershed. Due to the importance of these habitats, the State of New York has designated some of them as Significant Coastal Fish and Wildlife Habitats (SCFWH). According to NYSDEC, SCFWH include marshes, wetlands, mud and sandflats, beaches, rocky shores, riverine wetlands and riparian corridors, stream, bay and harbor bottoms, submerged aquatic vegetation beds, dunes, old fields, grasslands and woodlands and forests. These coastal habitats provide living and feeding areas for animals and are also economically important. Three NYSDEC-designated SCFWH areas exist in the watershed: Mill Neck Creek, Cold Spring Harbor, and Oyster Bay Harbor.

Oyster Bay Harbor and Cold Spring Harbor are hydrogeomorphically different from Mill Neck Creek, being predominantly composed of deep water estuarine habitats. Mill Neck Creek, in contrast, is predominantly composed of a tidal creek and marsh estuarine habitats. Each estuarine habitat provides unique resources for the fish and wildlife that use them. All or portions of these areas make up the majority of the Oyster Bay National Wildlife Refuge.

The Oyster Bay National Wildlife Refuge (NWR) is a 3,200-acre refuge that is the largest in the Long Island National Wildlife Refuge Complex. Oyster Bay NWR includes the northern three-quarters of Oyster Bay Harbor, the northwestern quadrant of Cold Spring Harbor (approximately 1,000 acres), and all of Mill Neck Creek. The refuge consists of bay bottom, saltmarsh, and freshwater wetlands systems. Bay bottom is the largest proportion of habitat owned and managed by the USFWS (78%). The remaining 22% consists of saltmarsh (low and high), estuarine stream bed, and unconsolidated shore habitats (10%, 9% and 3% respectively). The refuge also includes Mill Pond and its associated freshwater wetlands. The Oyster Bay NWR is well-sheltered from Long Island Sound and, as such, provides excellent winter habitat for a variety of water fowl and shorebirds. It also provides significant nursery and feeding habitat for finfish and substrate for shellfish (USFWS, 2009).

The following sections describe representative habitats and protected lands to illustrate the diverse and rich ecological communities that exist within the Oyster Bay/Cold Spring Harbor Complex and its watershed. The presence of diverse fish and wildlife habitats and species is indicative of the capacity of the harbor complex and its watershed to support these natural resources, despite the developed suburban landscape that makes up a large percentage of the watershed.

4.7.1 Estuarine Habitats

Oyster Bay/Cold Spring Harbor

The NYSDEC-designated SCFWH in Oyster Bay consists of approximately 2,500 acres of open tidal waters, mud flats, salt marshes, tidal creeks and sand islands. Depth of water at mean low tide ranges from 6 feet to 30 feet with some areas greater than 50 feet (USFWS, 2009; NYSDOS, 2005).

The designated SCFWH in Cold Spring Harbor consists of approximately 2,500 acres of open tidal waters, mud flats, salt marshes, tidal creeks and sand islands. Depth of water at mean low tide ranges from 6 feet to 20 feet with some areas as deep as 70 feet. Only a few areas of undeveloped salt marsh remain, including St. John's Marsh located at the southern end of the harbor and unnamed tidal marshes on the west shore associated with the Sagamore Hill National Historic Site (NYSDOS, 1987).

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Oyster Bay/Cold Spring Harbor and its associated lagoons, smaller embayments and tidal marshes serve as nursery and feeding habitat for various marine fish species including scup (*Stenotomus chrysops*), striped bass (*Morone saxatilis*), bluefish (*Pomatomus saltatrix*), Atlantic silverside (*Menidia menidia*), Atlantic menhaden (*Brevoortia tyrannus*), winter flounder (*Pseudopleuronectes americanus*), and blackfish (*Tautoga onitis*). This area is also known as one of a few spawning runs for smelt (*Osmerus mordax*) on Long Island (NYSDOS, 1987).

Attempts in recent years have been made to open up fish passage throughout the watershed to anadromous fish (which spend most of their adult lives in coastal marine waters) such as river herring (*Alosa sapidissim*), sea lamprey (*Petromyzon marinus*) and sea-run brook trout and catadromous fish (which live in freshwater but spawn at sea) such as American eel (*Anguilla rostrata*). (NYSDOS, 2005; Gomez & Sullivan, undated). A fish ladder has been constructed at the downstream end of Beaver Lake to open passage to sea run trout and potentially other anadromous and catadromous fish (NYSDOS, 2005).

Fish passage feasibility studies have also been completed by the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay to evaluate restoration of diadromous fish (which travel between salt and freshwater and include both anadromous and catadromous fish) to the Mill River and other areas of the harbor complex watershed. According to an evaluation conducted by NYSDEC, Region 1 Fisheries Bureau (Kozlowski, 2001), the fishery in the Oyster Bay/Mill River system is unusual for Nassau County (Gomez & Sullivan, undated) due to the documented presence of brown trout and brook trout.

The NYSDEC conducted electrofishing of Mill River above the pond near Glen Cove Road in December 1993 and discovered that Mill River, upstream of Mill Pond, has a naturally reproducing brown trout population. It is one of three known reproducing brown trout populations on Long Island. The NYSDEC believes this population became established from stockings of brown trout in Mill Pond, as annual stocking has occurred since 1978. NYSDEC continues to stock brown trout in Mill Pond.

The presence of brook trout in Beekman Creek is one of only two known spawning populations in Nassau County. The other exists in the Beaver Brook subwatershed, in Shu Swamp Preserve. In February 2008, for the first time, natural reproduction of brook trout in Beaver Brook was documented by NYSDEC and Long Island Trout Unlimited (Gomez & Sullivan, undated).

Brook trout are also believed to be using Mill River during various times of their life cycle. From the Mill River confluence, Beekman Creek runs upstream under the Beekman Beach parking lot and West Shore Avenue where it runs exposed for approximately 75 yards before passing beneath the LIRR Bridge. In December 1995, ten brook trout were captured in Beekman Creek ranging in size from 3.4 to 10.2 inches with at least three size classes. Brook trout have never been stocked in Beekman Creek; however, they were stocked in Mill Pond until 1977 by the NYSDEC. Brook trout were stocked in Mill River upstream of the dam in 1996 and 1997 by the Cold Spring Harbor Fish Hatchery (Gomez & Sullivan, undated).

Shellfish

Oyster Bay/Cold Spring Harbor is one of the most productive shellfish growing areas in New York State. The Frank M. Flower & Sons, Inc. shellfish company, along with more than 80 independent commercial baymen, annually harvests up to 90% of New York's oyster crop from the Oyster Bay NWR. In addition to oysters, Oyster Bay/Cold Spring Harbor produces a substantial crop of other commercial shellfish including soft clams (*Mya arenaria*), mussels, Conch (*Strombus* sp.), Razor clam (*Ensis directus*), and most notably hard clams (*Mercenaria mercenaria*).

Landing data from the NYSDEC Shellfish Division illustrates the abundant commercial value of the shellfish population in Oyster Bay/Cold Spring Harbor. The average annual landing of oysters between 2005 and 2007 was more than 25,000 bushels worth an estimated annual average of $1.6 million. By comparison, the average hard clam production from Oyster Bay/Cold Spring Harbor between 2005 and 2007 was over 61,000 bushels worth an estimated annual average of $5.5 million. *Table 4-3* summarizes annual shellfish landing data from the NYSDEC Shellfish Division from 2005, 2006 and 2007 for Oyster Bay (NYSDEC Shellfish Harvest Area NS2) (NYSDEC, 2008).

Table 4-3. Shellfish Production in Oyster Bay

Shellfish	2005		2006		2007	
	Bushels	Value*	Bushels	Value*	Bushels	Value*
Hard Clams	53,744	$5,062	58,040	$5,201	72,492	$6,489
Soft Clams	65	$5.2	169	$15	69	$6.2
Oysters	27,010	$1,812	14,879	$964	33,415	$2,239
Mussels	--	--	--	--	180	$1.8
Conch	147	$3.9	447	$8.6	855	$16.4
Razor Clams	--	--	32	$1.3	--	--

* in thousands of dollars

Overharvesting, habitat destruction, pollution, and disease reduced native oyster populations in Oyster Bay and Cold Spring Harbor to 1 to 2 percent of historic populations by the early 1960's. Wild oyster reefs have been gone so long that there is no record of where they were. To compensate for the decline of oyster populations, the only remaining commercial oyster company, Frank M. Flower & Sons, raises oysters in a hatchery and uses them to seed the underwater beds which they lease from the Town of Oyster Bay. The oyster population has been restored to the abundant levels seen in the past, and up to 90% of NY's oyster harvest comes from Oyster Bay. Construction of artificial reefs can be used to boost the commercial wild harvest of oysters by the local independent baymen as well. Those reefs could be populated with larvae generated by the annual spawning of the large number of broodstock size oysters now present in the bay.

Birds

The sheltered nature of Oyster Bay/Cold Spring Harbor provides excellent winter and breeding habitat for a variety of avian species including waterfowl; shorebirds; gulls, terns and allied species; song birds; and raptors. Over 110 species of birds have been documented in the Oyster Bay NWR and other coastal areas, (USFWS, 2006, 2009; NYDOS, 1987, 2005; Edinger et al., 2002, Conolly, 1991).

- *Waterfowl* – Numerous waterfowl use the Oyster Bay/Cold Spring Harbor area as over-winter habitat. Mid-winter aerial surveys of the embayment have documented an abundance of waterfowl, in some cases more than 20,000 individuals per survey, during peak usage. Common species include American black duck (*Anas rubripes*), Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), greater scaup (*Aythya marila*), lesser scaup (*Aythya affinis*), canvasback (*Aythya valisineria*), bufflehead (*Bucephala albeola*), common goldeneye (*Bucephala clangula*), American widgeon (*Anas Americana*), mergansers (common (*Mergus merganser*), red-breasted (*Mergus serrator*) and hooded (*Lophodytes cucullatus*)) long-tail duck (*Clangula hyemalis*), gadwall (*Anas strepera*), green-winged teal (*Anas carolinensis*), and mute swan (*Cygnus olor*)(NYDOS, 1987, 2005; USFWS, 2006). It is estimated that 85% of all the duck species using the embayment as over-winter habitat are greater scaup, bufflehead and black duck. (USFWS, 2006).

- *Shorebirds, Gulls, Terns and Allied Species* – The category of shorebirds includes cormorants, gulls, terns egrets, grebes, plovers and the like. The most common of these species in Oyster Bay/Cold Spring Harbor are double-crested cormorant (*Phalacrocorax auritus*) and gulls. The double-crested cormorant is a year-round resident, with populations peaking during breeding season (between April and October). Great cormorants also inhabit Oyster Bay/Cold Spring Harbor, however, not typically as a breeding species but as an over-winter species (USFWS, 2006, Conolly, 1991).

- *Gulls* – As in most northeastern coastal areas, gulls are very common. Most common of these include herring gull (*Larus argentatus*), great black-backed gull (*Larus marinus*), ring-billed gull (*Larus delawarensis*), laughing gull (*Leucophaeus atricilla*) and Bonaparte's gull (*Chroicocephalus philadelphia*) (SCFWH – CSH/MNC; Oyster Bay NWR). An estimated 1,500 gulls, mostly herring and great black-backed gulls, use the Oyster Bay NWR over winter. However some, such as the laughing gulls, use the NWR in the summer (USFWS, 2006; Conolly, 1991)

- *Passerine Birds* – Variable coastal habitats support a wide assemblage of passerine birds (song birds). These birds may make use of any number of habitats from beaches to tidal marshes to upland forests and will move among different habitats depending on the time of year, availability of food, and breeding status. Common passerine birds that have been observed throughout the area include, but are not limited to, mourning dove (*Zenaida macroura*), gray catbird (*Dumetella carolinensi*), northern mockingbird (*Mimus polyglottos*), northern flicker (*Colaptes auratus*), eastern kingbird (*Tyrannus tyrannus*), American robin (*Turdus migratorius*), barn swallow (*Hirundo rustica*), red-winged blackbird (*Agelaius phoeniceus*), house sparrow (*Passer domesticus*), sharp-tailed sparrow (*Ammodramus caudacutus*), and fish crow (*Corvus ossifragus*) (NPS, 2009, Conolly, 1991).

- *Raptors* – Numerous raptors have been observed in Oyster Bay/Cold Spring Harbor. These include piscivorous (i.e., fish-eating) species like wintering populations of bald eagle (*Haliaeetus leucocephalus)* and breeding populations of osprey (*Pandion haliaetus*); carnivorous species like the red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*); and scavenger species like the turkey vulture (*Cathartes aura*) (USFWS, 2006; NPS, 2009; Conolly, 1991).

- *Other Common Bird Species* – Other common shorebird, migrants and residents, have been observed in the NWR at various times of the year. These species include common loon (*Gavia immer*), red-throated loon (*Gavia stellata*), horned grebe (*Podiceps auritus*), pie-billed grebe (*Podilymbus podiceps*), American coot (*Fulica americana*), belted kingfisher (*Megaceryle alcyon*), great blue heron (*Ardea herodias*), black-crowned night heron (*Nycticorax nycticorax*), yellow-crowned night heron (*Nycticorax violaceus*), green heron (*Butorides virescens*), great egret (*Ardea alba*), snowy egret (*Egretta thula*), least bittern (*Ixobrychus exilis*), black-bellied plover (*Pluvialis squatarola*), dunlin (*Calidris alpina*), greater yellow legs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), least sand piper (*Calidris minutilla*), spotted sandpiper (*Actitis macularia*) (USFWS, 2006; Conolly, 1991).

Mill Neck Creek

The NYSDEC-designated SCFWH in Mill Neck Creek consists of approximately 700 acres of open tidal waters, tidal marshes and creeks, mudflats and wooded freshwater swamps. The fish and wildlife habitat areas that are associated with Mill Neck Creek include Oak Neck Creek, Bayville Brook, and Beaver Brook.

The network of tidal creeks and salt marshes that make up much of Mill Neck Creek provide a unique and valuable habitat to a variety of species. This area is composed of a combination of high salt marsh, low salt marsh, intertidal mudflat communities and sub-tidal areas. Each of these communities is a part of the larger coastal marsh ecosystem – one transitioning to another – forming a mosaic with adjacent communities.

The low salt marsh community is characterized by regular flooding of semidiurnal tides. The vegetation of the low salt marsh is a nearly monospecific stand of cordgrass (*Spartina alterniflora*). A few species of marine algae can form dense mats on the surface sediments between the cordgrass stems, including knotted wrack (*Ascophyllum nodosum*), and rockweed (*Fucus vesiculosus*). Sea lettuce (*Ulva* spp.), and hollow green weeds (*Enteromorpha* spp.) can be abundant, especially in early summer. Other plants that are present in very low numbers include glasswort (*Salicornia europaea*), salt marsh sand-spurry (*Spergularia marina*), and lesser sea blite (*Suaeda maritima*) (Edinger et al., 2002).

Animals common to these low salt marsh communities include clapper rail (*Rallus longirostris*), willet (*Catoptrophorus semipalmatus*), marsh wren (*Cistothorus palustris*), seaside sparrow (*Ammodramus maritimus*), fiddler crabs (*Uca pugilator* and *U. pugnax*) nesting along creek banks, ribbed mussel (*Geukensia dimissa*), and at high tide mummichog (*Fundulus heteroclitus*), sheepshead minnow (*Cyprinodon variegatus*), and several other small fishes that live in the tidal creeks at low tide (Edinger et al., 2002).

The high salt marsh community is characterized by less frequent flooding compared to low salt marsh communities. Typically, flooding occurs only at the spring tide; however, semidiurnal tidal fluctuations maintain regular, saturated conditions in the soil. The vegetation of the high salt marsh is dominated in many areas by either salt-meadow grass (*Spartina patens*) or a dwarf form of cordgrass (*Spartina alterniflora*); also common are large areas dominated by spikegrass (*Distichlis spicata*), black-grass (*Juncus gerardii*), and glassworts (*Salicornia* spp.) (Edinger et al., 2002).

Characteristic species of the upper high marsh (the area that grades into salt shrub or is topographically slightly higher than its surroundings) are blackgrass, switchgrass (*Panicum virgatum*), sea-lavender (*Limonium carolinianum*), seaside gerardia (*Agalinus maritima*), seaside goldenrod (*Solidago sempervirens*), and slender saltmarsh aster (*Aster tenuifolius*) (Edinger et al., 2002).

Animals characteristic to the high salt marsh include salt marsh mosquitoes (*Aedes* spp.), greenhead flies (*Tabanidae*), coffeebean snail (*Melampus bidentatus*), sharp-tailed sparrow (*Ammodramus caudacutus*), marsh wren (*Cistothorus palustris*), eastern meadowlark (*Sturnella magna*), clapper rail (*Rallus longirostris*), and American black duck (*Anas rubripes*).

4.7.2 Riverine and Palustrine Habitats

Representative areas of riverine and palustrine habitats in the Oyster Bay/Cold Spring Harbor Complex are described below.

Charles T. Church/Shu Swamp Nature Preserve

The Charles T. Church/Shu Swamp Nature Preserve (Shu Swamp) is located in the Beaver Brook subwatershed immediately upstream of Beaver Lake. This 60-acre preserve is dominated by a forested wetland system set in the heavy clay soils of the Mill Neck Creek valley. The wetland system is dominated by trees, specifically red maple (Acer rubrum), tulip tree (*Liriodendron tulipifera*) and black tupelo (*Nyssa sylvatica*) and an understory of primarily sweet pepperbush.

Red maple-black gum swamps are hardwood swamps that occur in poorly drained depressions. Hummock-hollow microtopography is usually evident in these wetlands. Other characteristic shrubs of this wetland type are highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), fetterbush (*Leucothoe racemosa*), dangleberry (*Gaylussacia frondosa*), and on the Atlantic coastal plain inkberry (*Ilex glabra*). Vines such as greenbrier (*Smilax rotundifolia*), sawbrier (*Smilax glauca*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*) are present at low amounts in the understory. The herbaceous layer is not particularly diverse, characterized by cinnamon fern (*Osmunda cinnamomea*), skunk cabbage (*Symplocarpus foetidus*). The nonvascular layer may include some *Sphagnum* species (Edinger et al., 2002).

Given the hummock-hollow microtopography of the swamp, small pockets of breeding amphibian pools provide habitat for species such as wood frog (*Rana sylvatica*), spring peeper (*Pseudacris crucifer*), northern red-back salamander (*Plethodon glutinosa*) and possibly spotted salamander (*Ambystoma maculatum*).

Common bird species that may inhabit Shu Swamp include American robin *Turdus migratorius*, hermit thrush (*Catharus guttatus*), veery *Catharus fuscescens*, grey catbird (*Dumetella carolinensis*), and wood duck *(Aix sponsa).* Common mammals may include Virginia opossum (*Didelphis virginiana*), short-tailed shrew (*Blarina brevicauda*), little brown myotis (*Myotis lucifugus*), eastern cottontail (*Sylvilagus floridanus*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), mink (*Neovison vison*)/ Recent observations indicate that river otter (*Lontra canadensis*) may also have begun populating local waterbodies such as Shu Swamp (Rather, 2008).

Muttontown Preserve

Muttontown preserve is a 550-are parcel located in the upper reaches of the Mill River subwatershed. Nassau County's largest nature preserve, this tract of land consists of fields, moist woodlands, and kettle-hole ponds.

The dominant vegetation community type in Muttontown Preserve is a coastal oak-hickory forest. These types of forests are co-dominated by several species of oaks (*Quercus* spp.) and hickory (*Carya* spp.) and are typically found in dry well-drained, loamy sand of knolls, upper slopes, or slopes of glacial moraines. The forest is usually co-dominated by two or more species of oaks, usually white oak (*Q. alba*), black oak (*Quercus velutina*) and chestnut oak (*Q. montana*). Scarlet oak (*Quercus coccinea*) is also a common associate. Mixed with the oaks, usually at moderate densities, are one or more of the following hickories: pignut (*Carya glabra*), mockernut (*C. tomentosa*), and sweet pignut (*C. ovalis*) (Edinger et al., 2002).

Characteristic animals include eastern towhee (*Pipilo erythrophthalamus*), vireos (*Vireo* spp.), woodpeckers (Edinger et al., 2002). Muttontown Preserve is also notable for having several kettle-hole ponds. In addition, there are an estimated eight to ten vernal pools. These habitats offer both breeding and refuge for several common species of amphibians including green frog (*Rana clamitans*), American toad (*Bufo americanus*) wood frog, spring peepers, and spotted salamanders. Tiger salamanders (*Ambystoma tigrinum*) have also been documented at the site; however, the local populations appears to have been locally extirpated.

Sagamore Hill National Historic Site

Sagamore Hill National Historic Site is located on the western shore of Cold Spring Harbor. One of Sagamore Hill's greatest natural resource values lies in the high number of varied habitat types located in close proximity to each other. From oak-tulip forests, to open fields, to ponds, to salt marshes, the park offers a wide variety of habitat types that support a diverse assemblage of plants and animal species. The following account was provided by the National Park Service for the Sagamore Hill National Historic Site.

Birds

Though a small park, Sagamore Hill contains a range of vegetation types and habitats that support a wider variety of bird species. Most notably, mature forest, salt marsh, and beach habitats on the eastern portion of the site offer excellent natural habitat. Notable species found here include the winter wren (*Troglodytes troglodytes*), great crested flycatcher (*Myiarchus crinitus*), yellow-billed cuckoo (*Coccyzus americanus*), and ruby-crowned kinglet (*Regulus calendula*).

Reptiles & Amphibians

Reptiles and amphibians can be found in nearly all of Sagamore Hill's vegetative communities, from dry upland forests to salt marshes. Many of the amphibian and reptile species of the park exhibit complex life-cycles that require complex habitat mosaics for reproduction and over-wintering. Species such as wood frogs and spotted salamanders (a locally uncommon species) spend only a short time within the park's ponds during the breeding season and utilize adjacent forested upland for the remainder of the year. Aquatic species, such as painted and snapping turtles, likewise depend upon well-drained upland forests and fields for nesting.

Terrestrial species such as the eastern red-backed salamander, common garter snake, and box turtle extensively utilize Sagamore Hill's mixed deciduous forests, with the box turtle in particular depending upon large, roadless patches. Heron and Woodpile ponds constitute the only freshwater wetland sites within the park, but they exhibit the highest species diversity of amphibians and reptiles. These sites are critical for obligate vernal-pool breeders, such as wood frogs, spotted salamanders, spring peepers, and grey treefrogs.

The northern diamondback terrapin, though the most abundant reptile at Sagamore Hill, is found exclusively within the park's estuarine habitats. These turtles are found primarily in Eel Creek and Cold Spring Harbor and nest on the adjacent beach. Though small, the maritime complex at Sagamore Hill is a vital part of the larger harbor complex, which supports one of the larger diamondback terrapin populations in the state.

Insects, Spiders, Centipedes, Millipedes

According to a recent odonate survey of Sagamore Hill, the site hosts at least twenty-one species of dragonflies and damselflies, which utilize a variety of habitats within the park.

Heron Pond, located in the eastern forest, had one of the highest species diversities for odonates in the entire park, with six species of dragonflies and two species of damselflies recorded at the site. These species included the park's only recorded Twelve-spotted skimmer and Slender spread-wings. Three dragonflies and one damselfly were also recorded at the Woodpile Pond just north of the parking area. Two fields within the park also displayed high species abundance, with at least 10 species being found in each. These included one rare species, the Comet Darner (*Anax Longipes*).

Five species of dragonflies have also been recorded within the estuarine complex at the eastern edge of the park. These include the only Seaside dragonlet recorded at Sagamore Hill, as well as Wandering and Spot-winged gliders.

4.7.3 Threatened and Endangered Species

The NYSDEC Natural Heritage Program was consulted regarding rare or state-listed animals and plants, significant communities and other significant habitats within the Oyster Bay/Cold Spring Harbor Complex watershed. A query of the Natural Heritage Program database was generated on January 27, 2009 and a response, dated February 6, 2009, was received from NYSDEC Natural Heritage Program listing rare species and ecological communities.

The NYSDEC Natural Heritage Program database shows, based on recent observation and documentation (1980 to present), that there are 6 rare or state-listed animal species and 16 rare or state-listed plant species within (in whole or in part) the Oyster Bay/Cold Spring Harbor Complex watershed. Animal species include one species of amphibian, four species of birds and one species of butterfly. In addition, six significant natural communities were identified within the watershed.

The NYSDEC Natural Heritage Program database also provided historic records of plants and animals, located in the vicinity of the watershed, which have not been documented since 1979. One rare or state-listed animal species and eight rare or state-listed plant species have historically been identified within the harbor complex watershed.

The location of these species and the information provided by the NYSDEC Natural Heritage Program is considered sensitive. It is strongly recommended that the information provided should not be disseminated to the public without permission from the Natural Heritage Program. For this reason, details regarding the exact species and communities have not been appended to this report.

5 Water Quality

5.1 Water Quality Classifications, Standards, and Impairments

All waters in New York State are assigned a classification indicating their best uses including drinking water source, swimming, boating, fishing and shellfishing. Letter classes such as A, B, C, and D are assigned to fresh waters and two-letter classifications beginning with S are assigned to saline (marine) waters. Water quality classifications for New York surface waters are found at 6 NYCRR Part 701, and classifications for surface waters in the Oyster Bay/Cold Spring Harbor Complex are summarized in *Table 5-1*.

Table 5-1. Selected Surface Water Quality Classifications

Classification	Description
A	The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
B	The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
C	The best usage of Class C waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
SA	The best usages of Class SA waters are shellfishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
SB	The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival.
SC	The best usage of Class SC waters is fishing. These waters shall be suitable for fish, shellfish, and wildlife propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

Note: Complete description of classifications at http://www.dec.ny.gov/chemical/23853.html.

Figure 5-1 shows the water quality classifications assigned to fresh and marine waters in the Oyster Bay/Cold Spring Harbor Complex and its watershed. All freshwaters in the watershed are Class C. Class SA, SB, and SC marine waters are located in the Oyster Bay/Cold Spring Harbor Complex, with SA designations assigned to the open water areas and many nearshore areas. Exceptions are the Frost Creek, Mill Pond, Beaver Brook, and Fresh Pond areas where saline waters have an SC classification (*Figure 5-1*).

Numeric and narrative water quality standards for New York waters are found at 6 NYCRR Part 703. The narrative standards for surface water classifications A, B, C, SA, SB, and SC are shown in *Table 5-2*. Numeric standards for these surface water classifications for pH, dissolved oxygen (DO), dissolved solids, total coliform, and fecal coliform are provided in *Table 5-3*.

State of the Watershed Report
Oyster Bay/Cold Spring Harbor

Friends of the Bay

Friends of the Bay
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Legend

- ☐ OB/CSH Watershed
- ☐ Subwatershed
- ☐ County
- ☐ Town

Stream Class

- — C
- — SA
- — SB
- — SC

Lake/Pond/Ocean Class

- 🟥 C
- 🟦 SA
- 🟨 SB
- 🟩 SC

N
W E
S

0 0.5 1 2
Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 5-1
Surface Water Quality Classifications

Table 5-2. Narrative Water Quality Standards

Parameter	Classes	Standard
Taste-, color-, and odor-producing, toxic and other deleterious substances	A, B, C, SA, SB, SC	None in amounts that will adversely affect the taste, color or odor thereof, or impair the waters for their best usages.
Turbidity	A, B, C, SA, SB, SC	No increase that will cause a substantial visible contrast to natural conditions.
Suspended, colloidal and settleable solids	A, B, C, SA, SB, SC	None from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages.
Oil and floating substances	AA, A, B, C,SA, SB, SC	No residue attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules of grease.
Garbage, cinders, ashes, oils, sludge and other refuse	SA, SB, SC	None in any amounts.
Phosphorus and nitrogen	A, B, C,SA, SB, SC	None in amounts that will result in growths of algae, weeds and slimes that will impair the waters for their best usages.
Thermal discharges	AA, A, B, C, SA, SB, SC	Details in 6 NYCRR Part 704.
Flow	A, B, C	No alteration that will impair the waters for their best usages.

Table 5-3. Numeric Water Quality Standards

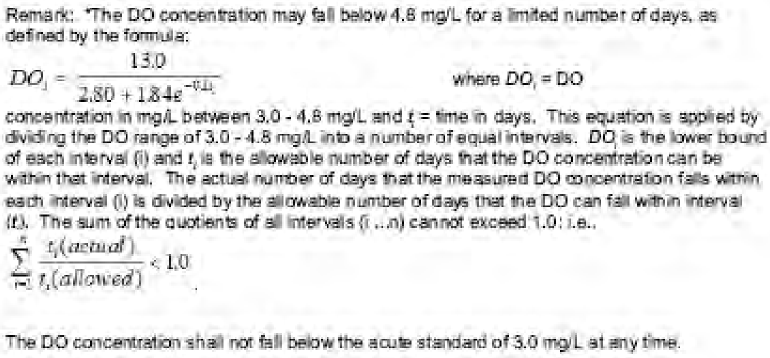
Parameter	Classes	Standard
pH	A, B, C	Shall not be less than 6.5 nor more than 8.5.
	SA, SB, SC	The normal range shall not be extended by more than one-tenth (0.1) of a pH unit.
Dissolved oxygen (DO)	A, B, C	For trout spawning waters (TS), the DO concentration shall not be less than 7.0 mg/L from other than natural conditions. For trout waters (T), the minimum daily average shall not be less than 6.0 mg/L, and at no time shall the concentration be less than 5.0 mg/L. For nontrout waters, the minimum daily average shall not be less than 5.0 mg/L, and at no time shall the DO concentration be less than 4.0 mg/L.
	SA, SB, SC	Chronic: Shall not be less than a daily average of 4.8 mg/L*  Remark: *The DO concentration may fall below 4.8 mg/L for a limited number of days, as defined by the formula: $DO_i = \frac{13.0}{2.80 + 1.84e^{-0.1t_i}}$ where DO_i = DO concentration in mg/L between 3.0 - 4.8 mg/L and t_i = time in days. This equation is applied by dividing the DO range of 3.0 - 4.8 mg/L into a number of equal intervals. DO_i is the lower bound of each interval (i) and t_i is the allowable number of days that the DO concentration can be within that interval. The actual number of days that the measured DO concentration falls within each interval (i) is divided by the allowable number of days that the DO can fall within interval (t_i). The sum of the quotients of all intervals (i ...n) cannot exceed 1.0: i.e., $\sum_{i=1}^{n} \frac{t_i(actual)}{t_i(allowed)} < 1.0$ The DO concentration shall not fall below the acute standard of 3.0 mg/L at any time.

Table 5-3. Numeric Water Quality Standards

Parameter	Classes	Standard
	SA, SB, SC	Acute: Shall not be less than 3.0 mg/L at any time.
Dissolved Solids	A, B, C	Shall be kept as low as practicable to maintain the best usage of waters but in no case shall it exceed 500 mg/L.
Total Coliforms (number per 100 ml)	A, B, C, D, SB, SC	The monthly median value and more than 20 percent of the samples, from a minimum of five examinations, shall not exceed 2,400 and 5,000, respectively.
	SA	The median most probable number (MPN) value in any series of representative samples shall not be in excess of 70.
Fecal Coliforms (number per 100 ml)	A, B, C, SB, SC	The monthly geometric mean, from a minimum of five examinations, shall not exceed 200

Assessments of water quality are typically based on comparisons with numeric and narrative criteria for various pollutants or water characteristics (e.g., color or dissolved oxygen) and determination of impairment. Waters that are unable to support the uses for which they are designated (e.g., primary or secondary contact recreation, fishing, water supply, habitat, etc.) are said to be impaired. Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987, Public Law 100-4 and regulations for Water Quality Planning and Management found at 40 CFR 130 require each state to identify waters not meeting water quality standards for any given pollutant applicable to the water's designated uses, i.e., classification. The NYSDEC develops the 303(d) list for New York waters.

The 2008 303(d) list references Mill Neck Creek and its tidal tributaries, Cold Spring Harbor and its tidal tributaries, and Oyster Bay Harbor as impaired due to pathogens from urban and stormwater runoff and, in the case of Mill Neck Creek, municipal discharges are also identified as a source of impairment. As reflected by these impairments, water quality issues in the Oyster Bay/Cold Spring Harbor Complex have focused on elevated pathogen levels, which impact shellfish harvesting in the estuary. Shellfish, such as oysters and clams, are filter feeders, meaning they filter the water around them to feed on microscopic organisms. If the water column contains pathogenic bacteria and viruses, they can be retained in the shellfish and pose a health threat if the oysters or clams are eaten raw or partially cooked.

Although identified as impaired, these waters are no longer on the 303(d) list because, in response to these impairments, the NYSDEC has developed Total Daily Maximum Loads (TMDL) for pathogens for the impaired waters in the Oyster Bay/Cold Spring Harbor complex. A TMDL is required for each pollutant violating or causing a violation of water quality standards for each impaired water body. A TMDL determines the maximum amount or load of a pollutant from both point and non-point sources that a water body can receive and continue to meet applicable water quality standards. In 2003, a TMDL for Oyster Bay Harbor and Mill Neck Creek and its tidal tributaries was developed (NYSDEC et al., 2003). In 2007, Cold Spring Harbor was included in the New York Shellfish Pathogen TMDL (NYSDEC et al., 2007).

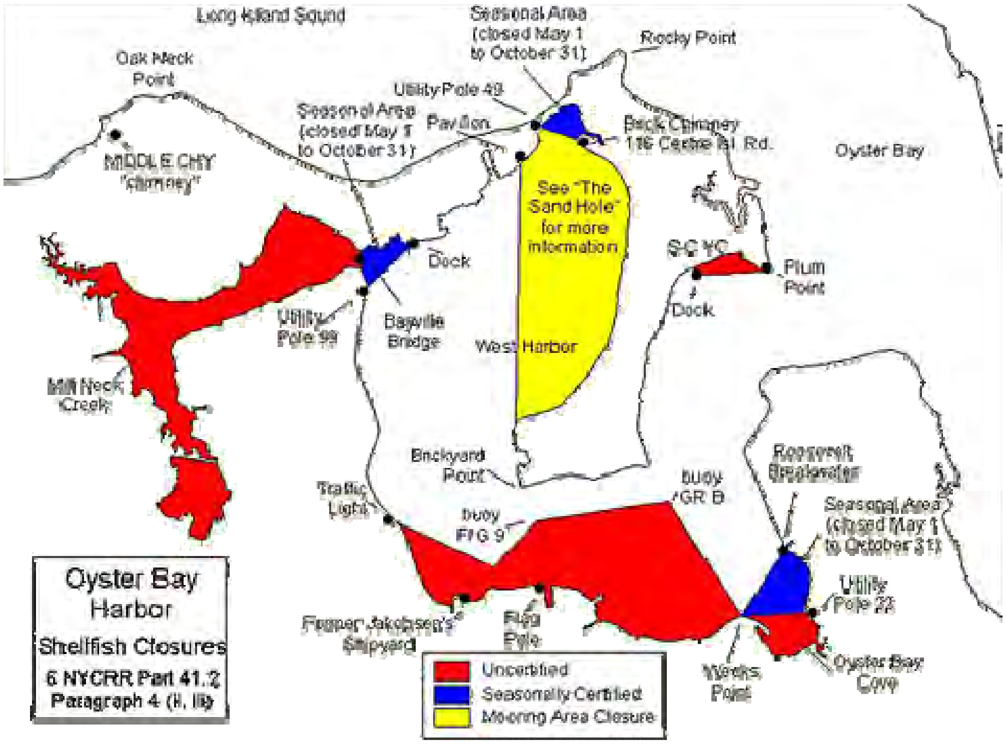
5.2 History of Water Quality Issues

The TMDL for Oyster Bay Harbor and Mill Neck Creek (NYSDEC, 2003) summarized the water quality issues and identified potential sources of pathogens by conducting a shoreline survey and investigation of point and non-point sources of pollutants. The following were identified as pathogen sources:

- Centralized wastewater discharges (Oyster Bay wastewater treatment plant, Seawanhaka Corinthian Yacht Club, The Birches),
- Domestic waste disposal using cesspools,
- Stormwater discharges,
- Freshwater streams,
- Boats/marinas/mooring areas,
- Wildlife and waterfowl.

The impact of these point and non-point sources varies spatially throughout the harbor complex. *Figures 5-2 and 5-3* show the areas in the harbor complex subject to shellfish harvesting closures. Uncertified areas are those that fail to meet the water quality standards for shellfishing listed in *Table 5-3*. Conditionally certified harvesting areas are those that marginally fail to meet the certified shellfish harvesting area criteria and may be operated during certain times of the year under certain rainfall conditions. Areas around the wastewater treatment plant outfalls, marinas, and boat mooring areas are subject to administrative closures for shellfishing. Although these areas may meet the water quality standard for coliform, the administrative closures are necessary in the event of a wastewater treatment plant malfunction, and they provide a buffer between pathogen sources and nearby certified shellfish harvesting areas.

The New York Shellfish Pathogen TMDL (NYSDEC et al., 2007) provided a generic identification of pollution sources likely to affect pathogen concentrations in Cold Spring Harbor. These included agricultural sources, marine vessels/marinas, urban/residential sources including pet waste, waterfowl, beach wrack, and marine sediment resuspension.



Source: http://www.dec.ny.gov/regs/4014.html

Figure 5-2. Oyster Bay Harbor and Mill Neck Creek Shellfish Closure Areas

Source: http://www.dec.ny.gov/regs/4014.html

Figure 5-3. Cold Spring Harbor Shellfish Closure Areas

In addition to these broader analyses of water quality, there have been specific studies of water quality in locations in the estuary complex where chronic water quality problems exist. Over the past several years, the Friends of the Bay water quality monitoring program (See Section 5.1.3) has identified elevated concentrations of pathogens and nutrients in the area near Beekman Beach. This area is near the discharge of the Mill River to Oyster Bay Harbor. In 2007, the Town of Oyster Bay's *Mill River Watershed Study and Public Stewardship Program* report summarized the nearly 30 years of investigations into water quality in the Mill River watershed. Beginning with a 1977 study, high coliform levels were noted in the Mill River outflow and the need for reduced dumping and dog wastes and sediment removal from Mill Pond were identified as measures to improve water quality. The 1995 *Oyster Bay/Cold Spring Harbor Complex Stormwater Management/Coastal Water Qualty Improvement Program (SM/WQIP) Report* identified stormwater outfalls along the shoreline and recommended general measures to improve stormwater quality. A study of the Mill Pond outflow in 2001 (Cashin Associates, P.C., 2001) identified the need to address wet-weather flows from the pond to reduce pathogen loading to Oyster Bay Harbor and suggested dredging or drawdown in anticipation of significant rainfall events to reduce loading from Mill Pond.

In 2004-2005, three rounds of dry-weather sampling at three locations in the Mill River watershed were conducted and are presented in the *Mill River Watershed Study and Public Stewardship Program* report. Based on the three samples, the report concluded that:

- Fecal and total coliform levels were consistent with typical results for similar waters under dry weather conditions.
- Elevated nitrate levels found on the South Side of Glen Cove Road are likely due to leachate from on-site wastewater disposal systems.
- Elevated phosphate levels and total dissolved solids from samples collected at a tributary near the Town Highway Yard may be due to runoff from the Yard.
- Despite the presence of golf course lands, arboretum grounds and cultivated areas, the samples did not exceed the detection limit for the herbicide atrazine, indicating it is unlikely to be a concern in the Mill River watershed.

5.3 Friends of the Bay Water Quality Monitoring Program

Friends of the Bay's ongoing water quality monitoring program in the Oyster Bay/Cold Spring Harbor Complex was developed in cooperation with the U.S. Fish and Wildlife Service, the U.S. Environmental Protection Agency, the NYSDEC, local governments, and other volunteer monitoring groups around Long Island Sound. Under the ongoing monitoring program, every Monday morning from April through October, data is collected on water quality and ambient conditions at 19 sites throughout the harbor complex. Since 2007, Friends of the Bay has also collected quarterly water quality data at 10 stream and outfall monitoring locations within the watershed. Sampling in the estuary and the watershed is conducted consistent with the Standard Operating Procedures and Quality Assurance Project Plans (QAPPs) that were approved by the EPA in 2006 and 2007 for the open water and stream and outfall monitoring, respectively.

5.3.1 Open Water Body Monitoring

Figure 5-4 shows the 19 monitoring locations in the Oyster Bay/Cold Spring Harbor Complex. During the 28-week annual monitoring season, the parameters measured by Friends of the Bay including:

- Bacteria - fecal coliform (since 2000) and enterococci (since 2004),
- Nutrients - ammonia, nitrate/nitrite, total Kjeldahl nitrogen, total phosphorus,
- Salinity,
- Water clarity - Secchi disk depth.

In addition to sample collection for these parameter, several environmental conditions are noted including the time the sample was collected; qualitative description of rainfall in the previous 24 hours; tidal stage on a scale of 1-4; air temperature; wind direction and speed; wave height (subjective, on a scale of 0-5); weather conditions (on a predetermined 1-6 scale); water color (subjective color, e.g. yellow-brown); cloud cover (0-5 scale); and any unusual conditions (i.e., odors, fish kills, debris).

5.3.2 Stream and Outfall Monitoring

In 2007, Friends of the Bay began collecting stream and outfall data from 10 major discharges into the estuary four times a year to complement the open water body monitoring program. The objectives of the stream and outfall monitoring program are to establish current baseline water quality conditions in the watershed, identify water quality impacts from potential point and non-point pollution sources, develop a water quality database to guide environmental decision-making, and measure the progress toward meeting water quality goals in the watershed.

The monitoring locations (*Figure 5-4*) include streams, ponds, an untreated sewage discharge, and a 'rotating' outfall that changes in an effort to identify other pollutant sources, based on a set of standard criteria. Samples are collected four times per year, with two of these monitoring events to occur following a period without precipitation ("dry weather" events), and the remaining two during precipitation events ("wet weather" events). The dry weather events are used to characterize background constituent inputs and potential dry weather issues such as illicit discharges, while the wet weather events provide information on pollutant concentrations and loadings associated with precipitation runoff.

Samples are analyzed for a variety of biological, chemical, and physical parameters including:

- Bacteria - fecal coliform and escherichia coli (E. coli),
- Nutrients - ammonia, nitrate/nitrite, total Kjeldahl nitrogen, total phosphorus,
- Chemical oxygen demand,
- Turbidity,
- Dissolved oxygen and temperature,
- Hardness,
- pH,
- Metals - lead, copper, zinc.

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Site ID	Location
OBS – 1	The Birches Sewage Outfall
OBS – 2	Beaver Lake Outflow
OBS – 3	Beekman Creek
OBS – 4	Mill River Headwaters
OBS – 5	Mill River Outflow
OBS – 6	White's Creek
OBS – 7	Tiffany Creek
OBS – 8	DeForest Pond Outflow
OBS – 9	St. John's Pond Outflow
FB-1	South Cold Spring Harbor Cove
FB-2	CSH Cove North Mooring Field
FB-3	CSH South
FB-4	CSH North
FB-5	Plum Point
FB-6	Seawanhaka Yacht Club PSTP outfall
FB-7	Oyster Bay Cove
FB-8	Whites Creek and OB-STP outfall
FB-9	Roosevelt Beach
FB-10	Beekman Beach and Mill Pond outfall
FB-11	West Harbor
FB-12	Turtle Cove
FB-13	Mill Neck Creek-East
FB-14	Mill Neck Creek -West
FB-15	Mill Neck Creek- South
FB-16	Mill Neck Creek-North
FB-17	The Birches STP
FB-18	Mill Neck Cove
FB-19	Flowers Oyster Hatchery

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🟥	OB/CSH Watershed
☐	Subwatershed
⊕	Monitoring Locations
—	Stream/River
🟦	Lake/Pond
▨	Swamp/Marsh
☐	County
⬚	Town

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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 5-4
Water Quality
Monitoring Locations

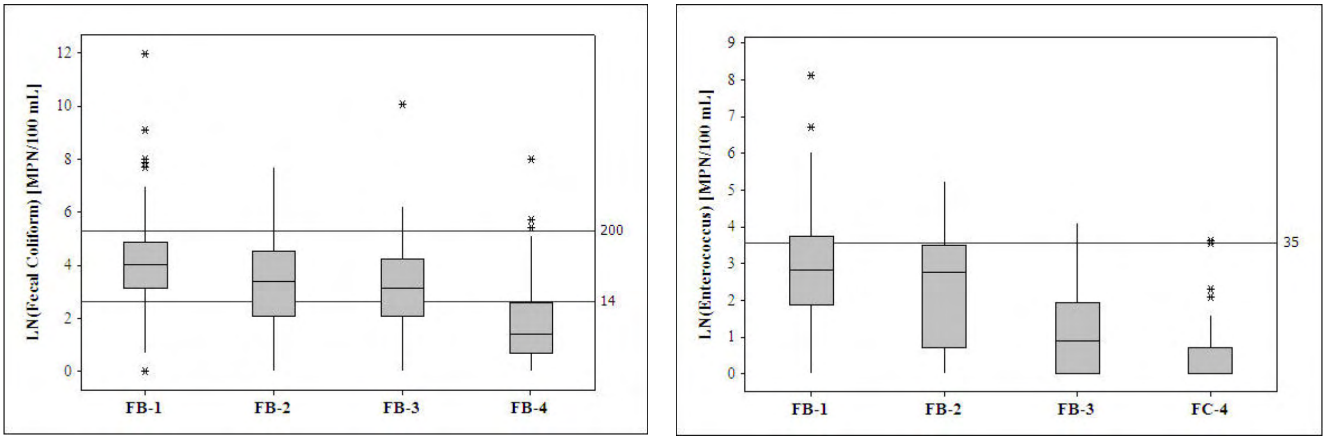
5.3.3 Water Quality Trends

Results of the Friends of the Bay water quality monitoring from 1999 to 2008 have been documented in a series of annual reports. A 2008 summary report (Fuss & O'Neill, 2008) evaluated spatial and temporal trends in the water quality data generated through the 2006 monitoring season. The goals of the comprehensive analysis were to identify how water quality in the Oyster Bay/Cold Spring Harbor Complex has changed and the progress that is being made as a result of management efforts to address water quality problems in the estuary. The evaluation consisted of graphical and statistical analysis of the data, including non-parametric tests for trends in the bacteria and nutrient data collected from 2000 to 2006.

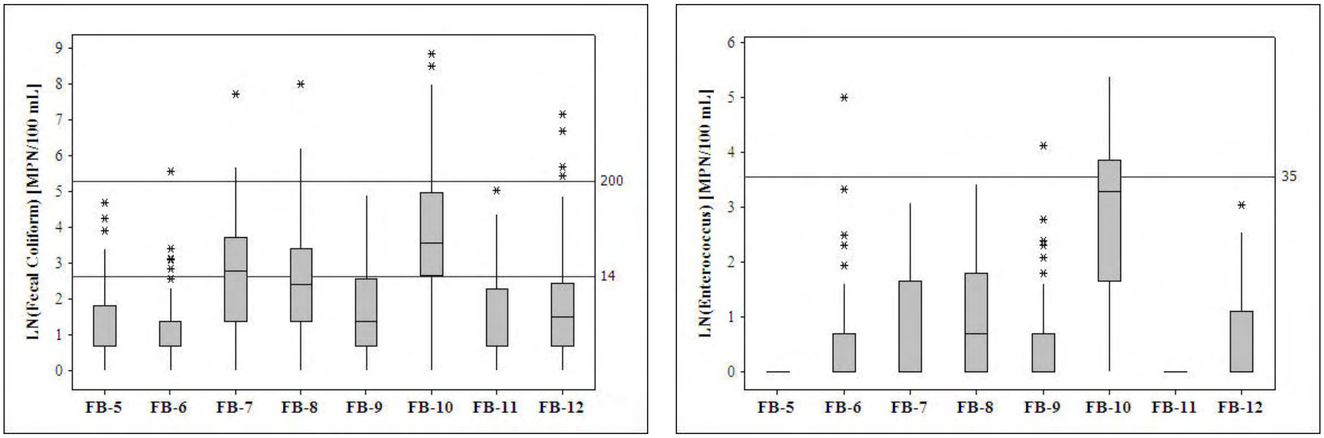
Based on the results of this evaluation, fecal coliform concentrations appear to be decreasing at many locations, and there is no indication of an increasing trend in fecal coliform concentrations at any of the 19 monitoring locations. These findings were made through visual analysis of the boxplots and confirmed by the trend analysis. Only two years of enterococci data were available for the analysis. Two key observations that emerged are: (1) in some locations the two indicator organisms sampled appeared to trend in different directions, with decreases in fecal coliform and increases in enterococci observed at the same monitoring locations (e.g., FB-13 and FB-15), and (2) where trends were present, there was an increase in enterococci. Given, that the enterococci data set is of limited duration compared to the fecal coliform data period of record, the identification of a trend in the enterococci concentrations at some locations should be viewed with caution and should be revisited with additional years of data. This result supports the need for on-going enterococci monitoring. Use of this indicator organism is encouraged because it is found exclusively in the intestinal tracts of warm-blooded animals, while coliform bacteria can originate from other sources including plant material, and because it is typically considered a more reliable indicator of health risk for contact recreation in marine waters (USEPA, 1986).

There are also spatial trends in microbial water quality. Generally, monitoring locations in the southern part of Oyster Bay Harbor (FB-7, FB-8, FB-10), the southern part of Cold Spring Harbor (FB-1 and FB-2), and landward in Mill Neck Creek (FB-15 and FB-17) exhibit consistently higher bacteria values, as shown in the boxplots in *Figure 5-5*, which summarize the data at each station for the entire period of record evaluated. In these locations, point and non-point sources are likely contributors to in-harbor water quality. This finding is also supported by the observed relationships with rainfall and tides. At many of the monitoring locations, there is a correlation between bacteria concentrations and/or nitrogen species concentrations and precipitation on the day of or day prior to sampling. Examination of indicator organism concentrations at various phases of the tidal cycle shows the influence of landside sources on water quality. In both Cold Spring Harbor and Oyster Bay Harbor, there are higher concentrations of bacteria at low tide, when there is less dilution from the incoming tide and in-harbor water quality is more strongly influenced by inputs from runoff and streams discharging to the estuary.

Cold Spring Harbor



Oyster Bay Harbor



Mill Neck Creek

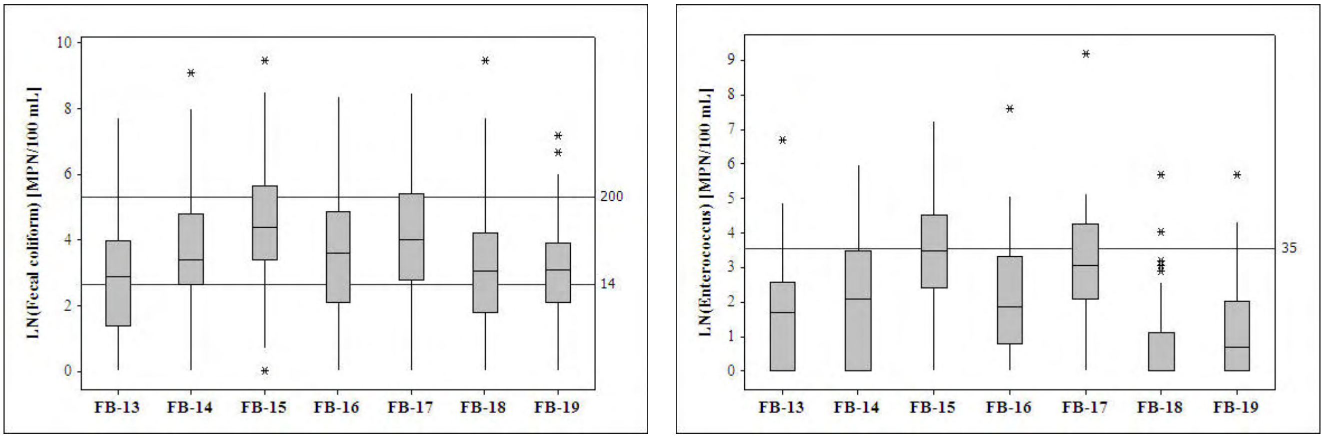


Figure 5-5. Indicator Bacteria Concentrations

The results of multi-year monitoring shows that in the Oyster Bay/Cold Spring Harbor Complex (1) there are correlations between nutrients and precipitation and (2) while the concentrations of ammonia show no trends or are decreasing, TKN and therefore organic nitrogen levels are increasing at some locations in the estuary. For example, in Oyster Bay Harbor, at FB-5, FB-6, FB-7, and FB-9, there is a decline in ammonia over the period of record, but there is an increasing trend in TKN, the result of increased organic nitrogen. This may reflect the input of organic nitrogen from sources such as runoff or atmospheric deposition or from sources within the estuary such as phytoplankton. Bronk et al. (1994) report that an estimated 25-41% of inorganic nitrogen (i.e., ammonia and nitrate/nitrite) taken up by phytoplankton is released and dissolved organic nitrogen. Since phytoplankton utilize ammonia, the decreased ammonia and increased TKN may reflect increased phytoplankton within the estuary system. In addition, sediment can act as both a source and sink of organic nitrogen.

The influence of the tides and precipitation should be considered in any temporal comparison of monitoring stations, as a direct comparison under different tidal/precipitation conditions requires adjustment of the data for these influences. Additional understanding of in-harbor water quality and the factors that influence water quality could be gained from targeted monitoring under clearly defined wet or dry weather conditions. Such sampling would both provide a snapshot of water quality under specific conditions and could be added to the long term water quality database.

The statistical analysis generally indicates that monitoring locations near the shore show higher concentrations of nutrients and bacteria, which suggests the influence of freshwater sources. Location FB-10 consistently exhibited lower water quality compared with other locations in the estuary. This has been noted in prior annual water quality reports, and the multi-year analysis demonstrates that this location is clearly impacted by a localized pollution source. This site is located near the outflow of Mill Pond and the Mill River, which supports a substantial population of waterfowl, and Beekman Creek, which flows under West Shore Road and the Beekman Beach parking lot and eventually discharges to the Mill River and Oyster Bay Harbor. It is suspected that the outflow of Mill Pond and the Mill River, including Beekman Creek, is contributing to elevated levels of bacteria and nutrients at FB-10.

5.4 Other Water Quality Monitoring

5.4.1 Long Island Sound Study – Sound Health 2008

The Long Island Sound Study (LISS) is a cooperative effort involving researchers, regulators, user groups and other concerned organizations and individuals. The LISS report *Sound Health 2008* provides information on water quality, the abundance of animal and plant life in the Sound, and trends in land use along the shore. The LISS divides Long Island sound into three (3) basins: Western, Central, and Eastern. The Oyster Bay/Cold Spring Harbor Complex discharges to the Western Basin. The *Sound Health 2008* report uses three indices to rate basin conditions: water quality, sediment quality, and benthic quality. The Western Basin, with greater population density and weaker currents, is the most stressed of the three basins (LISS, 2008)

5.4.2 Shellfish Growing Area Sanitary Surveys

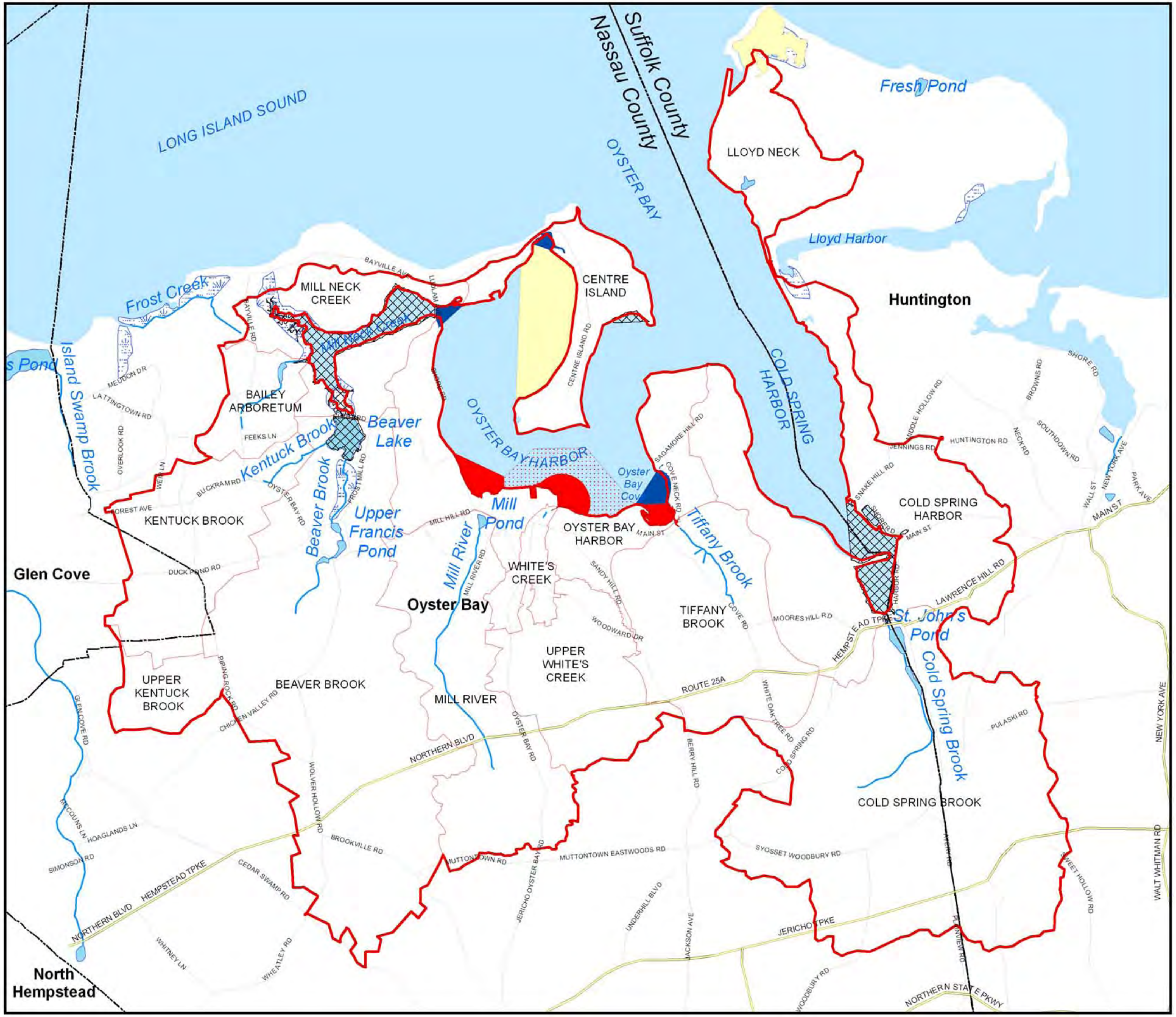
The NYSDEC conducts shoreline surveys of shellfish growing areas (SGAs) at least every 10 years to identify pollution sources that may be affecting SGAs. The Oyster Bay/Cold Spring Harbor Complex is divided into two SGAs, one consisting of Mill Neck Creek and Oyster Bay Harbor (SGA #47) and the other consisting of Cold Spring Harbor (SGA #48).

SGA #47 is approximately 5,040 acres. Of that area, approximately 785 acres are uncertified for shellfish harvesting and an additional 75 acres are seasonally certified (*Figure 5-6*). There are approximately 17 miles of shoreline within SGA #47, and NYSDEC maintains 42 sampling stations within the SGA. Thirty-eight (36) are located in Oyster Bay Harbor and seven (7) are located in Mill Neck Creek. A shoreline survey was completed in May 2002 and updated in 2003. *Table 5-4* summarizes the findings of the survey. The survey concluded that water quality is primarily affected by nonpoint source runoff. Waterfowl, wastewater treatment plant discharges, and improperly treated septic wastes from recreational vessels were identified as secondary pollution sources.

The total area of SGA #48 (Cold Spring Harbor) is approximately 4,640 acres with an uncertified area of approximately 190 acres located at the southern end of the harbor (*Figure 5-6*). Twenty (20) sampling stations are monitored by NYSDEC in SGA #48 (*Figure 5-6*). The shoreline in SGA #48 is over 9 miles, and surveys of the shoreline for potential pollution sources were conducted in 1988 and 2001. *Table 5-5* summarizes the findings of the survey. The sanitary survey found that the primary source of bacterial loading in Cold Spring Harbor is non-point source runoff and that this source is primarily concentrated a the southern end of the Harbor near the intersection of Routes 25A and 108 and from the stormwater drainage system serving the Village of Cold Spring Harbor. Waterfowl and discharges from recreational vessels were determined to be insignificant.

5.4.3 Nassau County Department of Public Health Beach Monitoring

Each beach season, samples for bacteria testing are collected by the Nassau County Department of Health (NCDH) with assistance from the Town of Oyster Bay at four active beaches in the Oyster Bay/Cold Spring Harbor Complex: Laurel Hollow Beach, Theodore Roosevelt Beach, West Harbor Beach, and Centre Island Bay Beach (Wendolovske, pers. comm., 2009). Samples are also collected at Beekman Beach, although the beach is no longer an approved public bathing beach. On average, samples are collected twice a week with additional sampling conducted in the event of a closure. These bacteria samples are analyzed at the NCDH laboratory, currently for fecal coliform and enterococci, in conformance with beach closure standards that were implemented in 2004. In addition to beach closings based on



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Legend

- ▭ OB/CSH Watershed
- ▭ Subwatershed
- ▦ Conditionally Certified Areas
- 🟥 Uncertified Areas
- 🟦 Seasonally Certified Nov1-April30
- 🟨 Holiday
- ▨ Closed
- — Stream/River
- 🟦 Lake/Pond
- ▦ Swamp/Marsh
- ▭ County
- ▭ Town

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 5-6
Regulated Shellfishing Areas

bacteria sample results, NCDH instituted pre-emptive or administrative beach closings following rain events that exceed a threshold level and duration of precipitation. During the 2008 beach season, that threshold was ½ inch of rain or more. In 2008, the beaches in the harbor complex were closed pre-emptively for nine days due to rain events. The beach closings occurred on 6/15, 7/24, 7/28, 8/6, 8/8, 8/12, 8/15, 8/16, and 8/31, based on a threshold of ½-inch of precipitation over a 24-hour period (Wendolevske, pers. comm., 2009).

5.4.4 Nassau County Groundwater Monitoring

The Nassau County Department of Public Works has been monitoring groundwater quality and quantity in the County since the 1930s. Currently, the County monitors a network of 5,000 monitoring wells for groundwater quality, water elevations, and potentiometric head in the deeper aquifers (Nassau County DPW, 2005). There are several monitoring wells located in the Oyster Bay/Cold Spring Harbor Complex watershed used to monitor water levels in the Upper Glacial, Lloyd, and Magothy aquifers as well as volatile organic compounds (VOCs), pesticides, perchlorate, the gasoline additive methyl tertiary butyl ether (MBTE), and pharmaceuticals.

The 2005 report entitled *Nassau County Groundwater Monitoring Program 2000-2003 With Historical Information* (Nassua County DPW, 2005) concluded that raw groundwater quality throughout the County is improving due to the installation of sanitary sewers and the implementation and enforcement of regulatory programs governing the use, storage and disposal of hazardous substances and that annual water demand has been increasing in recent years. Saltwater intrusion is present in the watershed, as the monitoring wells illustrate saltwater intrusion has occurred at localized areas in Bayville and in Centre Island. As a result of the saltwater intrusion, portions of the Lloyd, North Shore, and Upper Glacial aquifers have become unusable for public water supply purposes. Saltwater intrusion along the north shore of Long Island is driven by groundwater withdrawal from public supply wells located near the shoreline.

MTBE was detected at levels of 2 to 10 parts per billion (ppb) in a monitoring well in the Upper Glacial aquifer located in the Mill Neck Creek watershed during the period 1995-1999. It was not detected at monitoring wells within the watershed during 2000-2003. This is consistent with the larger finding by the Nassau County DPW that there is not widespread MBTE contamination in the County's groundwater. There were no detectable levels of pesticides or perchlorate in monitoring wells within the watershed sampled in 2001-2003, and no detectable levels of pharmaceuticals in monitoring wells within the watershed sampled in 2002-2003. Although VOCs were detected at levels of >5 to 10 ppb in 1985-1987 in monitoring wells located in Cove Neck in the Oyster Bay Harbor subwatershed, concentrations of Total VOCs in monitoring wells in the Upper Glacial, Lloyd, and North Shore Aquifers within the watershed during 2000-2003 were at concentrations ranging from below detection limit to 5 ppb. This finding is consistent with the general conclusion that raw water quality in Nassau County is improving with respect to VOCs (Nassau County DPW, 2005).

5.4.5 Subwatershed Illicit Discharge Detection and Hot Spot Investigations

As part of their compliance with the National Pollution Discharge Elimination System (NPDES) Phase II requirements and as part of a stormwater runoff impact analysis, Nassau County initiated illicit discharge detection and elimination surveys in the Oyster Bay/Cold Spring Harbor Complex watershed in 2006, and six have been completed to date (Bailey Arboretum, Francis Pond, Kentuck Brook, Mill River, Tiffany Creek, Whites Creek). One goal of the investigations was to identify "hot spots" or illicit discharges. Hot spots are land uses that are known to have a high potential for pollutant discharge. Illicit discharges are locations were unpermitted discharges outfall into the stream. The investigations found potential hot spots and/or illicit discharges in the Mill River and Whites Creek subwatersheds. In the Mill River subwatershed, the Town of Oyster Bay Highway Yard on Lake Avenue, a golf course along Mill River Road, and commercial businesses on State Route 25a were identified as having the potential to be hot spots or illicit discharges (Cashin Associates, P.C., 2007). Numerous potential hot spots were also identified in the Whites Creek subwatershed. These included a petroleum bulk station, railroad car terminal/storage yard, multiple auto repair and service stations, boat storage and repair shops, gas stations, and parking lots (Cashin Associates, P.C., 2007).

Table 5-4. Sampling Stations and Pollution Sources in Oyster Bay Harbor, SGA #47

Station Number	Location & Pollution Source(s) Monitored A = Actual P = Potential	Type(s) of Pollution Source(s) PT = Point NP = Non-Point
1	On closure line, near buoy C "19" in channel to boat ramp. Effects of runoff from boat ramp and outflow from Mill Pond at Beekman Beach A & P	Indirect, NP
1A	Near shore (Beekman Beach) effect of outflow from Mill Pond, west of former Jakobsen Shipyard A & P	Direct, PT (Mill Pond outflow) Indirect, NP (runoff to/waterfowl in Mill Pond)
2	Near buoy C "15" off Brickyard Point, general water quality in certified area SW section of OB Hbr. P	Indirect, NP
3	Near shore, outflow from unnamed cove, north of Brickyard Point; runoff from residential property P	Indirect, NP
4	Near shore, off long dock at just north of Cleft Road. Effect of non-point runoff from West Shore Road P	Indirect, NP (runoff)
5	Near shore, effects of non-point runoff from West Shore Road P	Indirect, NP
6	Off shore, mid-harbor. General water quality in the certified area of West Harbor P	Indirect, NP
7	Near shore, off the NW point of Centre Island peninsula, runoff from residential property P	Indirect, NP
8	Off shore, mid-harbor. General water quality in the certified area of West Harbor P	Indirect, NP
9	On south end of seasonal closure line outside Mill Neck Creek. Effects of outflow from M N Crk A & P	Direct, PT (Mill Neck Creek mouth)/ Indirect, NP (runoff into M N Creek)
10	In seasonal closure, effects of drainage from wetlands south of West Harbor Road and effects of outflow from Mill Neck Creek A & P	Direct PT (wetlands runoff & Mill Neck Creek)/ Indirect, NP (runoff into wetlands & Mill Neck Creek)
11	Off shore, effects of outflow from Mill Neck Creek and potential effects of cesspool at Mill Neck Rod & Gun Club P	Indirect, NP

Table 5-4. Sampling Stations and Pollution Sources in Oyster Bay Harbor, SGA #47

Station Number	Location & Pollution Source(s) Monitored A = Actual P = Potential	Type(s) of Pollution Source(s) PT = Point NP = Non-Point
12	Off shore, mid-harbor. General water quality in the certified area of West Harbor. Potential effects of large # of occupied boats summer weekends P	Direct, NP (summer boat discharges) Indirect, NP (rest of the year)
13	Near shore, off Town of Oyster Bay Centre Island Beach. Potential effects of bathers, runoff; and, large number of occupied boats summer weekends P	Indirect, NP
13A	Near shore, north end of West Harbor at mouth of private canal on Centre Island. Potential effects of large # of occupied boats summer weekends P	Indirect, NP Direct, NP (summer boat discharges)
14	Near shore, off long dock for a residence on Centre Island. Potential effects of large # of occupied boats summer weekends P	Direct, NP (summer boat discharges) Indirect, NP (rest of year)
15	Near shore, near "split rock" on beach. Potential effects of large # of occupied boats summer weekends P	Direct, NP (summer boat discharges) Indirect, NP (rest of year)
16	Near buoy N Red "12" south of Brickyard Point, middle of east-west boat channel and just north of closed area around STP outfall & boat moorings P	Indirect, NP
17	Off shore, in uncertified area around closed area around STP outfall & boat moorings (summer) A & P	Indirect, PT (STP outfall) and NP (runoff from Oyster Bay village)
18	Near buoy N Red "8" south of Brickyard Point, middle of east-west boat channel and just north of closed area around STP outfall & boat moorings P	Indirect, PT (STP outfall) and NP (runoff from Oyster Bay village)
19	Near buoy Red N "6" southeast of Moses Point P	Indirect, NP
20	Near buoy JB "B" south of Moses Point, just north of closed area around STP outfall & boat moorings A&P	Indirect, PT (STP outfall) and NP (runoff from Oyster Bay village)
21	Near buoy Red N "4" in commercial channel to fuel depot & marinas. Within the uncertified area around STP outfall & boat moorings A & P	Direct, PT (STP outfall) and Indirect, NP runoff from village
22	Near shore, near buoy C "7" in commercial channel to fuel depot & marinas. Within the uncertified area around STP outfall & boat moorings A & P	Direct, PT (STP outfall) and Indirect, NP runoff from village
	Near shore at STP outfall site. Effects of STP outfall and stormwater runoff from Whites Creek and village business district, end of South Street A & P	Direct, PT (STP outfall) and Indirect, NP runoff from village
23	Near shore, off long fixed dock at a residence east of Steamboat Landing Road. Within uncertified area around STP outfall & boat moorings. Potential effects of runoff from road end. P	Indirect, NP (runoff from road end)
24	Off shore, along closure line at east side of the uncertified area around STP outfall & moorings. Potential effects of discharges from occupied boats in summer weekend anchoring area P	Indirect, NP & Direct, NP (boat discharges, summer months)
25	Off Roosevelt Breakwater (stone jetty) northeast side of Oyster Bay Cove. Along the seasonal closure line. Potential effects of discharges from occupied boats (summer months) & runoff into OB Cove A & P	Indirect, NP & Direct, NP (boat discharges)
26	Near shore, off small boat house on Cove Neck P	Indirect, NP
27	Near shore, off large estate property on Cove Neck P	Indirect, NP
28	Near shore, at Cove Point. General water quality in the certified area. P	Indirect, NP

Table 5-4. Sampling Stations and Pollution Sources in Oyster Bay Harbor, SGA #47

Station Number	Location & Pollution Source(s) Monitored A = Actual P = Potential	Type(s) of Pollution Source(s) PT = Point NP = Non-Point
29	Off shore, near buoy Green "5" between Cove Point and Plum Point. General water quality in the certified area. P	Indirect, NP
30	Near shore, at buoy Red N "4' east of Plum Point. General water quality in outer Oyster Bay Harbor P	Indirect, NP
31	Off long dock at Sewanhaka-Corinthian YC, on closure line for sewage outfall from YC. A & P	Direct, PT (sewage outfall) & Indirect (boats in S-C YC mooring area)
32	Near shore off long dock for residences on Centre Island. Potential effects of discharges from occupied yacht/sailboats in S-C YC anchorage P	Indirect, NP (boats in YC mooring area)
33	Near shore, off small group of residences along shoreline (Morgan Place & Roosevelt Drive). Potential effects of cesspools & road runoff P	Indirect, NP
C-1	Near shore at Weeks Point, along west end of seasonal closure line. Potential effects of runoff to Oyster Bay Cove & discharges from occupied boats in/outside OB Cove. (summer months) P	Indirect, NP
	Same as Sta. #25. Sampled as C-2 when evaluating w/q in Oyster Bay Cove for Conditional program P	Indirect, NP & Direct, NP (boat discharges)
C-3	Near shore in seasonally (November - April) certified area in Oyster Bay Cove. Potential effects of runoff from Cove Neck Road. P	Indirect, NP (runoff)
C-4	Near shore in the uncertified portion of Oyster Bay Cove, quite shallow. Potential effects of road runoff and discharge from Tiffany Creek. A & P	Indirect, NP (runoff)
C-5	Tiffany Creek at Cove Neck Road. Assess w/q in Tiffany Crk. when establishing conditional programs in OB Cove. Station not used in many yrs. A & P	Direct, PT (NP runoff into Creek)

Table 5-5. Sampling Stations and Pollution Sources in Cold Spring Harbor, SGA #48

Station Number	Location & Pollution Source(s) Monitored A = Actual P = Potential	Type(s) of Pollution Source(s) PT = Point NP = Non-Point
1	Near shore, at Cooper Bluff; general water quality in outer harbor area, land runoff below bluff P	Indirect, NP
2	Off shore, mid-harbor; general water quality in outer harbor area P	Indirect
3	Near shore, off West Neck Beach pavilion; potential effects of septic systems serving beaches, bathers P	Indirect, NP
3.1	Outflow from Smugglers Cove, runoff into Cove P	Indirect, PT (outflow from Cove)/NP land runoff into cove
4	Off shore, mid-harbor; general water quality in outer harbor area P	Indirect
5	Mouth of unnamed inlet at private residence P	Direct from inlet, NP
6	Off shore, mid-harbor; general water quality in outer harbor area P	Indirect
7	Near shore, runoff P	Indirect, NP
8	Near shore, near rock jetty, runoff P	Indirect, NP
9	Off shore, mid-harbor; general water quality in souther portion or Cold Spring Harbor P	Indirect

Table 5-5. Sampling Stations and Pollution Sources in Cold Spring Harbor, SGA #48

Station Number	Location & Pollution Source(s) Monitored A = Actual P = Potential	Type(s) of Pollution Source(s) PT = Point NP = Non-Point
10	General water quality near Harbor mouth P	Indirect, NP
11	Near mouth of marina boat basin, in uncertified area potential effects of boats & outflow from inner Cold Spring Harbor uncertified area A & P	Indirect, NP; Direct (boats) NP
12	Just east of south end of closure line, in uncertified area. Off white house on CSH Labs property. Potential effects of outflow from inner CSH uncertified area A & P	Indirect, NP
13	Off eastern tip of sand spit, north of boat ramp. Effects of runoff from ramp and Route 25A, boats and marina in inner harbor uncertified area A & P	Direct, NP
13.1	In uncertified cove north of station 13, effects of outflow from ponds at Spring Road and runoff from Cold Spring Harbor village roads A & P	Direct, PT (pond outflow); NP (runoff from roads)
14	West of Town fishing dock, within boat mooring area potential effects of runoff, marina and boats A & P	Direct, PT (boats); Indirect, NP (runoff)
15	Near shore, former discharge from small STP serving CSH Labs. Discharge ceased 1992. Station monitors w/q effects of runoff and freshwater inflow from ponds south of Route 25A, near hatchery	Indirect, NP (runoff)
21	Near fixed navigation aid , general water quality in outer harbor area P	Indirect
22	Near buoy Red N "2", general water quality in outer harbor area P	Indirect
23	Near buoy Gong "1" , general water quality in outer harbor area, near boundary with SGA #34, P	Indirect

6 Watershed Modifications

6.1 Dams and Impoundments

There are several small dams and impoundments in the Oyster Bay/Cold Spring Harbor Complex watershed, which are used primarily for recreational purposes. According to the NYSDEC Dam Safety Regulations, a dam's hazard classification is based on the height of the dam, its maximum impoundment capacity, physical characteristics of the dam site, and location of downstream facilities. *Figure 6-1* shows the location and hazard classification of each of the eight dams within the watershed; all dams are a rated a low hazard. Mill Pond Dam is owned by the Nassau County Department of Public Works and the others are privately owned. Mill Pond Dam creates an approximately 6-acre impoundment. The lands beneath the impoundment are part of the Oyster Bay National Wildlife Refuge.

In addition to recreational opportunities, these impoundments also provide aquatic and wildlife habitat. Some of the dams, as well as culverts and other obstructions, are potential barriers to fish passage. As described in Section 4.7 of this report, the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay recently completed fish passage feasibility studies to evaluate restoration of diadromous fish to the Mill River and other areas of the harbor complex watershed by installing fish ladders or removing Mill Pond Dam and other obstructions.

6.2 Water Supply

Groundwater aquifers supply drinking water to all of Long Island. Long Island's drinking water system was designated as the nation's first Sole Source Aquifer. To protect these groundwater aquifers, the state designated nine Special Groundwater Protection Areas (SGPAs), as defined in Article 55 of the NYS Environmental Conservation Law. The Oyster Bay SGPA is one of two such state-designated aquifer recharge areas in Nassau County. The Town of Oyster Bay has an Aquifer Protection Overlay District (APO) in addition to the SGPA, adopted in 2004, which affords added protection to groundwater resources.

The Town of Huntington contains portions of two SPGAs, only one of which (West Hills/Melville in the western part of the Town) is located within the Oyster Bay/Cold Spring Harbor Complex watershed. Most of the Town of Huntington's public water supply wells are located outside of SPGAs. Unlike the Town of Oyster Bay, Huntington has not enacted aquifer protection overlay district regulations.

Public water is supplied within the Oyster Bay/Cold Spring Harbor Complex watershed by the Jericho Water District, Village of Bayville, City of Glen Cove, Oyster Bay Water District, Locust Valley Water District and several private wells on Cove Neck and Centre Island. In Suffolk County, there are eleven wells that service the watershed within the Village of Lloyd Harbor, West Hills, Cold Spring Harbor and Huntington. *Figure 6-2* shows the locations of public water supply wells and the approximate limits of SGPAs within the watershed.

State of the Watershed Report
Oyster Bay/Cold Spring Harbor

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Legend

- ▭ OB/CSH Watershed
- ▭ Subwatershed
- ▭ County
- ⬚ Town

Dam Hazard Category

- ● A - Low Hazard
- ● B - Moderate Hazard
- ● C - High Hazard
- ● D - No Hazard
- — Stream/River
- ▬ Lake/Pond
- ▨ Swamp/Marsh

N S W E

0 0.5 1 2
Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 6-1
Watershed Dams

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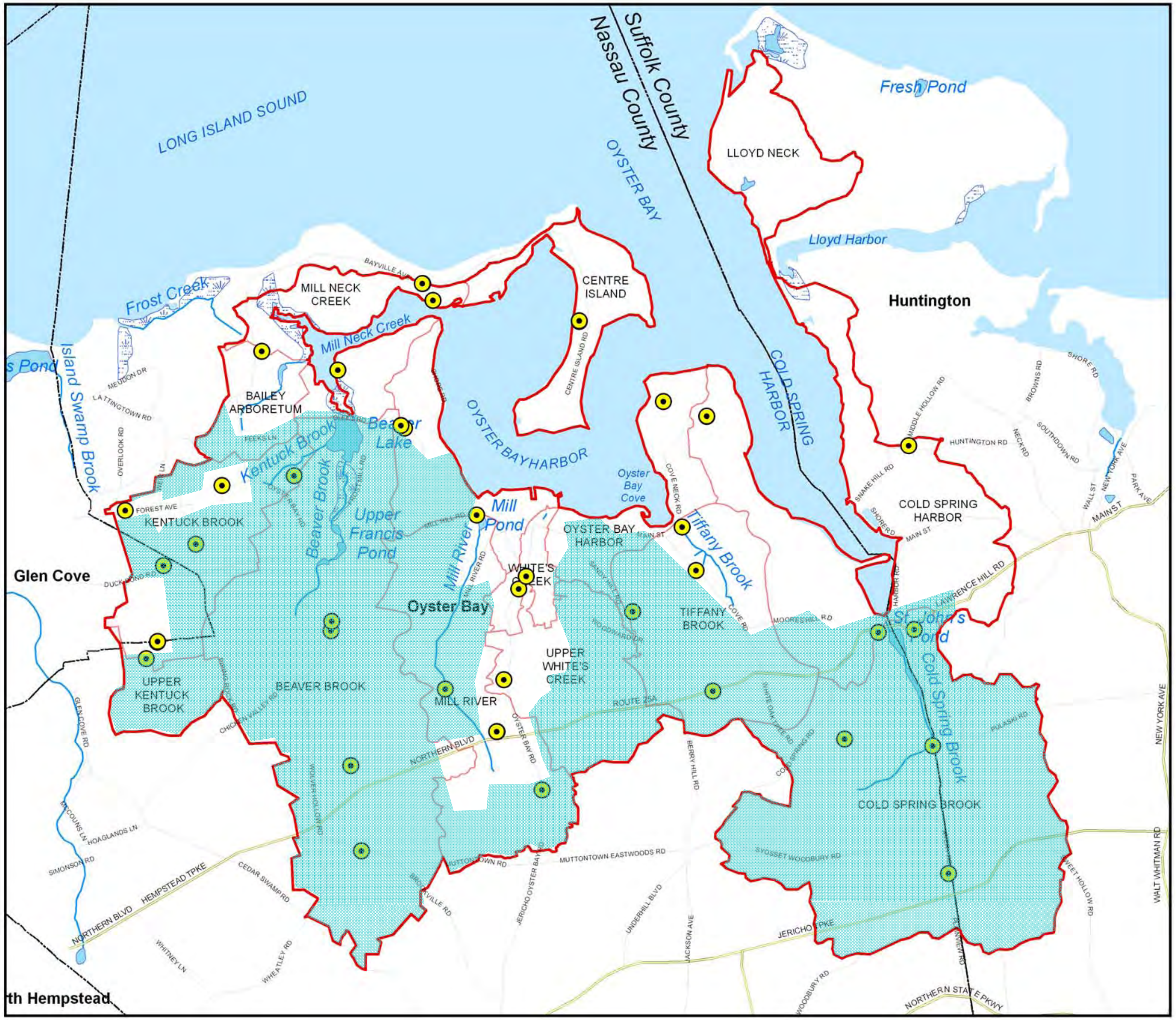

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- 🟥 OB/CSH Watershed
- 🟥 Subwatershed
- ☐ County
- ☐ Town
- ● Wells
- Stream/River
- 🟦 Lake/Pond
- ▨ Swamp/Marsh
- ▨ **Special Groundwater Protection Area (Approx. Limits)**

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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 6-2
Water Supply Wells

6.3 Wastewater

Oyster Bay Hamlet and portions of the Unincorporated Villages of Upper Brookville are served by sanitary sewers that transport sanitary waste to the Oyster Bay District Sewage Treatment Plant (OBDSTP). The treatment plant is located in Oyster Bay Hamlet and discharges treated effluent to Oyster Bay Harbor east of the Mill River outlet. The treatment plant operates under a State Pollution Discharge Elimination System permit with a maximum treatment capacity of 1.8 million gallons per day (MGD). The plant currently averages 1.25 MGD. The OBDSTP serves an area (*Figure 6-3*) of approximately 975 acres, with approximately 20 miles of sewer lines and 2,000 individual service connections (Ryan & Ryan PR, Inc., 1999). All facilities within the sewer service area must be connected to public sanitary sewers, and existing on-site sewage disposal systems, such as septic tanks or cesspools, must be properly abandoned according to the Nassau County Department of Public Works and Department of Health guidelines (Cashin Associates, P.C., 2007).

The OBDSTP has been in service since 1926 and has been upgraded several times. The most recent upgrade occurred in 2006 to provide advanced treatment for nitrogen removal. Nitrogen has been identified as the primary pollutant causing low dissolved oxygen conditions, or hypoxia, occurring throughout much of Long Island Sound's bottom waters each summer. Wastewater treatment plants that discharge directly to the Sound or into inland surface waters that reach the Sound are a significant contributor of nitrogen. To address this water quality problem, NYSDEC imposed limits to reduce nitrogen discharged from the 12 municipal treatment plants located on the north shore of Long Island. NYSDEC issued a revised discharge permit that required the OBDSTP to reduce nitrogen discharged to Oyster Bay from the treatment plant by 63.8 percent in three 5-year increments by August 2014. According to the Friends of the Bay 2007 and 2008 Annual Water Quality Report, the OBDSTP's new advanced treatment facility is already achieving the 2014 nitrogen limits imposed by NYSDEC permit. The upgrade has reduced the daily nitrogen discharged by as much as 75%.

Sanitary sewers in the southeastern portion of the watershed collect and convey waste to wastewater treatment plants on the South Shore of Long Island operated by the Nassau County Department of Public Works.

A second wastewater treatment plant in the harbor complex watershed is located west of Plum Point on Centre Island. This privately-owned plant, Seawanhaka STP, operates primarily in the summer months to process waste during the boating season. *Table 6-1* identifies the OBDSTP and the Seawanhaka STP, as well as other facilities with NYSDEC State Pollution Discharge Elimination System (SPDES) permits in the Oyster Bay/Cold Spring Harbor Complex watershed. *Figure 6-4* also depicts the locations of these facilities within the watershed.

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Legend

▭	OB/CSH Watershed
▭	County
▭	Town
▭	Village
●	Sewage Treatment Plants
▨	OBDSTP District
—	Sewer Pipe
▨	Sewer Collection District

N W E S

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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 6-3
Sewer Service Areas and Treatment Plants

Table 6-1. Facilities in the Oyster Bay Watershed with SPDES Permits

Facility	Town	Facility Type
Commander Terminal	Oyster Bay	Petroleum Bulk Station and Terminal
Mill-Max Manufacturing Corp.	Oyster Bay	Electronic Connector Manufacturing
MTA LIRR Oyster Bay Yard	Oyster Bay	Railroad
Oyster Bay Water Pollution Control Plant	Oyster Bay	Sewerage System
Seawanhaka-Corinthian Yacht Club Property	Oyster Bay (Centre Island)	Sports and Recreation Club
County Parkland	Huntington	--
Cold Spring Harbor Terminal*	Cold Spring Harbor	Petroleum Bulk Station and Terminal

Source: EPA Water Permit Compliance System (PCS) database and NYSDEC. SPDES: New York State Pollutant Discharge Elimination System

* Although still listed in the database, the Cold Spring Harbor Terminal bulk storage tanks have been removed.

The Birches (also known as Continental Villas) is a residential subdivision located on the west side of Oak Neck Creek, in the Locust Valley area. This subdivision historically operated its own sewage treatment system, which suffered chronic problems due to cesspool overflows and inadequate treatment of waste, impacting low-lying wetlands and the adjacent creek. In an attempt to address these issues, a contact chlorine treatment system was installed which disinfects the wastewater by adding chlorine prior to discharging to Oak Neck Creek. The treatment system did not fully address the problem, as elevated coliform bacteria concentrations in the harbor persisted near this location. Failing and/or low-functioning individual on-site sewage disposal systems located in this area are also believed to have contributed to these chronic problems. A groundbreaking occurred in April 2009 for long-awaited upgrades to sewer and water infrastructure to connect the homes in the Birches residential subdivision to the Glen Cove sewage treatment plant. This project will eliminate chronic cesspool overflows to Mill Neck Creek.

In October 2008, the Oyster Bay/Cold Spring Harbor Complex was declared a federal No-Discharge Zone (NDZ) for vessel sewage, regulated under Section 312 of the Clean Water Act. The designation prohibits the discharge of sewage (whether treated or untreated) from vessels, providing an additional level of protection to address water quality issues associated with sewage contamination in marine waters.

The remainder of the Oyster Bay/Cold Spring Harbor Complex watershed is served by individual on-site sewage disposal systems, including cesspools and septic tank systems. Cesspools were the most common method of on-site sewage disposal until about 1973, when the local development regulations were modified to require the use of sanitary sewers. Cesspools are essentially underground chambers with perforated walls through which wastewater leaches into the soil. Cesspools receive untreated sanitary waste, including both liquid and solid materials, and are therefore are susceptible to clogging. Septic tanks are typically

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Oyster Bay/Cold Spring Harbor

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▭	OB/CSH Watershed
▭	Subwatershed
▭	County
▭	Town
▨	Recharge Basins *Huntington Data Unavailable*
•	Storm Drainage Outfall *Huntington Data Unavailable*
▨	Self-contained Drainage Areas
★	SPDES Permits *(Stormwater or Wastewater Discharge)*
—	Stream/River
▨	Lake/Pond
▨	Swamp/Marsh

N W E S

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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 6-4
Stormwater Discharges and Recharge Basins

installed prior to a cesspool in order to settle out the heavier solids before entering the leaching system and prolong the life of the system. Further treatment of wastewater occurs in the soil below the leaching system, the effectiveness of which is strongly influenced by groundwater and soil conditions.

Cesspools and septic systems are a potential source of pollution, including nitrogen, pathogens, and other contaminants, to surface waters and groundwater as a result of system failure (inadequately treating sewage or by creating potential for direct or indirect contact between sewage and the public) or malfunction (typically a slow loss of function that is difficult to detect). Since a large portion of the watershed was developed prior to 1973, failure or malfunction of cesspools and septic systems is believed to be a significant source of pollution to surface water and groundwater.

6.3 Stormwater Infrastructure

The stormwater collection and drainage system within the harbor complex watershed consists of drainage infrastructure operated and maintained by the watershed municipalities, including the Town of Oyster Bay, the Town of Huntington, the associated villages, and Nassau and Suffolk Counties. Nassau and Suffolk County are responsible for the drainage infrastructure associated with county roadways. All of these municipal entities are regulated small Municipal Separate Storm Sewer Systems (MS4s) under the NYSDEC State Pollution Discharge Elimination System Phase II stormwater program.

Stormwater within the watershed is discharged to surface waters and to groundwater. A large portion of the watershed drains to surrounding surface waters. The stormwater drainage systems in selected areas of the watershed are described in the stormwater runoff impact analysis subwatershed reports prepared on behalf of Nassau County (Cashin Associates, P.C., October 2007) and in the Stormwater Management/Coastal Water Quality Improvement component of the Oyster Bay/Cold Spring Harbor Complex Harbor Management Plan (Cashin Associates, P.C., 2002). Outfall surveys performed by Nassau County and the Town of Oyster Bay to meet Phase II stormwater program requirements identified stormwater outfalls throughout the watershed, including numerous stormwater outfalls that discharge directly to the harbor complex (*Figure 6-4*). Note that information regarding stormwater outfalls was unavailable from the Town of Huntington as of the preparation of this report.

Artificial infiltration of stormwater runoff by use of basins or sumps has been practiced on Long Island since the 1930s to recharge collected stormwater back to the groundwater system. In the 1950s, Nassau and Suffolk Counties adopted regulations requiring stormwater to be retained and infiltrated onsite. Subsequently, the use of drywells, recharge basins, and drainage reserve areas became common practice to retain and infiltrate stormwater runoff from roadways in residential, commercial, and industrial areas. Recharge basins are most prevalent in eastern Nassau County and western Suffolk County. Most of these facilities have overflow structures that direct stormwater resulting from extreme rainfall events to either other recharge basins or to drainage facilities that ultimately discharge to surface waters. *Figure 6-4* shows the existing recharge basins within the Nassau County portion of the harbor complex watershed (note that information regarding recharge basins in the portion of the watershed within Suffolk County was unavailable as of the preparation of this report). Overall, there are approximately 70 recharge basins in the watershed in Nassau County. According to the Nassau County Storm Water Management Program, nearly half of the land area of Nassau County is serviced by recharge basins (Nassau County DPW, 2003).

Since much of the watershed was developed prior to the adoption of stormwater quality regulatory requirements, most of the existing drainage infrastructure that does not discharge to recharge basins consists of traditional storm drains/catch basin and storm pipes that discharge directly to surface waters without treatment, other than detention to maintain peak rates of discharge. As described in Section 7.1.4, uncontrolled stormwater runoff from impervious surfaces is a significant source of potential impacts to surface waters within the harbor complex watershed, groundwater supplies, and the water quality of the harbor complex itself. Through their Phase II stormwater management programs and other planning initiatives, the watershed municipal entities, including Nassau and Suffolk Counties, have developed and implemented a variety of Best Management Practices to address stormwater quality and quantity issues associated with land development and redevelopment projects. The municipalities have also begun to address historical development and nonpoint source pollution impacts in the watershed by identifying potential sites for stormwater retrofits. However, stormwater runoff continues to be a significant threat to the water quality and overall health of the Oyster Bay/Cold Spring Harbor Complex and its watershed.

6.4 Other Regulated Sites

Historical and current industrial and commercial activities within the harbor complex watershed pose a potential threat to surface waters and groundwater supplies. Illegal waste disposal, improper use and disposal of chemicals such as used oil, pesticides, and herbicides, and chemical spills are potential sources of contaminants from industrial and commercial facilities. As summarized in *Table 6-2* and shown in *Figure 6-5*, several hazardous waste generators and other regulated sites are located within the watershed. These facilities are generally located in the more densely developed commercial and industrial areas of the Towns of Oyster Bay and Huntington, primarily in the central and southeastern portions of the watershed.

Table 6-2. Regulated Sites

Site Types	Number of Sites in OB/CSH Watershed		
	Oyster Bay	Huntington	Glen Cove
Hazardous Waste Generators	94	27	0
Air Emissions	19	4	0
Remediation Sites	3	0	0

Source: EPA RCRAInfo (EPA and State Treatment, Storage, Disposal facilities), Air Facility System (AFS), and Superfund National Priorities List (NPL).

There are three NYSDEC-regulated remediation sites located within the watershed, all within the Town of Oyster Bay. The Bayville Village Cleaners, located in the western portion of the watershed, is being remediated under the NYSDEC Voluntary Cleanup Program.

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Oyster Bay/Cold Spring Harbor

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- OB/CSH Watershed
- Subwatershed
- County
- Town
- ★ Remedial Sites
- ● Toxic Release Inventory (TRI) Reporters
- · Resource Conservation and Recovery Act (RCRA) Permits
- ○ Permit Compliance System (PCS) Permits
- ★ Comprehensive Environmental Response, Compensation, and Liability Information System
- × Air Facility System Permits

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 6-5
Regulated Sites

The Mill Neck Marina located on Mill Neck Creek (northern portion of the watershed). The site is designated by the NYSDEC as a Class 2 site, meaning that the disposal of hazardous waste has been confirmed and the presence of such hazardous waste or its components or breakdown products represent a significant threat to the environment.

The third site is the former Jakobsen Shipyard, which is a six-acre site bordered on the north by Oyster Bay Harbor and in close proximity to Beekman Beach and Theodore Roosevelt Memorial Park on the west and east respectively. This State Superfund site was once highly contaminated with metals and other pollutants, but has been remediated and has been partially redeveloped as a passive waterfront park owned jointly by the Town and the State.

7 Land Use and Land Cover

The type and distribution of land use and land cover within a watershed has a direct impact on nonpoint sources of pollution and water quality. This section describes the current and potential future land use and land cover patterns in the harbor complex watershed, and the implications for water quality.

7.1 Current Conditions

7.1.1 Land Use

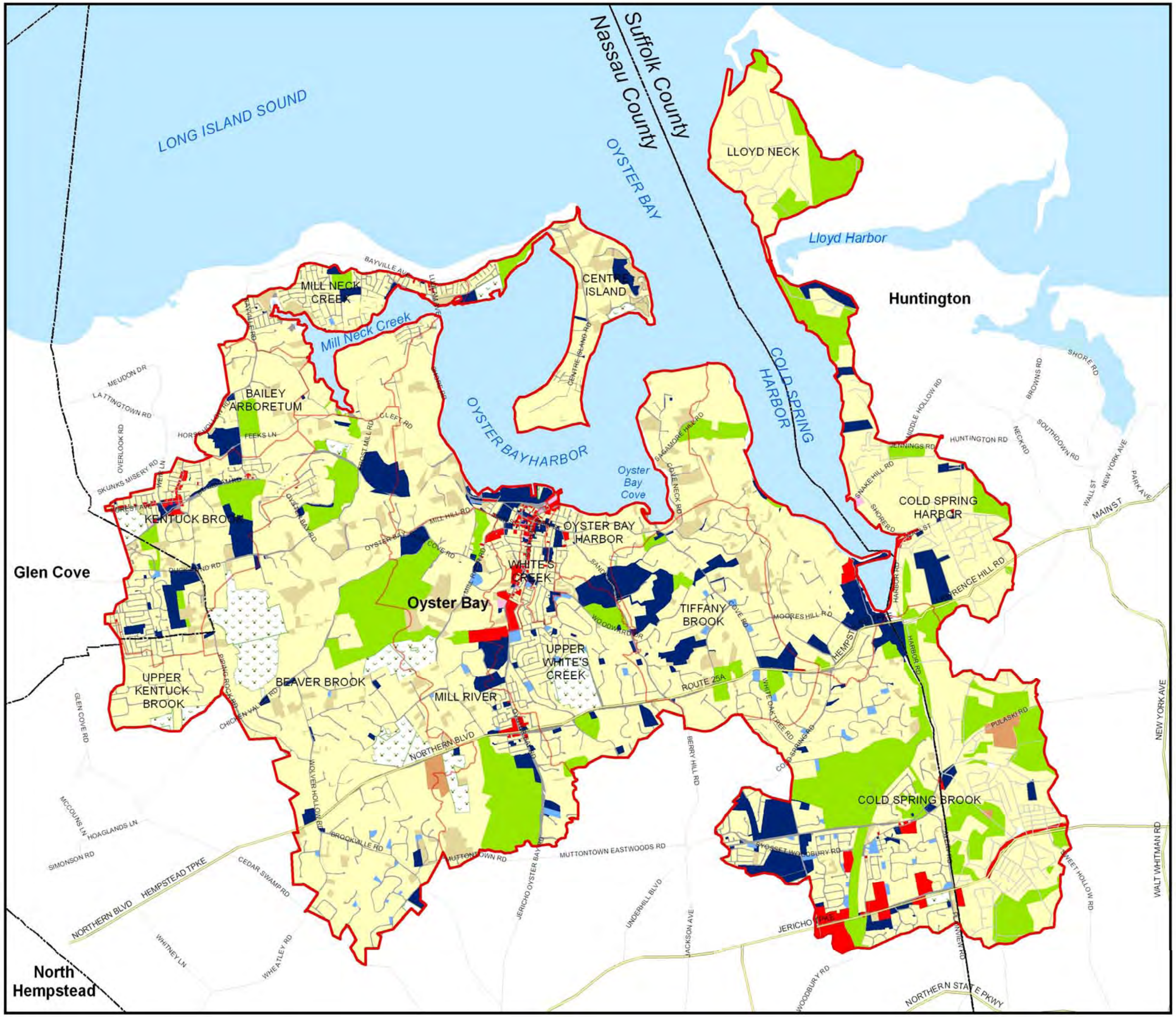
Figure 7-1 depicts general land use patterns in the Oyster Bay/Cold Spring Harbor Complex watershed. The land use information in *Figure 7-1* is a combination of parcel-based land use GIS data provided by the Town of Oyster Bay and land use derived from the Town of Huntington's Comprehensive Plan July 2008 Draft (Town of Huntington, 2008). Land use categories and associated acreage within the watershed are provided in *Table 7-1*.

The watershed's predominant land use (approximately 64%) is low-density residential. Approximately 10.3% of the watershed is considered open space, including conservation land and public parks. Land classifies as "open space" in the Town of Huntington consists of both undeveloped land and recreational parks. Land classified as "vacant" by the Town of Oyster Bay accounts for approximately 4.8% of the watershed area. The vacant land in Oyster Bay is a mixture of undeveloped parcels and forested areas. Transportation land use, including local and county roads and highways, comprises approximately 7% of the watershed land area.

Table 7-1. Watershed Land Use

Land Use Category	Acres	Percent of Watershed
Agriculture	96	0.4%
Commercial	368	1.5%
Industrial	16	0.1%
Residential	15949	63.9%
Transportation (3, 4)	1756	7.0%
Public Services (1)	131	0.5%
Recreation And Entertainment (1)	964	3.9%
Vacant Land (1,5)	1206	4.8%
Wild, Conservation Lands and Public Parks (1)	1490	6.0%
Community Services (1)	1911	7.7%
Institutional (2)	5	0.0%
Open Space (2)	1064	4.3%
Utilities (2)	9	0.0%
Water (2)	12	0.0%

Notes: (1) Category for Town of Oyster Bay land use only.
(2) Category for Town of Huntington land use only.
(3) Transportation land use for in the Town of Huntington was estimated by buffering roads included in the Census 2000 Tiger Road file.
(4) Transportation land use in the Town of Oyster Bay was estimated as the area between parcels bordered by roads.
(5) Some parcels in the Town of Oyster Bay were unclassified and determined to be vacant land based on aerial orthophotography.



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- ▭ OB/CSH Watershed
- ▭ Subwatershed

Oyster Bay Land Use

- 🟫 Agriculture
- 🟥 Commercial
- 🟦 Community Services
- 🟪 Industrial
- 🟦 Public Services
- ▨ Recreation and Entertainment
- 🟨 Residential
- ⬛ Transportation
- 🟫 Vacant Land
- 🟩 Wild, Conservation Land and Public Parks

Huntington Land Use

- 🟫 Agriculture
- 🟥 Commercial
- 🟪 Industrial
- 🟦 Institutional
- 🟩 Open
- 🟨 Residential
- ⬜ Transportation

N W E S

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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorporated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 7-1
Land Use

Commercial land use accounts for less than 2% of the watershed area, with the majority of the commercial areas concentrated in Oyster Bay Hamlet and along the Route 106/Pine Hollow Road/South Street corridor. Other isolated commercial areas are located along Forest Avenue in Locust Valley, in Laurel Hollow near the head of Cold Spring Harbor, along Main Street in Cold Spring Harbor, and along Jericho Turnpike in Woodbury and West Hills. Current and former industrial land use account for a small percentage of the watershed area (0.1%) and are located primarily along the Oyster Bay waterfront and Oyster Bay Hamlet.

7.1.2 Zoning

Figure 7-2 depicts the generalized existing zoning in the Oyster Bay/Cold Spring Harbor Complex watershed, which is based on a compilation of zoning districts and designations established by the various municipal entities in the watershed. The specific zoning districts across the watershed are highly variable because they are defined at the village or town level. For this reason, the village-defined zoning designations were grouped into the generalized zoning designations shown in *Figure 7-2*, including business, recreation, industrial, office, multi-family residential, and single-family residential. The pattern of existing zoning largely reflects the existing pattern of residential, commercial, office, and industrial uses. The majority of the harbor complex watershed is zoned single-family residential. *Figure 7-3* depicts the minimum lot size required in each residential zoning district based on the village-specific zoning. Minimum residential lot sizes vary from less than a quarter acre to over 5 acres.

7.1.3 Land Cover

Figure 7-4 depicts the generalized land cover in the harbor complex watershed. The data shown in Figure 7-4 are land cover types derived from 2002 Landsat satellite imagery with ground resolution of 30 meters. The land cover data in the watershed are summarized into eleven categories (*Table 7-2*). These ten categories are those used in the Connecticut Land Cover Map Series and are described following the table (University of Connecticut Center for Land Use Education and Research).

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Oyster Bay/Cold Spring Harbor

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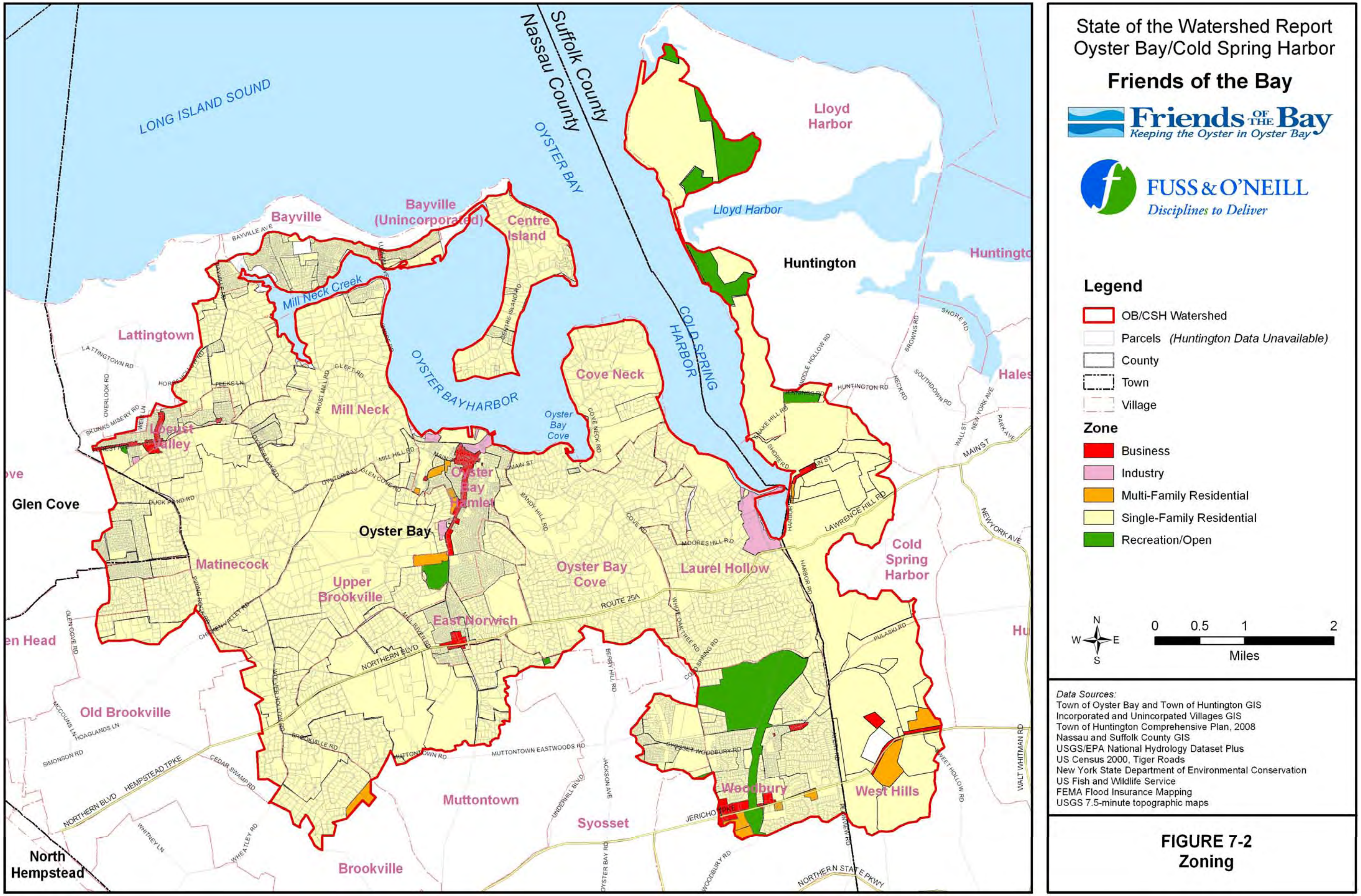

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 7-2
Zoning

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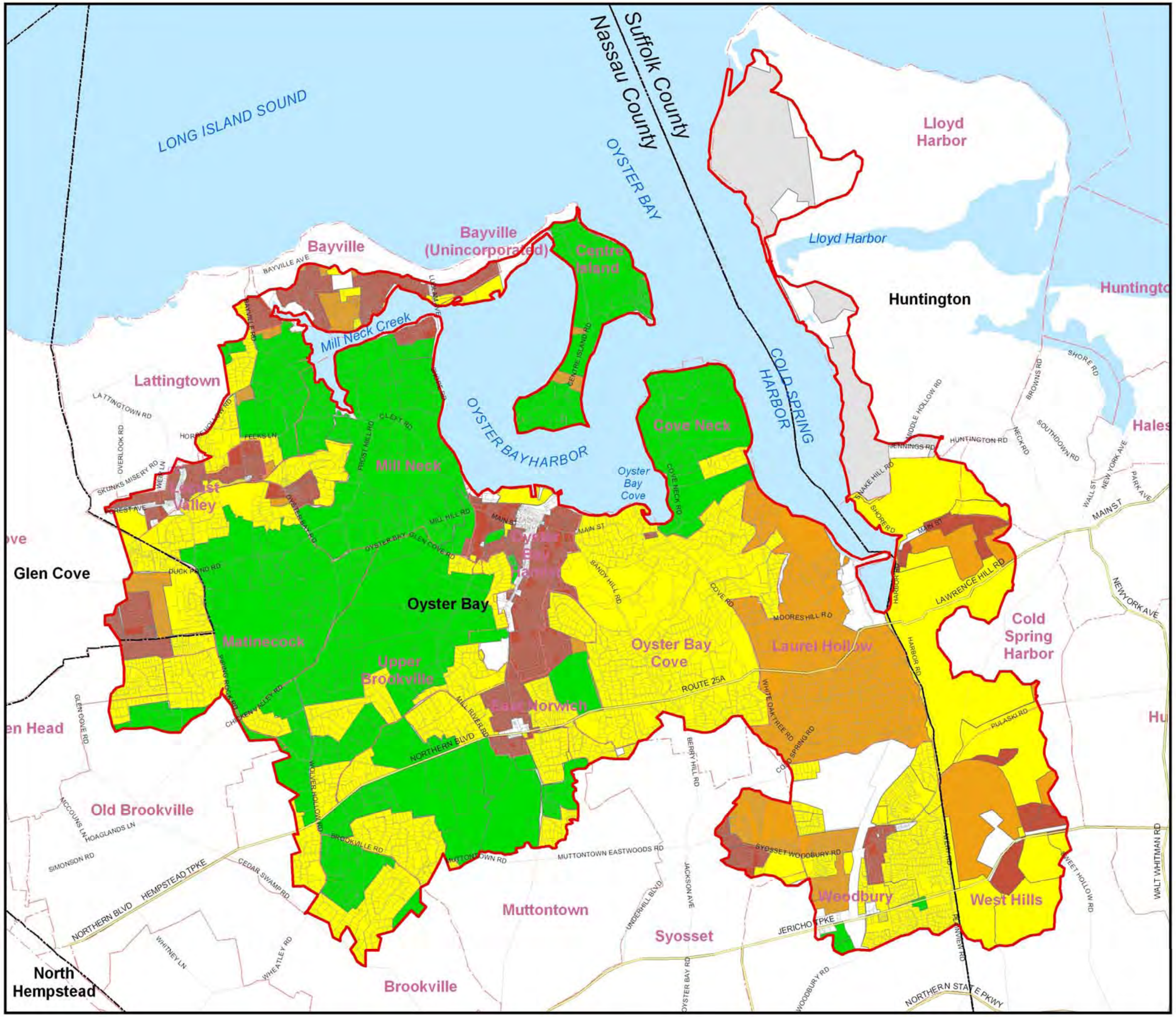

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- 🟥 OB/CSH Watershed
- ☐ Parcels *(Huntington Data Unavailable)*
- ☐ County
- ☐ Town
- ☐ Village

Minimum Allowable Residential Lot Size

- 🟫 < 1/4-acre
- 🟧 1/4-acre to 1/2-acre
- 🟨 1/2-acre to 2 acres
- 🟩 2 to 5 acres
- 🟦 > 5 acres
- ⬜ Unknown

N W E S

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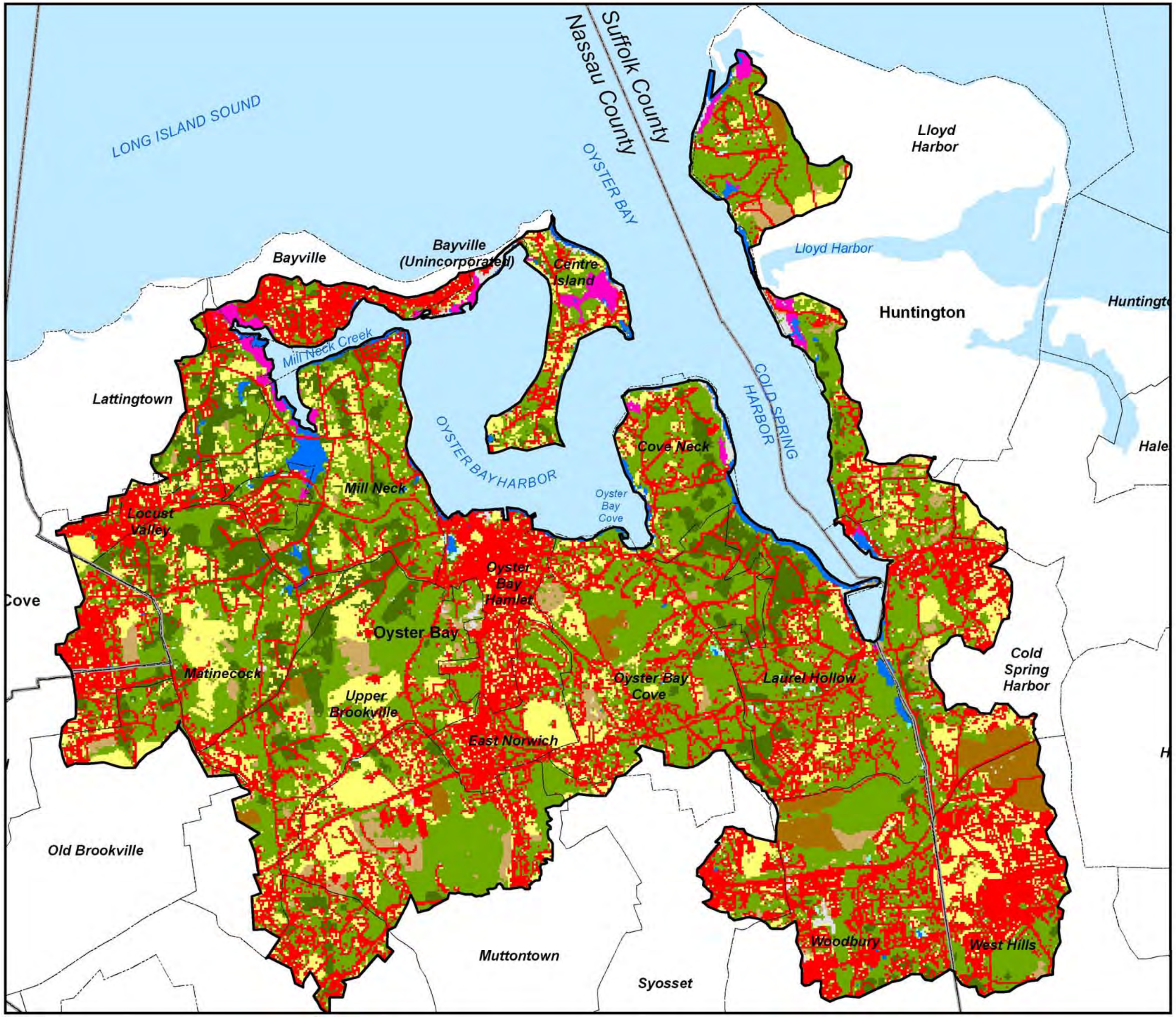
Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 7-3
Residential Zoning
Minimum Allowable Lot Size



State of the Watershed Report
Oyster Bay/Cold Spring Harbor

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Legend

OB/CSH Watershed
Town
Village

CLEAR Land Cover 2002

- 🟥 Developed
- 🟨 Turf/Grass
- 🟫 Other Grasses
- 🟩 Deciduous Forest
- 🟩 Coniferous Forest
- 🟦 Water
- 🟦 Non-forested Wetland
- ⬜ Forested Wetland
- 🟪 Tidal Wetland
- ⬜ Barren
- 🟫 Agriculture

N
W E
S

0 0.5 1 2
Miles

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR) at UCONN
USGS 7.5-minute topographic maps

FIGURE 7-4
Land Cover

Table 7-2. Watershed Land Cover

Land Cover Type	1985 Acres	1985 Percent of Watershed	2002 Acres	2002 Percent of Watershed	Relative Change in Percent of Watershed (%)[1]	Relative Change in Acreage (%)[2]
Deciduous Forest	9,500	39.0	9,068	37.2	-1.8	-5
Developed	7,175	29.5	7,455	30.6	1.1	4
Turf/Grass	3,439	14.1	3,661	15.0	0.9	6
Coniferous Forest	2,039	8.4	1,999	8.2	-0.2	-2
Other Grasses	561	2.3	683	2.8	0.5	22
Agriculture	559	2.3	524	2.2	-0.1	-6
Water	450	1.8	465	1.9	0.1	3
Barren	274	1.1	142	0.6	-0.5	-48
Tidal Wetland	250	1.0	247	1.0	0.0	-1
Forested Wetland	101	0.4	102	0.4	0.0	2
Non-forested Wetland	8	< 1	10	< 1	--	--

[1] Calculation = % land cover 2002 - % land cover 1985

[2] Calculation = (acres land cover 2002 - acres land cover 1985) / acres land cover 1985

Source: University of Connecticut's Center for Land Use Education and Research (CLEAR)

- Barren – Mostly non-agricultural areas free from vegetation, such as sand, sand and gravel operations, bare exposed rock, mines, and quarries. Also includes some urban areas where the composition of construction materials spectrally resembles more natural materials. Also includes some bare soil agricultural fields.

- Coniferous Forest – Includes Southern New England mixed softwood forests. May include isolated low density residential areas.

- Deciduous Forest – Includes Southern New England mixed hardwood forests. Also includes scrub areas characterized by patches of dense woody vegetation. May include isolated low density residential areas.

- Developed – High density built-up areas typically associated with commercial, industrial and residential activities and transportation routes. These areas contain a significant amount of impervious surfaces, roofs, roads, and other concrete and asphalt surfaces.

- Forested Wetland – Includes areas depicted as wetland, but with forested cover. Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.

- Non-forested Wetland – Includes areas that predominantly are wet throughout most of the year and that have a detectable vegetative cover (therefore not open water). Also includes some small watercourses due to spectral characteristics of mixed pixels that include both water and vegetation.

- Other Grasses and Agriculture – Includes non-maintained grassy areas commonly found along transportation routes and other developed areas and also agricultural fields used for both crop production and pasture.

- Turf & Grass – A compound category of undifferentiated maintained grasses associated mostly with developed areas. This class contains cultivated lawns typical of residential neighborhoods, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas. Also includes some agricultural fields due to similar spectral reflectance properties.

- Utility – Includes utility rights-of-way. This category was manually digitized on-screen from rights-of-way visible in the Landsat satellite imagery. The class was digitized within the deciduous and coniferous categories only.

- Water – Open water bodies and watercourses with relatively deep water.

A comparison of watershed land cover data between 1985 and 2002 (*Table 7-2*) shows a minor increase in watershed development during this period (4% increase in developed cover types) and a corresponding loss of coniferous (2% decrease) and deciduous forest (5% decrease). There was a significant percentage loss of barren land cover and percentage increase in other grasses; however these land cover categories comprise a very small percentage of the watershed area and could reflect construction or agricultural activity at the time the satellite data was obtained.

The harbor complex watershed is characterized by roughly equal amounts of forested land cover and developed land cover. These land cover types are described below.

Forest Cover

Approximately 45% of the watershed consists of deciduous and coniferous forest cover, which is associated with open space and wooded portions of low-density residential properties. *Table 7-3* compares the total acres and percent forest cover by subwatershed. The percent forest cover in each subwatershed ranges from approximately 15% in the White's Creek subwatershed to approximately 65% in the Tiffany Creek subwatershed.

Based on literature threshold values documented in several studies (CLEAR, 2007), watershed forest cover of 65% or greater is typically associated with a healthy aquatic invertebrate community. Only one of the fourteen subwatersheds, Tiffany Creek, meets or exceeds this threshold value of 65%. Based on a recommendation of the American Forests organization, 40% forest cover is a reasonable threshold goal for urban areas. Although the harbor complex watershed, as a whole, is above this threshold value, several of the subwatersheds, Centre Island (31%), Cold Spring Brook (37%), Kentuck Brook (39%), Mill Neck Creek (30%), and Upper White's Creek (33%), are below this threshold, with White's Creek significantly below the threshold at approximately 15%.

Table 7-3. Forest Cover – Oyster Bay Watershed

Subwatershed Name	Forest Cover in Subwatershed (acres)	Percent Forest Cover in Subwatershed	Developable Forest Cover in Subwatershed (acres)	Percent of Forest Cover that is Developable
Bailey Arboretum	310	61%	25	8%
Beaver Brook	2,157	46%	97	4%
Centre Island	243	31%	39	16%
Cold Spring Brook	1,745	37%	122	7%
Cold Spring Harbor	1,460	50%	25	2%
Kentuck Brook	567	39%	40	7%
Lloyd Neck	463	54%	0	0%
Mill Neck Creek	295	30%	9	3%
Mill River	1,207	58%	141	12%
Oyster Bay Harbor	777	48%	128	16%
Tiffany Creek	1,189	65%	77	6%
Upper Kentuck Brook	188	43%	0	0%
Upper White's Creek	424	33%	4	1%
White's Creek	42	15%	8	19%
Harbor Complex Watershed	**11,067**	**45%**	**25**	**8%**

Developed Areas

Developed land cover, characterized by significant amounts of impervious surfaces such as roofs, roads, and other concrete and asphalt surfaces, accounts for approximately 30% of the harbor complex watershed. When considered together with the turf/grass land cover category (primarily cultivated lawns typical of residential neighborhoods, parks, cemeteries, golf courses, turf farms, and other maintained grassy areas), approximately 46% of the watershed area consists of developed land cover types. The percentage of developed land cover (not including turf/grass) in each subwatershed ranges from approximately 17% in the Lloyd Neck and Bailey Arboretum subwatersheds to approximately 66% in the White's Creek subwatershed.

Table 7-4. Developed Land Cover by Subwatershed

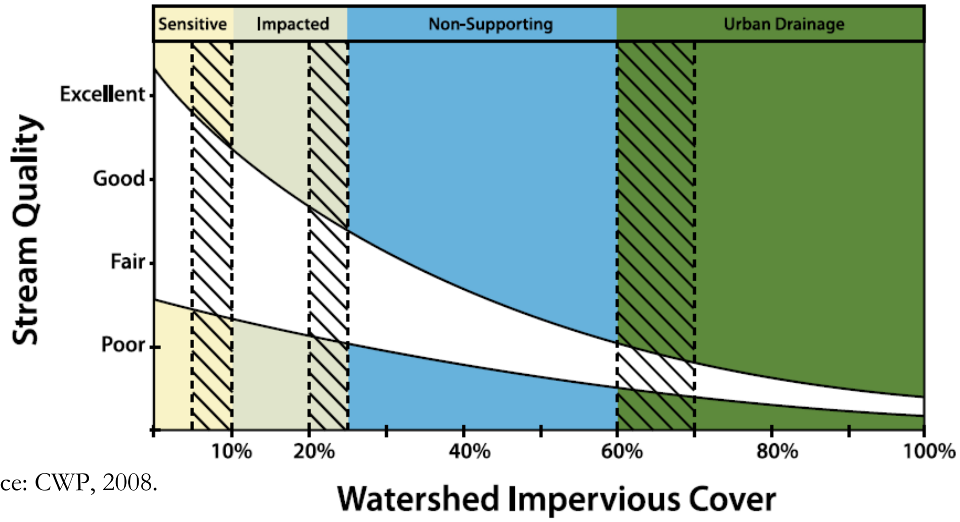
Subwatershed Name	Developed Land Cover in Subwatershed (acres)	Percent Developed Land Cover in Subwatershed (%)
Bailey Arboretum	85	17
Beaver Brook	1,064	23
Centre Island	198	25
Cold Spring Brook	1,815	39
Cold Spring Harbor	797	27
Kentuck Brook	598	41
Lloyd Neck	144	17
Mill Neck Creek	407	42
Mill River	541	26
Oyster Bay Harbor	515	32
Tiffany Creek	464	25
Upper Kentuck Brook	148	34
Upper White's Creek	496	39
White's Creek	184	66
Harbor Complex Watershed	**7,455**	**30**

7.1.4 Impervious Cover

Impervious cover has emerged as a measurable, integrating concept used to assess the overall condition of a watershed. Numerous studies have documented the cumulative effects of urbanization on stream and watershed ecology (Center for Watershed Protection, 2003; Schueler et al., 1992; Schueler, 1994; Schueler, 1995; Booth and Reinelt, 1993, Arnold and Gibbons, 1996; Brant, 1999; Shaver and Maxted, 1996). Research has also demonstrated similar effects of urbanization and watershed impervious cover on downstream receiving waters such as lakes, reservoirs, estuaries, and coastal areas.

The correlation between watershed impervious cover and stream indicators is due to the relationship between impervious cover and stormwater runoff, since streams and receiving water bodies are directly influenced by stormwater quantity and quality. Although well-defined imperviousness thresholds are difficult to recommend, research has generally shown that when impervious cover in a watershed reaches between 10 and 25 percent, ecological stress becomes clearly apparent. Between 25 and 60 percent, stream stability is reduced, habitat is lost, water quality becomes degraded, and biological diversity decreases (NRDC, 1999). Watershed imperviousness in excess of 60 percent is generally indicative of watersheds with significant urban drainage. *Figure 7-5* illustrates this effect. These research findings have been integrated into a general watershed planning model known as the Impervious Cover Model (ICM) (CWP, 2003).

Figure 7-5 also demonstrates the wide variability in stream response found in less-urban watersheds at lower levels of impervious cover (generally less than 10 percent). Stream quality at lower range of impervious cover is generally influenced more by other watershed metrics, such as forest cover, road density, extent of riparian vegetative cover, and cropping practices. Less variability exists in the stream quality at higher levels of impervious cover because most streams in highly impervious, urban watersheds exhibit fair or poor stream health conditions, regardless of other conditions (CWP, 2008).



Source: CWP, 2008.

Figure 7-5. Conceptual Model Illustrating Relationship Between Watershed Impervious Cover and Stream Quality

A GIS-based impervious cover analysis was performed for the harbor complex watershed, with assistance from the Center for Landuse Education and Research (CLEAR) at the University of Connecticut (Wilson, 2008). The satellite-derived land cover data described previously were used in the analysis. The sub-pixel classification method extracts impervious surface data directly from 2002 Landsat imagery to estimate the amount of impervious surface within each 30 meter pixel. The percent imperviousness by basin was calculated using the subwatershed GIS layer described previously. *Figure 7-6* graphically summarizes the results of this analysis.

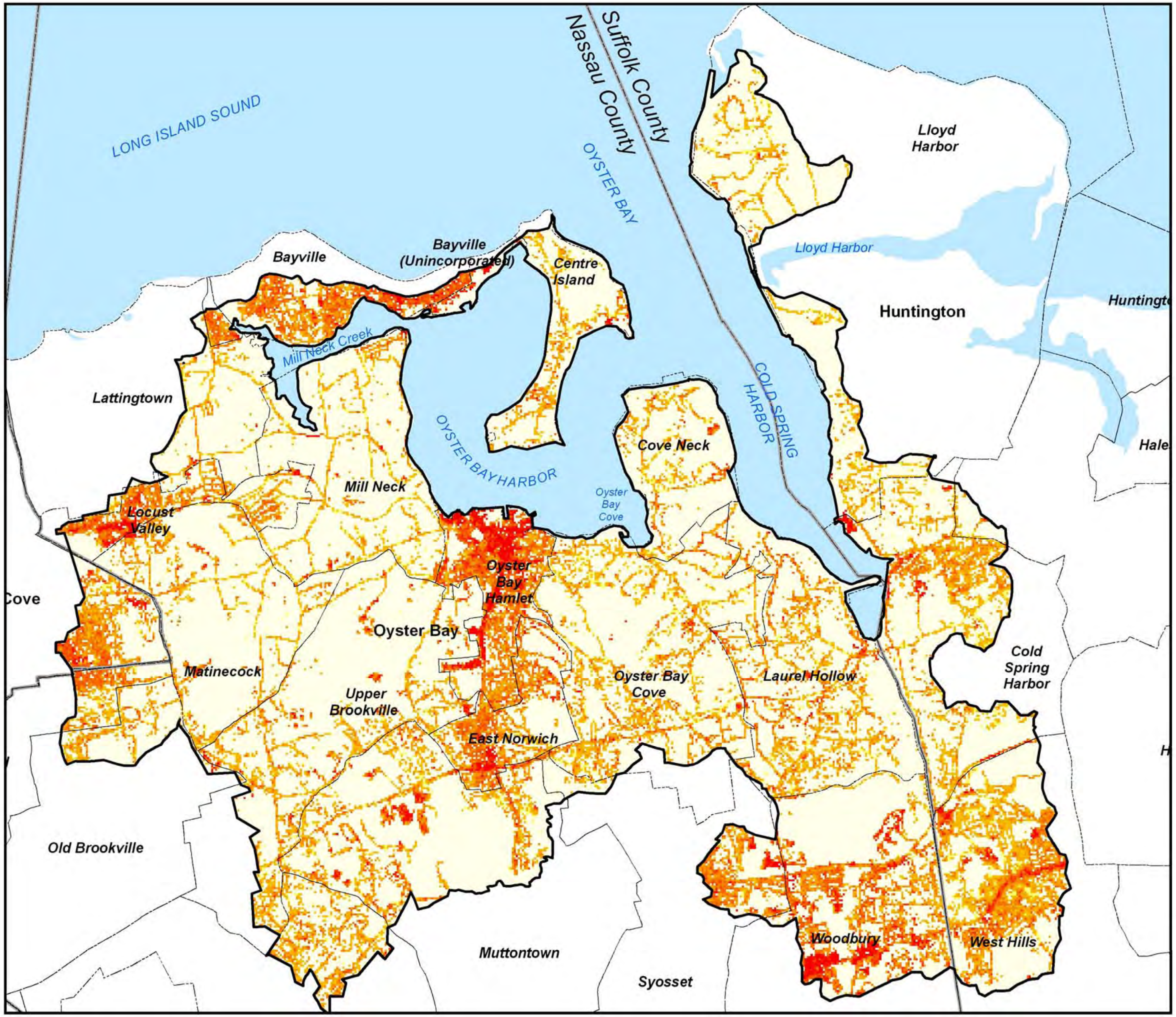
The overall imperviousness of the harbor complex watershed is estimated at approximately 12.3% (*Table 7-5*), which slightly exceeds the 10% threshold in the ICM where ecological stress and stream impacts become apparent. As shown in *Figure 7-6*, impervious cover is generally highest (30% to 70%) in the urbanized areas of Oyster Bay Hamlet and the Villages of Glen Cove, Bayville, Locust Valley, West Hills and the southern portion of Woodbury. Impervious cover in most of the residential areas of the watershed generally ranges from less than 10 percent up to 30%.

Figure 7-7 and *Table 7-5* summarize estimates of impervious cover by subwatershed. Most of the subwatersheds fall into the "impacted" category (impervious cover between 10 and 25%) according to the ICM. Several of the subwatersheds have significantly less than 10% impervious cover, including the Bailey Arboretum and Lloyd Neck subwatersheds. The White's Creek subwatershed has the highest impervious cover (43.3%), which is consistent with the high-density development in Oyster Bay Hamlet and indicative of degraded stream conditions according to the ICM.

Table 7-5. Existing Subwatershed Impervious Cover

Subwatershed	Percent Impervious Cover
Bailey Arboretum	4.6%
Beaver Brook	8.0%
Centre Island	10.0%
Cold Spring Brook	16.4%
Cold Spring Harbor	9.6%
Kentuck Brook	18.5%
Lloyd Neck	4.4%
Mill Neck Creek	19.1%
Mill River	10.5%
Oyster Bay Harbor	14.1%
Tiffany Creek	8.6%
Upper Kentuck Brook	11.9%
Upper White's Creek	15.8%
White's Creek	43.3%
Harbor Complex Watershed	**12.3%**

The results of this analysis provide an initial diagnosis of potential stream and receiving water quality within the watershed study area. The analysis method and ICM are based on several assumptions and caveats, which limits its application to screening-level evaluations. Some of the assumptions of the ICM include:



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Legend

OB/CSH Watershed
Town
Village

Impervious Cover

<10%
10-19%
20-29%
30-39%
40-49%
50-59%
60-69%
70-79%
80-89%
90-100%

N W E S

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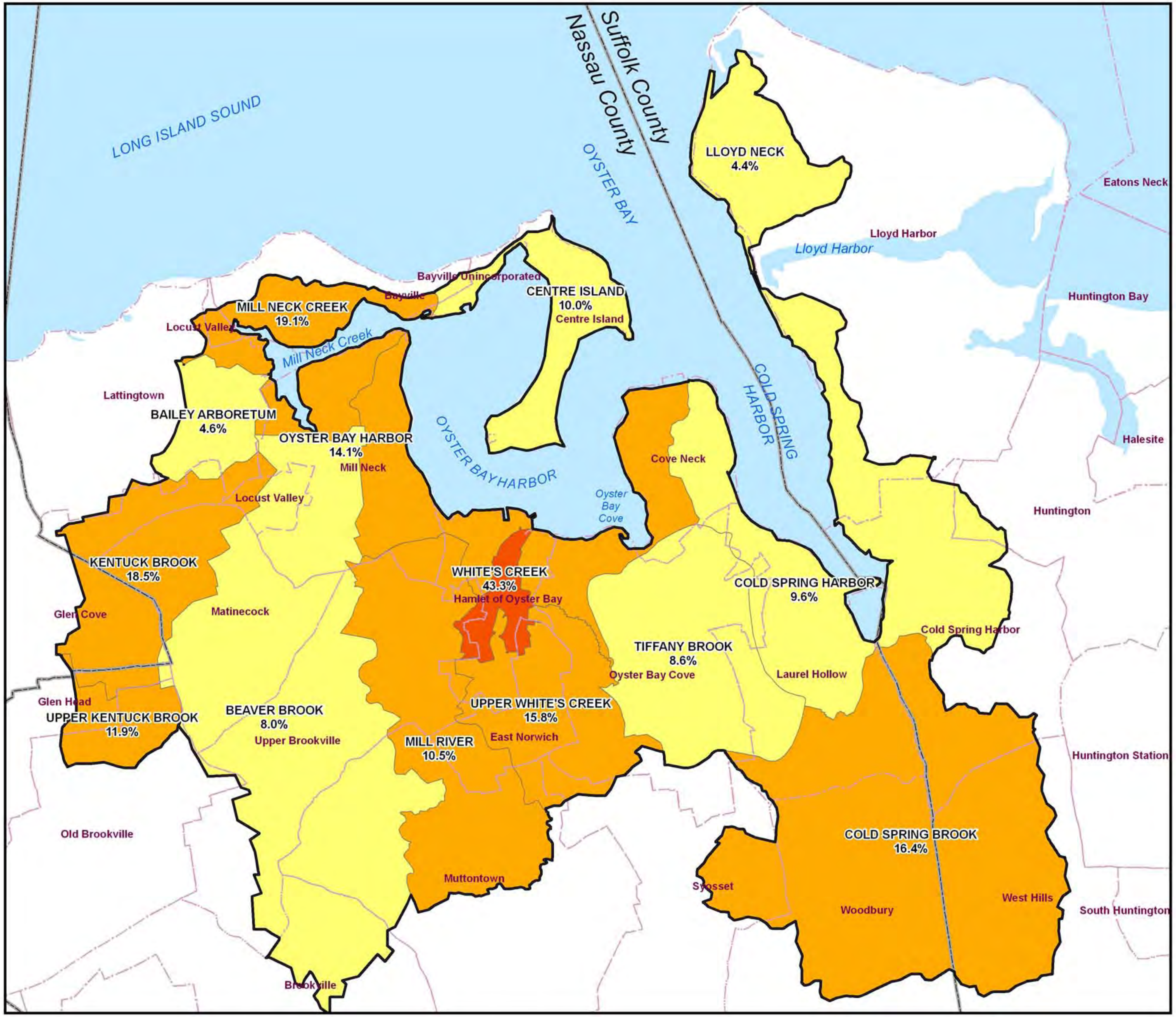
Miles

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR) at UCONN
USGS 7.5-minute topographic maps

FIGURE 7-6
Watershed Impervious Cover



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Legend

- OB/CSH Watershed
- Subwatershed
- Town
- Village

Impervious Surface

🟨	< 10%	Sensitive
🟧	10 - 25%	Impacted
🟥	25 - 60%	Non-Supporting
🟥	> 60%	Urban Drainage

N
W E
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Miles

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR) at UCONN
USGS 7.5-minute topographic maps

FIGURE 7-7
Impervious Cover
by Subwatershed

- Requires accurate estimates of percent impervious cover, which is defined as the total amount of impervious cover over a subwatershed area. The resolution of the land cover data used in the evaluation is relatively coarse, although sufficient for screening analysis.

- Predicts potential rather than actual stream quality.

- Does not predict the precise score of an individual stream quality indicator but rather predicts the average behavior of a group of indicators over a range of impervious cover.

- The 10 and 25 % thresholds are approximate transitions rather than sharp breakpoints.

- Does not currently predict the impact of watershed best management practices (treatment or non-structural controls).

- Does not consider the geographic distribution of the impervious cover relative to the streams and receiving waters. Effective impervious cover (impervious cover that is hydraulically connected to the drainage system) has been recommended as a better metric, although determining effective impervious cover requires extensive and often subjective judgment as to whether it is connected or not.

- Impervious cover is a more robust and reliable indicator of overall stream quality beyond the 10 percent threshold. The influence of impervious cover on stream quality is relatively weak compared to other potential watershed factors such as percent forest cover, riparian community, historical land use, soils, agriculture, etc. for impervious cover less than 10 percent.

7.1.5 Open Space

Open space areas were identified based on a review of land use information provided by the Town of Oyster Bay and Town of Huntington, review of aerial photographs, and through coordination with Friends of the Bay. Approximately 10% of the harbor complex watershed consists of protected open space that is primarily conservation land and public parks (*Figure 7-8*). This land is protected against future development. In addition, recreational open space (golf courses, beaches, and private institutional open space) accounts for another 5% to 10% of the watershed area (*Figure 7-1*). Future development of these parcels is unlikely, unless their continued use becomes threatened. Additional privately held natural open space exists on already subdivided parcels and large estates.

Nassau County has identified open space, parks, stormwater systems and brownfields that are recommended for acquisition or restoration funding in the report *The 2006 Nassau County Environmental Program: Recommended Properties and Projects* (Nassau County, 2006). The open space acquisition recommendations total 52 acres in the harbor complex watershed and include the Humes Property and Smithers Property in Mill Neck, the Held Property and Schwab Property in Oyster Bay Cove, and Woodbury Hills in Woodbury.

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Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 7-8
Protected Open Space

In February 2008, the Nassau County Legislature acquired most of the 31-acre Smithers Estate in Mill Neck for open space preservation. This important acquisition creates a continuous preserve all the way to the Oyster Bay National Wildlife Refuge, helping to protect water quality and the health of the Oyster Bay/Cold Spring Harbor estuary system. The Smithers Estate is within a state-designated Special Groundwater Protection Area (SGPA) and contains two ponds, as well as many of the fresh-water springs that supply Shu Swamp, Beaver Dam, Mill Neck Creek and Oyster Bay. The NYSDEC has documented 74 species of birds breeding in the area, including migratory birds. It also provides critical habitat for numerous fish species, such as Brook Trout and the American Brook Lamprey.

The NYSDEC *2006 New York State Open Space Conservation Plan* identifies several properties in the Oyster Bay/Cold Spring Harbor Complex watershed that are priorities for future acquisition to protect water quality, fish and wildlife habitat, and water-based industry, and provide increased opportunities for public access to Long Island Sound. The *DRAFT 2009 New York State Open Space Conservation Plan* updates the 2006 priority list and includes:

- *Sagamore Hill Additions* – 19 parcels totaling 358 acres, flanking Sagamore Hill National Park on the Cove Neck peninsula in the Town of Oyster Bay. Most parcels front either Oyster Bay or Cold Spring Harbor.

- *Shu Swamp Natural Area* – 9 parcels totaling 80 acres on either side of Shu Swamp Preserve in the Town of Oyster Bay. The area is a Class I freshwater wetland within the Oyster Bay SGPA. Home to endangered brook trout, brook lamprey and water otter as well as several unusual or regionally rare plant species.

- *Oyster Bay Mill Pond Area* – One 6-acre parcel fronting Oyster Bay Mill Pond, an 8-acre stream-fed pond within the boundaries of the Oyster Bay National Wildlife Refuge that flows directly into Oyster Bay Harbor.

- *Oyster Bay Harbor Area* – 36 parcels totaling 294 acres surrounding Oyster Bay Harbor, home to New York State's largest oyster fishing area. This popular area provides outstanding recreational opportunities and includes a large concentration of both saltwater and freshwater wetlands.

The *DRAFT 2009 New York State Open Space Conservation Plan* also identifies acquisition of parcels along trail corridors and greenways associated with the Long Island Trail & Greenway System to provide non-motorized travel corridors for people and wildlife, and to link recreational, natural and cultural attractions. In the Oyster Bay/Cold Spring Harbor Complex watershed, the primary trail and greenway acquisition priorities include:

- *Muttontown Preserve Trail System* – 11 parcels totaling 295 acres adjoining the Muttontown Preserve. This popular horse and foot trail system is heavily used and is threatened with fragmentation. It is located in the Oyster Bay SGPA and contains rare plants, tiger salamanders, and glacial kettle-hole ponds.

Finally, the *DRAFT 2009 New York State Open Space Conservation Plan* identifies acquisition of vacant land within SGPAs identified in the 1992 Long Island Comprehensive Special Groundwater Protection Area Plan. The protection of land within SGPA boundaries is directly linked to the long term health of Long Island's drinking water supply. In the Oyster Bay/Cold Spring Harbor Complex watershed, the primary acquisition priorities include:

- *Route 25A Heritage Area* – 16 parcels totaling 231 acres along Route 25A in the State-designated Long Island North Shore Heritage Area and the Oyster Bay SGPA. Parcels will preserve the history of Long Island's rural past while protecting drinking water for its future.

- *Planting Fields Arboretum Additions* – 21 parcels totaling 606 acres near or adjoining Planting Fields Arboretum State Historic Park in the Oyster Bay SGPA.

- *Tiffany Creek Preserve* – 18 parcels totaling 221 acres in the Oyster Bay SGPA. Two water district wells are located in project area, as well as spring fed ponds and streams, old growth woods, migratory songbirds, several turtle species and tiger salamanders.

7.2 Future Conditions

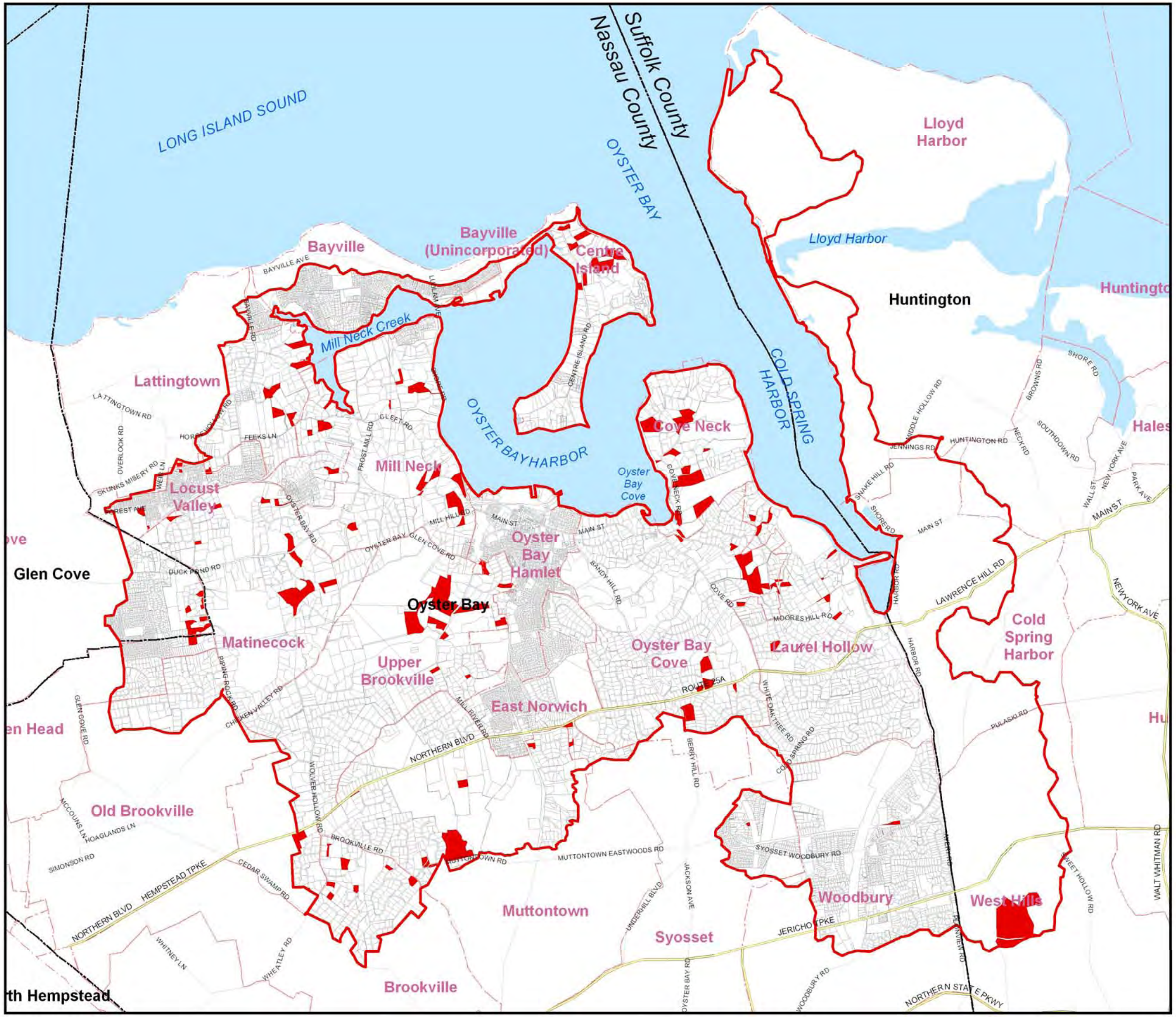
7.2.1 Watershed Buildout Analysis

A watershed buildout analysis was conducted to estimate future potential land use and impervious cover conditions in the watershed as a result of maximum development allowed by current zoning.

Land Use

Existing undeveloped land that could be developed in the future (i.e. "developable" land) is shown in *Figure 7-9*. Land designated as "Potential New Development" in *Figure 7-9* includes parcels in the Town of Oyster Bay that are designated as "Vacant Land." There is little vacant land remaining in the Town of Huntington, and no significant vacant parcels in the Huntington portion of the watershed. Areas identified as protected open space, as well as areas identified as having "Recreation and Entertainment" land use, were excluded from the analysis. Isolated fragments of land or parcels less than ¼-acre in size were also excluded. Potentially developable parcels were verified by Friends of the Bay using local knowledge of parcels that are unlikely to be developed and land designated as protected open space. The developable land in the watershed is primarily forested.

As indicated in *Table 7-6*, the harbor complex watershed is largely built-out. There are relatively few vacant, undeveloped parcels that are not either protected open space or recreational open space that is likely to be developed in the future. Overall, less than 3% of the watershed area has the potential for new development. The actual amount of land in the watershed that is subject to future development is likely even less since development on these parcels would be restricted by wetlands, steep slopes, and other physical factors, as well as maximum lot coverage, setbacks, and other zoning constraints. Most significant future development will most likely occur as infill or redevelopment.



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Legend

▭	OB/CSH Watershed
▭	County
▭	Town
▭	Village
🟥	Potentially Developable Land
▭	Parcels

(Huntington Data Unavailable)

N
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Miles

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 7-9
Potentially Developable Land

Table 7-6. Potential Developable Land

Subwatershed Name	Potential New Development (acres)	New Development Percent of Subwatershed
Bailey Arboretum	25	4.8%
Beaver Brook	97	2.0%
Centre Island	39	5.1%
Cold Spring Brook	3	0.0%
Cold Spring Harbor	25	0.8%
Kentuck Brook	40	2.6%
Lloyd Neck	0	0.0%
Mill Neck Creek	9	0.9%
Mill River	141	6.5%
Oyster Bay Harbor	128	7.9%
Tiffany Creek	77	4.0%
Upper Kentuck Brook	0	0.0%
Upper White's Creek	4	0.3%
White's Creek	8	2.7%
Harbor Complex Watershed	**596**	**2.4%**

Impervious Cover

The watershed buildout analysis was used in conjunction with the existing conditions impervious cover analysis (Section 7.1.4) to estimate future impervious cover in the harbor complex watershed. For this analysis, impervious cover was included as a parameter in the pollutant loading model described in Section 8.1. Each urban land use type was assigned an impervious cover coefficient based on literature values (see Table 2 in *Appendix A*). Land use data for both existing and buildout conditions were then entered into the model to determine the change in impervious cover for each subwatershed. The predicted change in impervious cover was then added to the existing impervious cover estimates described in Section 7.1.3 to estimate future impervious cover.

Table 7-7 presents estimates of existing and future impervious cover by subwatershed. The shaded cells in the table highlight the subwatersheds in which future impervious cover is predicted to approach or exceed the "impacted" (10%) threshold value as described by the Impervious Cover Model.

Table 7-7. Percent Impervious Cover – Existing and Future Conditions

Subwatershed	Existing Percent Impervious Cover	Future Percent Impervious Cover	Percent Change ($IC^{future}-IC^{existing}$)
Bailey Arboretum	4.6%	6.9%	2.3%
Beaver Brook	8.0%	8.7%	0.7%
Centre Island	10.0%	12.1%	2.1%
Cold Spring Brook	16.4%	16.4%	0.0%
Cold Spring Harbor	9.6%	10.0%	0.4%
Kentuck Brook	18.5%	20.0%	1.5%
Lloyd Neck	4.4%	4.4%	0.0%
Mill Neck Creek	19.1%	19.6%	0.5%
Mill River	10.5%	13.4%	2.9%
Oyster Bay Harbor	14.1%	17.6%	3.5%
Tiffany Creek	8.6%	10.4%	1.8%
Upper Kentuck Brook	11.9%	11.9%	0.0%
Upper White's Creek	15.8%	16.0%	0.2%

Table 7-7. Percent Impervious Cover – Existing and Future Conditions

White's Creek	43.3%	45.3%	2.0%
Harbor Complex Watershed	**12.3%**	**13.6%**	**1.3%**

Based on this analysis, the impervious cover in the overall harbor complex watershed is predicted to increase from 12.3% to 13.6%, but remain well below the ICM non-supporting threshold of 25%. The Cold Spring Harbor and Tiffany Creek subwatersheds are predicted to increase from slightly less than 10% impervious cover to meet or slightly exceed the 10% threshold where ecological impacts become apparent (see *Figure 7-5*). The largest relative change in impervious cover is predicted in the Oyster Bay Harbor subwatershed, where imperviousness could increase from approximately 14.1% to 17.6%.

Another useful metric was developed by Goetz et al. (2003) for the Chesapeake Bay region, which combines subwatershed impervious cover and tree cover within the 100-foot riparian area along streams and other watercourses. The harbor complex subwatersheds were analyzed with regard to the combined impervious cover/riparian zone metric, which is summarized in the following matrix by Goetz et al. (2003).

Stream Health	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Riparian Zone
Excellent	< = 6%	>=65%
Good	6-10%	60-65%
Fair	10-25%	40-60%
Poor	> 25%	<40%

Natural vegetation was determined using the CLEAR land cover data and included the deciduous forest, coniferous forest, forested wetland, and non-forested wetland categories. A 100-foot riparian area was considered on both sides of mapped streams and around Beaver Pond, Mill Pond, and St. John's Pond. The following table presents the results from the combined impervious cover/riparian zone metric. Centre Island, Cold Spring Harbor, Lloyd Neck, Mill Neck Creek, Oyster Bay Harbor, Upper Kentuck Brook, and Upper White's Creek are not included in the table since these subwatersheds do not contain well-defined, mapped streams.

Table 7-8. Existing Impervious Cover/Riparian Zone Metric

Subwatershed	% Watershed Impervious Cover	% Natural Vegetation in 100-ft Riparian Zone
Bailey Arboretum	4.6%	63%
Beaver Brook	8.0%	61%
Cold Spring Brook	16.4%	82%
Kentuck Brook	18.5%	62%
Mill River	10.5%	62%
Tiffany Creek	8.6%	71%
White's Creek	43.3%	30%

Overall, most of the harbor complex subwatersheds evaluated are currently categorized as "good" to "excellent" based on the riparian zone metric published by Goetz et al. (2003). White's Creek falls into the "poor" category, with approximately 30% natural vegetation in the 100-foot stream buffer. The segment of the stream in the subwatershed is approximately 360 feet long and the Oyster Bay Sewage Treatment Plant is on the western bank of the stream, with a forested area along the western bank. Future conditions were not evaluated since there is no significant undeveloped land within the 100-foot riparian zone.

8 Pollutant Loading

A pollutant loading model was developed using the land use/land cover data described in Section 7.0. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing and future conditions and not to predict future water quality. This section summarizes the methods and results of the analysis, which are presented in greater detail in *Appendix A*.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas. The model calculates watershed pollutant loads for sediment and nutrients based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) techniques to reduce pollutant loads.

Data obtained as part of the Land Use/Land Cover analysis presented in Section 7.0 were used to generate model inputs. Several other model parameters were specified for each pollutant and subwatershed, including:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model was applied to each subwatershed to estimate annual pollutant loads under existing and future land use scenarios, as described in Section 7.0. The existing and future pollutant loads were compared to assess anticipated changes in loads for each subwatershed. The area draining to existing recharge basins (see *Figure 6-4* for areas in the watershed that currently drain to a recharge basin) was excluded from the pollutant loading analysis since the recharge basins effectively infiltrate and provide treatment for the water quality volume, thereby eliminating pollutant loads to surface waters. The recharge basin drainage areas were determined based on mapping available from the Nassau County subwatershed stormwater management reports, where available, and the Nassau County Department of Public Works.

Because the study subwatersheds vary in size, pollutant loads were also evaluated in terms of loading rates (i.e., pollutant loads per acre of land area, as shown in *Table 8-1*). A higher loading rate indicates relatively greater pollutant sources per unit area, which suggests that implementation of best management practices (BMPs) in these areas would be more effective in reducing pollutant loads. The results in *Table 8-1* indicate that pollutant loading rates are relatively uniform across many of the subwatersheds. The highest loading rates for nitrogen, phosphorus and sediment are associated with the White's Creek, Mill Neck Creek, Centre Island, and Cold Spring Harbor subwatersheds.

As discussed previously, pollutant loads and loading rates are also correlated with the amount of area within a subwatershed that is served by recharge basins. For example, the Kentuck Brook and Tiffany Creek subwatersheds are characterized by high density residential, commercial, and institutional land use, but a large percentage of the stormwater runoff from these subwatersheds is captured and infiltrated in recharge basins (65% and 31% respectively). Consequently, these subwatersheds have lower pollutant loading rates than the Mill Neck Creek and Cold Spring Harbor subwatersheds, for example, in which little or none of the drainage area is currently served by recharge basins.

Table 8-1. Existing Pollutant Loads and Loading Rates

Subwatershed	% Area to Recharge Basins	N	P	Sediment	N	P	Sediment
		lb/yr	lb/yr	ton/yr	lb/ac-yr	lb/ac-yr	ton/ac-yr
Cold Spring Brook (4,851 ac)	39%	17,479	3,113	324	3.6	0.6	0.07
Cold Spring Harbor (2,953 ac)	0%	16,476	2,834	314	5.6	1.0	0.11
Beaver Brook (4,862 ac)	31%	14,789	2,677	269	3.0	0.6	0.06
Oyster Bay Harbor (1,612 ac)	2%	8,769	1,494	173	5.4	0.9	0.11
Mill Neck Creek (968 ac)	5%	8,491	1,765	132	8.8	1.8	0.14
Mill River (2,175 ac)	17%	7,796	1,494	140	3.6	0.7	0.06
Tiffany Creek (1,923 ac)	31%	7,670	1,386	137	4.0	0.7	0.07
Kentuck Brook (1,538 ac)	65%	5,942	1,483	71	3.9	1.0	0.05
Centre Island (762 ac)	0%	4,307	799	78	5.7	1.0	0.10
Lloyd Neck (894 ac)	0%	3,661	697	69	4.1	0.8	0.08
Bailey Arboretum (527 ac)	5%	2,929	504	53	5.6	1.0	0.10
White's Creek (292 ac)	0%	2,814	436	61	9.6	1.5	0.21
Upper White's Creek (1,317 ac)	100%	1,155	452	0	0.9	0.3	0.00
Upper Kentuck Brook (451 ac)	100%	295	115	0	0.7	0.3	0.00

- *White's Creek* – Although the White's Creek subwatersheds is the smallest in the study area, it is characterized by the dense residential and highest percent composition of commercial (18.4%) and industrial (2.2%) land uses in the watershed. For comparison, the next highest percentage of commercial land use is Cold Spring Brook with only 3.8% of the total subwatershed area. Transportation and other land uses are in comparable proportions to other subwatersheds in Oyster Bay. White's Creek does not contain any recharge basins, and is therefore characterized by high pollutant loading rates.

- *Mill Neck Creek* – Mill Neck Creek is characterized by both relatively high total pollutant loads and pollutant loading rates due to a high proportion of dense residential land use (42.8%). Other land uses are similar to other subwatershed areas. A major factor contributing the high pollutant loading rates in this subwatershed is that only 2 recharge basins are present in the watershed, with only 5% of the total area treated through recharge basins.

- *Centre Island* – Centre Island is characterized by rural residential land uses and no recharge basins within the subwatershed. The high loading rates for nitrogen and phosphorus are due to the septic systems.

- *Cold Spring Harbor and Oyster Bay Harbvor* – Cold Spring Harbor and Oyster Bay Harbor are moderately-sized subwatersheds in which stormwater is conveyed to the harbor complex through stormwater collection systems and overland flow. These coastal areas are heavily developed, and only very small portions of these subwatersheds are served by recharge basins. Consequently, existing pollutant loads and loading rates for these subwatersheds are relatively high.

Table 8-2 presents the results of the future pollutant loading analysis under the watershed buildout scenario described in Section 7. Results are shown in terms of increase in pollutant loading rate (the mass of pollutants discharged per contributing acre of land on an annual basis) and percent increase in pollutant load (based on the total pollutant discharge from each of the subwatersheds).

Table 8-2. Projected Future Pollutant Loading Rates and Load Increases

Subwatershed	Projected Future Loading Rate			Projected Load Increase		
	N	P	Sediment	N	P	Sediment
	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	ton/yr
Bailey Arboretum (527 ac)	5.8	0.99	0.107	5%	4%	6%
Beaver Brook (4,862 ac)	3.1	0.56	0.057	3%	2%	3%
Centre Island (762 ac)	5.9	1.09	0.109	5%	4%	6%
Cold Spring Brook 4,851 ac)	3.6	0.64	0.067	0%	0%	0%
Cold Spring Harbor (2,953 ac)	5.6	0.97	0.107	1%	1%	1%
Kentuck Brook (1,538 ac)	4.1	0.99	0.051	5%	3%	9%
Lloyd Neck (894 ac)	4.1	0.78	0.077	0%	0%	0%
Mill Neck Creek (968 ac)	8.8	1.83	0.137	1%	0%	1%
Mill River (2,175 ac)	3.9	0.73	0.072	10%	7%	11%
Oyster Bay Harbor (1,612 ac)	5.9	0.99	0.117	8%	7%	9%
Tiffany Creek (1,923 ac)	4.2	0.75	0.076	6%	4%	7%
Upper Kentuck Brook (451 ac)	0.7	0.26	0.000	0%	0%	0%
Upper White's Creek (1,317 ac)	0.9	0.34	0.000	0%	0%	0%
White's Creek (292 ac)	9.9	1.53	0.214	3%	3%	3%

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include Tiffany Creek, Mill River, Oyster Bay Harbor, and Kentuck Brook watersheds. The build-out conditions of the Mill River and Oyster Bay Harbor subwatersheds are projected to result in greater than 5% increase in pollutant loading rates for nitrogen, phosphorus and sediment loads. The increase in urban land use with a corresponding decrease in forest, with a proportion of the new urban land is likely to consist of new residential and industrial development. The increase in pollutant loads is the future is relatively small across the watershed because there is little opportunity for redevelopment in existing residential areas and for development in forested or vacant areas.

9 Comparative Subwatershed Analysis

A Comparative Subwatershed Analysis was performed for the Oyster Bay/Cold Spring Harbor subwatersheds to identify the subwatersheds with the greatest restoration potential. Subwatershed "metrics" were used to conduct this analysis. Metrics are numeric values that characterize the relative restoration potential of a subwatershed. The results of this analysis are used to prioritize field assessment efforts in future phases of this study and to guide plan recommendations.

The analysis involves a screening level evaluation of selected subwatershed metrics that are derived by analyzing available GIS layers and other subwatershed data sources. The basic approach used to conduct the Comparative Subwatershed Analysis consisted of:

1. Delineation of subwatershed boundaries and review of available metric data.
2. Selection and calculation of metrics that best describe subwatershed restoration potential.
3. Developing weighting and scoring rules to assign points to each metric.
4. Computing aggregate scores and developing initial subwatershed rankings.

Subwatersheds with higher aggregate "restoration potential" scores are more likely to have been impacted and have greater potential for restoration to improve upon existing conditions. This approach enables watershed planners to allocate limited resources on subwatershed where restoration and conservation efforts have the greatest chances of success. The subwatersheds used in this analysis are those identified in Section 5.1 of this document.

9.1 Analysis Methods and Results

The metrics for the Comparative Subwatershed Analysis are presented in *Table 9-1*. Ten metrics were evaluated for each subwatershed and points were assigned for the relative restoration potential indicated by the metric. All metrics were scored between 1 and 10, with 1 indicating the lowest potential for restoration and 10 indicating the highest potential for restoration. The scores for each of the 10 metrics were then added to arrive at a composite score for each subwatershed. The total number of points possible for each subwatershed is 100.

The results of the Comparative Subwatershed Analysis are summarized in *Table 9-2*. The restoration potential scores ranged from 20 to 54 points out of a possible 100. The highlighting identifies subwatersheds with high (orange), moderate (yellow), and low (green) restoration potential in the harbor complex watershed.

Table 9-1. Comparative Subwatershed Analysis Restoration Potential Metrics

Subwatershed Metric	How Metric is Measured	Indicates Higher Restoration Potential When	Metric Points
1. Existing Impervious Cover	% impervious cover in subwatershed	Current impervious cover is low, suggesting range of possible sites for storage retrofits and stream repairs	<10% = 10pts; 10 to 25% = 7 pts; 26 to 40 = 5 pts; 41 to 60% = 3 pts; > 60% = 1 pts
2. Forest Cover	% forest cover in subwatershed	Forest cover is low, suggesting potential for upland and riparian reforestation	<20% = 10 pts; 21 to 30% = 7 pts; 31 to 40% = 5 pts 41 to 60% = 3 pts, >60 % = 1 pt
3. Recharge Basin Drainage Area	% drainage area	Recharge basin drainage area is low, subwatersheds with smaller proportion of area served by recharge basins are better candidates for stormwater retrofits	One pt for each 10% below 100%
4. Publicly-owned land	% of subwatershed that is publicly owned	Public land ownership is high, providing range of potential sites for restoration practices	Award 1 pt for each 2.5% of subwatershed in public ownership (up to 10 pts)
5. Residential Land	% of subwatershed residential land use	residential land is high, suggests strong feasibility for neighborhood source control, on-site retrofits and upland forestry	Award 1 pt for each 10% residential land use
6. Industrial & Commercial Land	% of subwatershed that is industrial or commercial land	Industrial/Commercial land is high, suggesting potential for source controls, discharge prevention, and on-site retrofits	Award 1 pt for each 2% of subwatershed classified as industrial or commercial
7. Wetland Area	% of subwatershed that is tidal or freshwater wetlands	Wetland cover is high, suggesting potential for wetland and riparian restoration	Award 1 pt for each 4% of subwatershed area
8. Stream Density	Stream miles / square mile	Stream density is high, suggesting greater feasibility of stream corridor restoration practices	Award 1 pt for each 0.1-mile of stream/sq mi (up to 10 pts)
9 Regulated Site Density	Regulated sites / sq mi. (incl. RCRA, AFS, CERCLIS)	Regulated site density is high, suggests strong potential to implement source controls, discharge prevention and on-site retrofits	0 to 1 sites/sq. mi. = 1 pt; 1 to 2 = 3 pts; 2 to 5 = 5 pts; 5 to 10 = 7 pts; > 10 = 10 pts
10. Developed Areas with Septic	Density (septic systems/acre)	Density of septic systems is high, suggesting greater potential for improvements through septic system upgrades or new sewers	Award 1 pt for each 0.2 septic system per acre in subwatershed

Table 9-2. Results of Comparative Subwatershed Analysis

Subwatershed	1. Current Impervious Cover	2. Forest Cover	3. Recharge Basin Collection Area	4. Publicly-Owned Land	5. Residential Land	6. Industrial & Commercial Land	7. Wetland Area	8. Stream Density	9. Regulated Sites Density	10. Developed Areas Served by Septic	Total
Mill Neck Creek	7	7	10	3	7	0	8	0	3	9	**54**
Bailey Arboretum	10	1	10	4	7	0	1	10	5	2	**50**
Mill River	7	3	8	10	5	1	1	8	5	2	**50**
Cold Spring Brook	7	5	6	10	5	2	1	3	7	3	**49**
White's Creek	3	10	10	1	4	10	0	1	10	0	**49**
Centre Island	7	5	10	5	6	0	10	0	1	2	**46**
Cold Spring Harbor	10	3	10	6	5	1	2	0	5	2	**43**
Lloyd Neck	10	3	10	9	7	0	2	0	0	2	**43**
Oyster Bay Harbor	7	3	10	3	6	1	3	0	7	1	**41**
Kentuck Brook	7	5	3	4	6	1	0	3	5	6	**40**
Beaver Brook	10	3	6	3	6	0	1	3	1	1	**34**
Tiffany Creek	10	1	6	5	6	0	0	4	0	1	**33**
Upper White's Creek	7	5	0	4	6	1	0	0	5	3	**31**
Upper Kentuck Brook	7	3	0	0	8	0	0	0	0	2	**20**

As shown in *Table 9-2*, the following subwatersheds have the highest restoration potential based on the Comparative Subwatershed Analysis scoring system:

- *Mill Neck Creek* – The Mill Neck Creek subwatershed is ranked highest for the wetland and septic system-related metrics. The area of Bayville is densely developed and contains a significant number of on-site septic systems, offering ample opportunities for residential-related retrofits and restoration projects to address pollutant sources. The Mill Neck Creek subwatershed also has a high proportion of tidal wetlands, which provides opportunities for wetland restoration/preservation.

- *Bailey Arboretum* – The Bailey Arboretum subwatershed drains to Mill Neck Creek through a small tributary. The subwatershed is characterized by high impervious cover and residential development. Only 5% of the subwatershed area is served by existing recharge basins, providing opportunities for new stormwater controls.

- *Mill River* – The Mill River subwatershed contains a relatively high percentage of publicly-owned land, including large portions of the Muttontown Preserve and Planting Fields. The Mill River also has a relatively high stream density, suggesting greater feasibility for stream corridor restoration practices.

- *Cold Spring Brook* – The Cold Spring Brook subwatershed ranked favorably for restoration potential in terms of recharge basin density, publicly-owned land, existing impervious cover, and regulated sites. This subwatershed has a relatively low impervious cover, indicating a greater range of potential restoration sites for stormwater retrofits, stream repairs, reforestation, and source control practices. The relatively high density of regulated sites in this watershed, including permitted stormwater dischargers, provides opportunities for source controls, discharge prevention, and on-site retrofits.

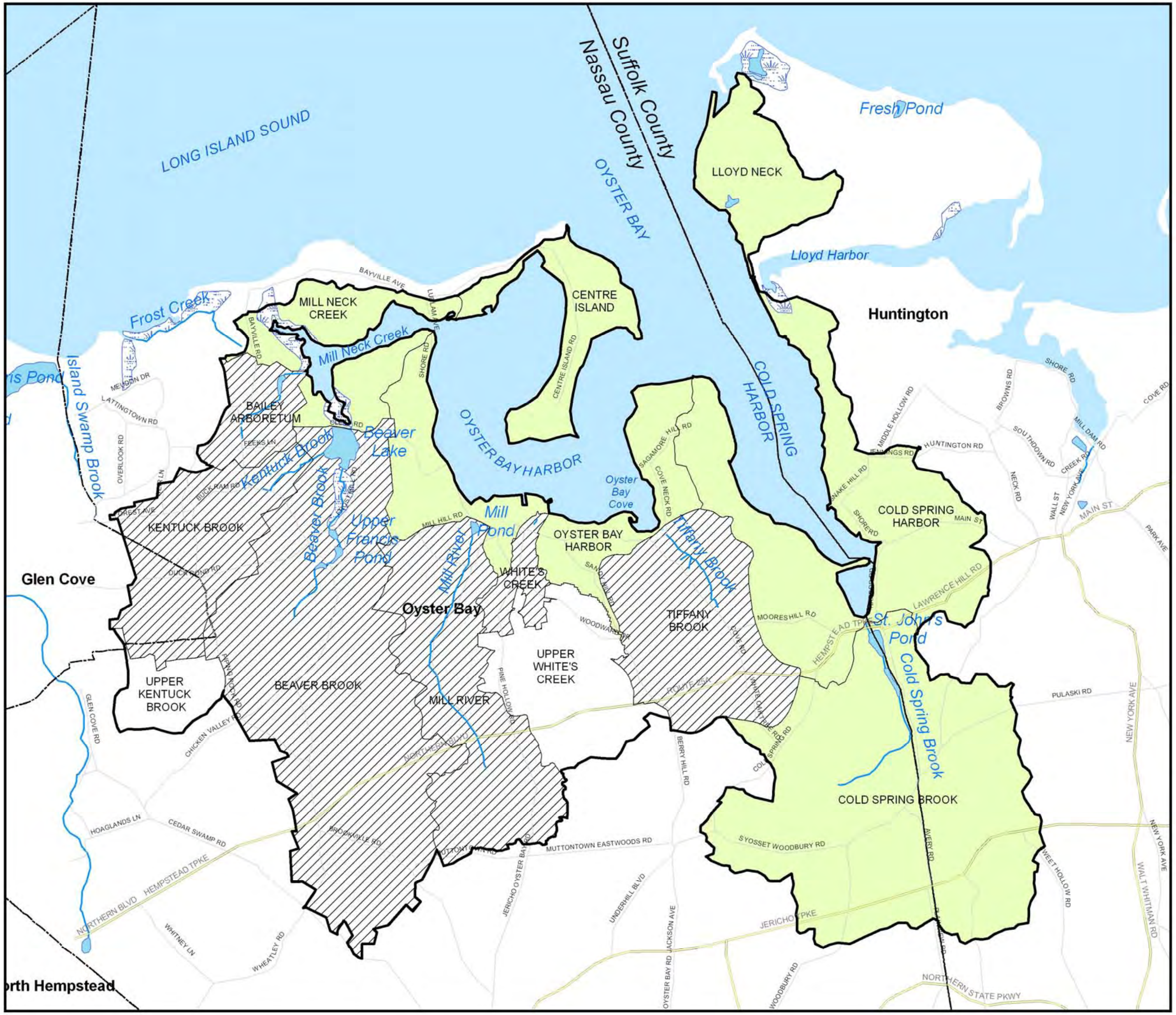
- *White's Creek* – The White's Creek subwatershed is a small drainage area characterized by high density residential development, as well as commercial and industrial uses with low forest cover. The subwatershed has a relatively high density of regulated sites, primarily located along South Street. White's Creek is, in effect, hydraulically separated from Upper White's Creek, as Upper White's Creek is almost entirely served by recharge basins. Unlike Upper White's Creek, the White's Creek subwatershed does not contain existing recharge basins, and therefore offers good potential for future stormwater retrofits.

9.2 Subwatersheds Recommended for Field Assessments

The Comparative Subwatershed Analysis results suggest that the subwatersheds identified in the previous section should be the focus of subsequent field assessments. However, a number of previous studies and stream/outfall assessments have already been performed by Nassau County in several of these priority subwatersheds, including Bailey Arboretum, Mill River, and White's Creek, in addition to subwatersheds with lower restoration potential including Beaver Brook (also named Francis Pond), Kentuck Brook, and Tiffany Creek. Subsequent field assessments should focus on those priority subwatersheds where previous studies and field assessments have not yet been performed, thereby providing new information and avoiding duplication of previous work. The results of the field assessments conducted in support of this watershed planning study will be combined with the findings of previous stream/outfall assessments to guide the overall watershed management plan recommendations.

The following subwatersheds are therefore recommended for detailed field assessments (*Figure 9-1*), potentially including stream corridor assessments and restoration inventories (for those areas where a defined stream channel exists), neighborhood source assessments, hotspot site investigations, and street and storm drain assessments:

- Cold Spring Brook,
- Cold Spring Harbor,
- Oyster Bay Harbor,



State of the Watershed Report
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Legend

- ☐ OB/CSH Watershed
- ☐ Subwatershed
- ▨ Previous Stream Assessment Completed
- 🟩 Recommended for Field Assessment
- — Stream/River
- 🟦 Lake/Pond
- ▨ Swamp/Marsh
- ☐ Town
- ☐ County

Data Sources:
Town of Oyster Bay and Town of Huntington GIS
Incorporated and Unincorpated Villages GIS
Town of Huntington Comprehensive Plan, 2008
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000, Tiger Roads
New York State Department of Environmental Conservation
US Fish and Wildlife Service
FEMA Flood Insurance Mapping
USGS 7.5-minute topographic maps

FIGURE 9-1
Subwatersheds Recommended for Field Assessment

- Mill Neck Creek,
- Centre Island,
- Lloyd Neck.

Limited upland assessments focusing on neighborhoods, hotspots, and streets/storm drains (rather than the stream corridor and stormwater outfalls along the stream corridor) are also recommended in selected areas of those subwatersheds that were previously studied by Nassau County. Detailed field assessments are not recommended for the Upper White's Creek or Upper Kentuck Brook subwatersheds since these areas are self-contained (i.e., the areas drain to existing recharge basins).

10 Watershed Field Assessments

Field inventories were performed by Fuss & O'Neill during summer 2009 to further assess existing watershed conditions and potential sources of pollution. The field inventories are a screening level tool for locating potential pollutant sources and environmental problems in a watershed along with possible locations where restoration opportunities and mitigation measures can be implemented. Similar field inventories were conducted by Cashin Associates in 2007 as part of a series of stormwater investigation reports developed for Nassau County in the Bailey Arboretum, Kentuck Brook, Francis Pond (Beaver Brook), Mill River, White's Creek, and Tiffany Creek subwatersheds. The 2007 field inventories primarily focused on the stream corridors and did not include upland assessments. However, retrofit opportunities were identified in the subwatersheds where field inventories were conducted. The field inventories conducted by Fuss & O'Neill during the summer of 2009 focused on subwatersheds that were not previously investigated, and were prioritized based on the Comparative Subwatershed Analysis presented in Section 9 of this report. This section integrates the findings of both the 2007 and 2009 subwatershed field assessments.

The stream corridor assessment procedure used in this study is adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) method (CWP, 2005). Upland areas and activities that may impact stream quality were also assessed using methods adapted from the Center for Watershed Protection's Unified Subwatershed and Site Reconnaissance (USSR) techniques (CWP, 2005). The upland assessments included inventories of selected representative residential neighborhoods, streets and storm drainage systems, and land uses with higher potential pollutant loads (i.e., "hotspot" land uses). Field assessment efforts were targeted on stream segments and upland areas with the greatest potential for direct impacts to streams and the harbor complex. These areas were identified through aerial and land use mapping. To the extent possible, efforts were also focused on publicly-owned land, which typically offers greater opportunities for retrofits and mitigation projects as opposed to privately-owned land. Potential retrofit opportunities were identified during the upland assessments, and preliminary sketches of structural retrofits were documented for use in the Watershed Action Plan.

During the field inventories, crews assessed approximately 1.2 miles of stream corridors, eight potential hotspot locations, nine representative residential neighborhoods, and a number of streets and storm drainage systems associated with the residential neighborhoods and hotspot land uses. Field inventory nomenclature used throughout this report is summarized in *Table 10-1*. Copies of completed field assessment forms are provided in *Appendix B*. Photographs of specific or representative pollutant sources and problem areas are included throughout this document for illustrative purposes. All of the photographs taken during the field inventories are included on a CD in *Appendix B*.

Table 10-1. Field Inventory Nomenclature

Bailey Arboretum	BAI
Beaver Brook	BEA
Centre Island	CTR
Cold Spring Brook	CSB
Cold Spring Harbor	CSH

Table 10-1. Field Inventory Nomenclature

Kentuck Brook	KBR
Lloyd Neck	LNK
Mill Neck Creek	MNC
Mill River	MRV
Oyster Bay Harbor	OBH
Tiffany Creek	TFY
White's Creek	WCR
Reach Level Assessment	RCH
Channel Modification	CM
Severe Bank Erosion	ER
Impacted Buffer	IB
Stormwater Outfall	OT
Stream Crossing	SC
Trash & Debris	TB
Utilities	UT
Hotspot Investigation	HSI
Neighborhood Site Assessment	NSA
Streets and Storm Drains	SSD
Retrofit Reconnaissance Inventory	RRI

10.1 Summary of Findings

A variety of conditions and issues were identified during the 2007 and 2009 subwatershed field assessments. Key findings, including some common issues throughout the watershed, are described below. These findings, along with other information presented in this baseline assessment report, will help guide the recommendations of the watershed management plan for the harbor complex.

- Overall in-stream habitat in the assessed reaches was mixed. Some of the assessed reaches have high quality habitat, with riparian cover, good floodplain connection, varied substrate, and significant stream shading (e.g., Bailey Arboretum, Kentuck Brook, and the middle segments of Cold Spring Brook). In other segments, even within the same subwatershed, in-stream habitat is marginal to poor due to bank erosion, buffer encroachment, trash and debris, lack of shading, and in-stream sedimentation (much of White's Creek, portions of Mill River, and the lower reach of Cold Spring Brook). However, many of the stream reaches assessed appear to be either supporting biological communities (fish, frogs, birds, etc.) or sufficient to support such communities.

- Many potential barriers to fish passage were observed throughout the watershed, including perched culverts, culverts with very shallow flow, and natural and manmade dams. The impacts of these obstructions on fish passage and the feasibility of fish barrier removal efforts in the harbor complex watershed are currently being investigated through a study led by the Long Island Chapter of Trout Unlimited, Environmental Defense, and Friends of the Bay.

- Segments of some streams in the watershed are buried in underground conduits, resulting from historical development and past storm drainage practices. These stream reaches offer potential opportunities for daylighting and stream restoration to enhance aquatic and wildlife habitat, improve aesthetics, and provide educational opportunities. Potential candidates for daylighting include segments of White's Creek and Beekman Creek.

- Stream buffer encroachments are prevalent along stream corridors in or near areas of residential, commercial, and industrial development and roads. Residential lawns and some commercial lawns extend down to the banks of the stream in many areas, particularly in residential back yards. Yard waste such as grass clippings, leaves, and brush and waste materials were also common occurrences in and near these areas where easy access exists to the streams. Education, signage, stream buffer regulations, and stream cleanups are potential approaches for improving buffer management.

- Residential roofs appear to contribute significant quantities of stormwater runoff to the storm drainage system, particularly in residential neighborhoods with smaller yards and lots with a high percentage of impervious cover. Opportunities exist to disconnect residential rooftop runoff from the storm drainage system and reduce the quantity of runoff by redirecting the runoff to pervious areas or through the use of rain barrels or rain gardens.

- Lawn-care maintenance practices in residential areas are typically high. Manicured lawns are common in residential areas, suggesting the prevalent use of fertilizer and other lawn care products, as well as permanent irrigation systems. Opportunities exist to educate the public about the impacts of lawn care practices on the water quality of the harbor complex and to encourage the use of residential lawn care best management practices, with the objective of reducing excess fertilizer runoff and the overall quantity of runoff from residential lawns.

- Parking lots associated with existing commercial development, municipal and institutional land uses, and commuter parking areas are potential candidates for stormwater retrofits to reduce site runoff and improve water quality through the use of bioretention, water quality swales, buffer strips/level spreaders, and other small-scale Low Impact Development (LID) and green infrastructure approaches. Candidate stormwater retrofit sites exist in virtually all of the assessed subwatersheds but are most prevalent in Mill River, Tiffany Creek, White's Creek, Mill Neck Creek, and Oyster Bay Harbor.

- The field assessments identified many areas in the watershed where storm drains are stenciled or watershed stewardship signage exists. Storm drain stenciling and/or stewardship signage could be expanded to other areas of the watershed, targeting commercial areas such as the Pine Hollow Shopping Complex and additional residential subdivisions including those along Harbor Road in Huntington and along Hernan Avenue in Bayville. Interpretive educational signage is also recommended in key public areas of the watershed.

- Stormwater recharge basins are prevalent in many areas of the watershed. Recharge basins are designed to capture and infiltrate stormwater, thereby replenishing groundwater aquifers and reducing the quantity of runoff that is discharged directly to surface receiving waters. Drainage areas that are served by existing recharge basin are believed to be self-contained by infiltrating their entire design volume. However, several of the basins maintained by Nassau County and the Town of Oyster Bay are overgrown and have a large amount of accumulated sediment and/or standing water, and a few are completely full. Their performance may be compromised as a result of the accumulated sediment and reduced storage volume and infiltration capacity. Routine sediment removal and other maintenance measures are recommended for the recharge basins.

- Most of the developed areas surveyed have inadequate stormwater quality controls. Many of the residential developments were constructed prior to the advent of modern stormwater quality regulations and design requirements. Therefore, most of the development observed in the watershed employs traditional curb and gutter storm drainage collection systems with little, if any, stormwater management beyond water quality inlets and detention basins for peak flow control.

- Stormwater runoff from areas that are not served by recharge basins generally receives little or no treatment prior to discharge. Such discharges are a source of sediment, pathogens, nutrients, and other pollutants to the receiving streams and the harbor complex. Opportunities exist for stormwater retrofits at roadway stormwater outfalls throughout the watershed. A number of roadway outfall retrofit candidates were identified in the Bailey Arboretum, Beaver Brook, Kentuck Brook, Mill River, and White's Creek.

- Roosevelt Memorial Park is one of the few areas in the watershed where Low Impact Development (LID) design practices were observed. The stormwater management features that were incorporated into this redevelopment project exemplify the type of stormwater controls that could be promoted throughout the watershed. Local LID demonstration sites are a valuable tool for public education and promoting the widespread use of such practices. The incorporation of LID into town and county projects, parks, and municipal buildings can also serve as a proactive model for private development. Opportunities also exist for incorporating LID practices into existing roadway upgrades and retrofit projects (i.e., "green streets") to promote stormwater infiltration, streetscape improvements, and traffic calming.

- Relatively isolated areas of moderate to severe streambank erosion were observed along Beaver Brook, Mill River, Cold Spring Brook, Tiffany Brook, and White's Creek. Most of these areas are located at or downstream of stormwater outfalls in developed areas of the watershed. Access to some of these areas is limited; therefore, potential candidate sites for bank stabilization projects should be evaluated further for overall feasibility.

- Hotspot land uses and facilities were observed throughout the watershed, including several commercial shopping centers, the Town of Oyster Bay highway yard, the LIRR Maintenance Yard, Commander Oil Terminal, and municipal parking lots. Many of these facilities discharge stormwater directly to receiving waters with no treatment or attenuation. Pollution prevention and source controls are often lacking or nonexistent at these facilities.

The following sections present a more detailed discussion of the stream corridor and upland assessment methods and findings.

10.2 Stream Corridor Assessment

Stream corridors along Cold Spring Brook were assessed by Fuss & O'Neill during August 24 through 27, 2009 using methods adapted from the U.S. EPA Rapid Bioassessment (RBA) protocol (EPA, 1999) and the Center for Watershed Protection's Unified Stream Assessment (USA) (CWP, 2005). Stream assessments were not performed on other priority subwatersheds since similar assessments were recently performed in these subwatersheds in 2007.

The method used for the 2009 stream assessments is a continuous stream walk method that identifies and evaluates the following impact conditions:

- Outfalls (OT), including stormwater and other manmade point discharges;
- Severe Bank Erosion (ER), such as bank sloughing, active widening, and incision;
- Impacted Buffer (IB), which is a narrowing or lack of natural vegetation;
- Utilities in the stream corridor (UT), such as leaking or exposed pipes;
- Trash and Debris (TR), such as drums, yard waste, and other illegal dumping;
- Stream Crossings (SC), which are hard objects, whether natural or artificial, that restrict or constrain the flow of water. These may include bridges, culverts, dams, and falls;
- Channel Modification (CM), where the stream bottom, banks, or direction have been modified;
- Miscellaneous (MI), other impacts or features not otherwise covered; and
- Reach Level Assessment (RCH), the average characteristics of each reach.

The stream assessment method also includes a semi-quantitative scoring system as part of the reach level assessment to evaluate the overall condition of the stream, riparian buffer, and floodplain, based on a consideration of in-stream habitat, vegetative protection, bank erosion, floodplain connection, vegetated buffer width, floodplain vegetation and habitat, and floodplain encroachment.

Stream assessments were performed by Cashin Associates in 2007 for the Nassau County Stormwater Management Program for the Bailey Arboretum, Francis Pond (Beaver Brook), Kentuck Brook, Mill River, Tiffany Creek and White's Creek subwatersheds. These subwatershed stormwater runoff impact investigations were performed to assess subwatershed conditions and identify stormwater retrofit opportunities to improve water quality. The 2007 stream assessments were performed using the Center for Watershed Protection's USA methods.

Six stream reaches were evaluated by Fuss & O'Neill in 2009 and 14 as part of the Nassau County subwatershed stormwater runoff impact investigations in 2007. *Table 10-2* summarizes the number of reach level assessments that were performed and the number of impact conditions that were identified. Stream assessments were not performed along Upper Kentuck Brook and Upper White's Creek since these subwatersheds drain to existing recharge basins.

Table 10-2. Number of Reach Level Assessments Performed and Impact Conditions Identified

Subwatershed [1]	RCH	CM	ER	MI	IB	OT	SC	TR	UT
Bailey Arboretum	1	-	-	-	-	5	-	-	-
Beaver Brook	3	-	-	1	-	16	-	-	-
Cold Spring Brook [2]	6	3	-	-	1	7	10	3	-
Kentuck Brook	1	-	-	1	-	13	-	-	-
Mill River	5	1	1	3	1	21	13	-	1
Tiffany Creek	2	-	-	2	-	7	-	-	-
White's Creek	2	1	-	-	2	6	4	1	-

[1] Subwatersheds without a well-defined stream are not included in the table.

[2] Field surveys conducted by Fuss & O'Neill in 2009; streams associated with the other subwatersheds listed in the table were conducted in 2007 by Nassau County.

10.2.1 2009 Stream Assessments

The primary objective of the 2009 stream assessments of Cold Spring Brook was to quantify the overall condition of stream corridors in Cold Spring Brook and identify opportunities for stream restoration, stormwater retrofits, land preservation, and other stewardship recommendations.

Reach level assessment scores were assigned by field crews based upon the overall condition of the stream, stream buffer, and floodplain. A subjective determination of eight criteria is assessed on a scale of 0 to 20; 0 relating to poor conditions and 20 being optimal conditions. The total of these scores provides a quantitative index of overall stream health and condition. The maximum possible number of points that would be assigned for a fully optimal stream reach is 160 points. *Table 10-3* summarizes the total scores and associated ranks for the assessed stream reaches along Cold Spring Brook.

Table 10-3. Cold Spring Brook Overall Stream Reach Scores

Reach	Instream Habitat Score	Buffer Zone and Floodplain Score	Total Score	Rank
CSB-01	54	38	92	4
CSB-02	68	67	135	1
CSB-03	70	72	142	2
CSB-04	46	48	94	3
CSB-05	38	20	58	6
CSB-06	42	43	85	5

As depicted in the photographs in *Figure 10-1*, CSB-03 is the highest rated stream reach due to a wide vegetative buffer, adequate riparian cover, and good instream habitat. In contrast, CSB-05 has the lowest total score due to channel modification along the entire reach, the lack of canopy cover, poor instream habitat due to uniform channel properties, and limited stream buffer due to the proximity of Harbor Road.

Figure 10-1. Photographs of Cold Spring Brook Stream Reaches

The following sections summarize the major issues identified during the 2009 stream assessment of Cold Spring Brook. Specific locations are identified according to the stream reach and impact condition IDs described previously. Identification of "right" and "left" stream banks is from the observer's perspective facing downstream. Stream reaches were assigned a subwatershed abbreviation followed by a two-digit numerical identifier. Reaches were generally numbered sequentially from downstream to upstream. A reach was considered to be a stream segment with relatively consistent geomorphology and surrounding land use, and generally less than one-half mile in length. Features noted at reach junctions (e.g., culvert crossings) were associated with the downstream reach. Impact conditions within each reach were numbered sequentially with an abbreviation followed by a two-digit number. For example, the second stream crossing in a reach would have the identifier SC-02.

Cold Spring Brook

Cold Spring Brook originates in a forested area northeast of the Cold Spring Harbor MTA commuter train station parking lot and flows in a northerly direction generally parallel to Harbor Road, eventually discharging downstream of the Route 25A overpass into Cold Spring Harbor. Franklin Pond and St. John's Pond are large ponds inline with the stream channel created by man-made impoundments. Cold Spring Brook is divided into six stream reaches, labeled CSB-01 through CSB-06 (*Figure 1; Appendix B*). All six reaches were assessed on August 24, 2009. The reaches are described beginning at the mouth of the stream and moving upstream to the headwaters.

CSB-01
Stream reach CSB-01 begins in a tidal marsh at the mouth of Cold Spring Brook and continues upstream under Route 25A, past the Cold Spring Harbor Fish Hatchery, and ends at the St. John's Pond dam.

- RCH – The overall stream conditions are suboptimal due to a lack of stable in-stream habitat, protective vegetation and some evidence of non-native vegetation in the upland areas. There is suboptimal connection to the floodplain in the upper portion of the reach due to the area of impacted buffer caused by a deck, a large pool downstream of the St. John's Pond dam spillway, and other impacts on the fish hatchery property. The overall buffer and floodplain condition is marginal due to a narrow vegetated buffer of approximately 15 feet on the left bank and slightly wider on the right bank, possibly 40 feet or greater. The floodplain is highly impacted in the vicinity of the Route 25A overpass. The floodplain vegetation is dominated by shrub and wetland plants. The tidal wetlands downstream of the Route 25A stream crossing are minimally impacted.

- OT – There are six outfalls along this reach. The first, OT-01, is a circular, 24-inch diameter concrete pipe embedded in the concrete abutment wall associated with the St. John's Pond dam. The pipe had a small dry-weather flow and some orange staining, although is likely caused by iron in the groundwater and is therefore not recommended for further investigation or retrofit. OT-02 and OT-03 are twin 6-inch metal pipes on the left bank, possibly associated with stormwater drainage from the fish hatchery property. The pipes are in fair condition, with some chips and cracking. OT-04 is a 14-inch circular clay pipe on the left bank discharging water from the fish hatchery, with moderate dry-weather flow. The discharge is clear and does not have a detectable odor. OT-05 and OT-06 are 18-inch concrete pipes located near the Route 25A overpass, one on the left bank and the other on the right bank, and are associated with stormwater outfalls from the roadway. A substantial dry-weather discharge was observed. However, the source could not be determined in the field and further investigation should be conducted to determine the source.

- SC – There are three stream crossings along the reach. SC-01 is the St. John's Pond dam at the upstream end of the reach. This dam is approximately 15 feet wide and 20 feet high and is a physical barrier to fish passage. Downstream of the dam is a plunge pool that collects and slows the water from the dam spillway. A concrete broad-crested weir approximately 2 feet in height (SC-02) was constructed approximately 25 feet downstream of the spillway to create the plunge pool. SC-03 is a twin box culvert beneath the Route 25A overpass. Each culvert is approximately 12 feet wide, 6 feet deep, and has a concrete bottom. The flow in both culverts was shallow (approximately 3 inches deep), which may impede fish passage under low-flow conditions.

SC-03 is a twin box culvert beneath Route 25A along reach CSB-01.

- IB – One area of impacted buffer is present on the left bank where a deck of approximately 15 feet in length was installed on the fish hatchery property. The deck was constructed to overhang the stream by approximately 2 to 4 feet.

Impacted buffer along reach CBS-01 near the Cold Spring Fish Hatchery property.

CSB-02

Stream reach CSB-02 begins at the outlet structure of the Franklin Pond dam and continues downstream to the inlet to St. John's Pond. A portion of the reach is within the Nature Conservancy's Franklin Pond Preserve, and the remaining portions are on private lands.

- RCH – The stream reach is of high quality and is characterized by wide stream buffers, a connected floodplain as evidenced by a large adjacent are of wetland seeps, and extensive canopy cover. The stream reach has optimal instream habitat characterized by submerged logs, shaded areas, large woody debris in the channel, and over 90% of the streambank shaded by native trees. The vegetated buffer width exceeds 50 feet along the main stream channel with little evidence of human impacts. The floodplain area is characterized by a mixture of wetland species and mature forest species.

Reach CSB-02 is a high quality segment, characterized by optimal instream habitat, vegetated buffer, and floodplain connectivity.

- SC – The Franklin Pond dam is the only stream crossing along this reach. The dam is approximately 15 feet wide and the spillway cascades approximately 15 feet from the pond elevation to a downstream pool prior to entering the main stream channel. The dam is a physical barrier to fish passage, although it is an unlikely candidate for removal due to the presence of the St. John's Pond dam downstream and the recreational benefits that Franklin Pond provides.

CSB-03

Stream reach CSB-03 begins at a footbridge that crosses the stream connecting a walking trail adjacent to Harbor Road to the downstream area at the inlet to Franklin Pond, which is primarily a braided channel that flows through a wetland complex.

- RCH – The stream reach flows adjacent to Harbor Road and is generally of optimal quality, with sand and gravel channel substrate and a mostly-shaded stream canopy. There is some evidence of stream widening and sediment deposition, which is consistent with the upstream development. The overall stream conditions are optimal with the exception of instream habitat, which is suboptimal due to lack of woody debris, undercut banks, or non-uniform channel substrate. The streambanks are stable and there is adequate floodplain connectivity along this reach. The vegetated buffer width is greater than 50 feet and there is little evidence of human impacts.

- SC – There are two stream crossings along this reach. SC-01 is a private driveway crossing at 428 Harbor Road constructed of wood beams, concrete and a paved surface. The crossing does not impact potential fish passage or have a large impact on the channel dynamics since the crossing has an open bottom and a natural substrate. The second stream crossing, SC-02, is located at the upstream end of the reach and is a footbridge associated with a trail system through the adjacent wooded area. Consistent with the construction of SC-01, the bottom substrate was left intact, and the footbridge has minimal impact on fish passage.

- TR – Although the reach habitat, stream buffers and floodplain are in optimal condition, the reach is characterized by areas of trash (bottles, cups, and various other household trash) in the stream and on the banks. The relatively minor amount of trash observed could be collected by volunteers with trash bags. This reach is a potential candidate for s stream cleanup.

Evidence of household trash and debris, which was typical along CSB-03.

CSB-04

Stream reach CSB-04 begins at the footbridge stream crossing and continues upstream to a gabion wall constructed across the stream channel for stabilization. The stream channel divides into two channels for approximately 100 feet, although the characteristics of the two channels are similar and are therefore considered part of the same reach.

- RCH – The reach is characterized by sand and gravel substrate, some floating aquatic plants, approximately 50% stream shading, and evidence of active channel dynamics, including downcutting, headcutting, sediment deposition and channelization. The overall instream habitat and buffer and floodplain characteristics are lower compared to stream reaches downstream (CSB-03, CSB-02, and CSB-01). The instream habitat ranges from marginal to suboptimal due to limited vegetative protection, non-native and invasive vegetation growing over the stream channel, and active bank erosion and stream channel dynamics. The vegetative buffer is wider on the left bank and narrower on the right bank. The floodplain habitat is marginal due to a lack of plant species diversity on the streambanks.

- SC – There is one stream crossing along reach SC-01, consisting of a gabion wall constructed across the stream channel at the upstream end of the reach. The gabion wall is approximately 2 feet tall, 6 feet long and 20 feet wide and spans the entire stream channel and banks. The gabion wall appears to have been constructed to prevent active headcutting at the location. Although the headcutting is no longer occurring, a pool exists downstream of the wall and shows signs of active downcutting.

Gabion wall along reach CSB-04

- TR – There are two areas of trash in the stream channel and on the streambanks along this reach. TR-01 is a fallen wire fence that was previously a property marker which is approximately 4 to 5 feet tall and greater than 200 feet long. The second is a trash dumping area (TR-02) consisting of traffic cones and household trash.

CSB-05

This reach is almost entirely channelized and flows from the base of the Cold Spring Harbor MTA parking lot, beneath Woodbury Road and continues along Harbor Road in a channelized roadside ditch, ending at the gabion wall structure, which marks the downstream end of a channelized stream segment.

- RCH – This reach is characterized by cobble and gravel channel substrate reinforced by wire mesh, creating a channelized stream bottom. The channel is a uniform 6 foot width with 4 foot vertical bank walls. Due to the uniform properties of the channel and the roadside location, the instream habitat and vegetative protection are marginal. There is little evidence of bank erosion since gabion walls are securing the banks. There is an approximately 15-foot buffer between the roadway and the channel. The channel has been disconnected from the floodplain by creating vertical retaining walls that serve as the banks of the stream, and the floodplain characteristics are generally marginal to poor.

- CM – The entire channel reach has been modified and can be subdivided into three distinct channel segments, CM-01, CM-02, and CM-03. CM-01 extends from the gabion wall on the downstream end of the reach to an upstream culvert. This segment is approximately 200 feet long, and wire mesh has been placed on the bottom of the stream channel and approximately 10 feet up both banks for stabilization. The bottom width of the stream at this location is approximately 6 feet. CM-02 is a stream segment that is entirely contained in an underground concrete box culvert that conveys the stream beneath Harbor Road. The culvert is approximately 3 feet tall, with an approximately 12-feet wide concrete bottom. CM-03 begins at the upstream end of the culvert where the stream is daylighted and runs to the upstream end of the stream reach, across Woodbury Road. CM-03 is also characterized by a modified channel, with wire mesh used for stabilizing the channel bottom and vertical gabion walls for bank stabilization. The stream channel along this segment is approximately 8 feet wide and is greater than 500 feet long, flowing adjacent to Harbor Road.

Reach CSB-05(CM-03) consists of a modified stream channel with gabion wall banks.

- OT – One outfall, OT-01, is present along this reach, which conveys flow from a mulched area and discharges inside the culvert along CM-02. Although the outfall is approximately 8 feet in diameter, no dry weather flow was observed.

This arched culvert, OT-01, discharges to the box culvert that conveys Cold Spring Brook beneath Harbor Road.

- SC – There are three stream crossings along this reach. SC-01 and SC-02 are box culvert driveway crossings providing access to residences at 511 and 523 Harbor Road. SC-03 is a diagonal road crossing beneath Woodbury Road. At the intersection of Harbor Road and Woodbury Road, the stream flows from a catch basin on the west side of the street with an outlet pipe heading east. The pipe is believed to be connected to the inlet pipe on the opposite side of Woodbury Road, although the connection could not be field verified.

CSB-06

Stream reach CBS-06 is located at the headwaters of Cold Spring Brook. The brook originates in a forested wetland northeast of the MTA railway tracks and parking lot. The stream flows from its headwaters to the inlet structure adjacent to Woodbury Road.

- RCH – The reach is characterized by a sand substrate with some sediment deposition observed. The instream habitat, buffer and floodplain are generally suboptimal to marginal due to the small channel width and impacts from the railway tracks and nearby parking lot.

10.2.2 2007 Stream Assessments

The following sections briefly summarize the findings of the 2007 stream assessments performed by Cashin Associates for the Nassau County Stormwater Management Program. Stream assessments were performed for Bailey Arboretum, Francis Pond (Beaver Brook), Kentuck Brook, Mill River, Tiffany Creek, and White's Creek. The details of these assessments are provided in the Stormwater Runoff Impact Analysis and Candidate Site Assessment Reports that are cited in *Section 1.3* of this report.

The 2007 stream assessment results presented in the Stormwater Runoff Impact Analysis and Candidate Site Assessment Reports were compared based on the number of outfalls, hotspot locations, road crossings, inadequate buffers, trash accumulation locations, etc. in each subwatershed. *Table 10-4* presents an overall score for each subwatershed based upon the quantitative results from the 2007 stream assessments. The subwatersheds in *Table 10-4* are listed in order of decreasing pollution potential (relative high pollution ranking to low pollution ranking). It is important to note that the 2007 stream assessment results should not be compared directly with the 2009 stream assessment results for Cold Spring Brook due to differences in the assessment methods and field personnel used in each study. However, the scores presented in *Table 10-4* are useful for comparing the relative pollution potential of the subwatersheds that were assessed in 2007.

Table 10-4. 2007 Stream Assessment Results Summary

Subwatershed	Pollution Potential Score[1]
White's Creek	86
Mill River	51
Tiffany Creek	35
Beaver Brook	26
Kentuck Brook	25
Bailey Arboretum	18

[1] Pollution potential score calculated from the quantitative stream assessment results presented in the 2007 Stormwater Runoff Impact Analysis and Candidate Site Assessment Report for each subwatershed.

Bailey Arboretum

The overall stream condition was assessed to fall in the suboptimal to optimal range due to the inadequate vegetated buffers in the arboretum. The overall buffer and floodplain condition was assessed as being within the suboptimal to optimal range due to minor floodplain encroachment and a narrow vegetated buffer width (Cashin Associates, P.C., 2007).

The Bailey Arboretum subwatershed is in optimal condition for most of the subwatershed but the drainage infrastructure system carries road runoff directly into the creek and the buffer impacts within the Bailey Arboretum property offer opportunities to improve the subwatershed further. A number of stormwater retrofits were recommended to address pollutant loads associated with the existing drainage system in the Bailey Arboretum subwatershed. In addition, the 2007 study report recommended non-structural measures including increased street sweeping, public education on garden fertilizer and chemical use and disposal, public education on the importance of buffers between cultivated lawns and waterbodies, and public education on the importance of vegetative cover to prevent soil erosion (Cashin Associates, P.C., 2007).

Beaver Brook (Francis Pond)

Three reaches were assessed in the Beaver Brook (Francis Pond) subwatershed. The first reach (103-1) encompasses all of Beaver Lake. The second reach (103-2) extends from Beaver Lake south to the intersection of Frost Mill Road and Beaverbrook Road. The third reach (103-3) extends south from Frost Mill Road and to the headwaters in the vicinity of Valley Road, including Lower Francis Pond, Upper Francis Pond, and two small branches extending south and southwest from Upper Francis Pond (Cashin Associates, P.C., 2007).

The overall stream condition for reach 103-1 was assessed to be within the suboptimal to optimal range because of its favorable in-stream habitat and floodplain connection. The overall buffer and floodplain condition was assessed to be within the poor to marginal range due to significant floodplain encroachment and inadequate floodplain vegetation due to various land development such as cultivated residential yards, roadways, horse grazing and an ice skating facility (Cashin Associates, P.C., 2007).

The overall stream condition for reach 103-2 was assessed to be within the optimal range due to the well maintained area in Shu Swamp Preserve and ideal vegetative protection. The overall buffer and floodplain condition was assessed to be within the optimal range due to little or no floodplain encroachment and adequate vegetated buffer width (Cashin Associates, P.C., 2007).

The overall stream condition for reach 103-3 was assessed in the optimal range due to ideal in-stream habitats and vegetative protection. The overall buffer and floodplain condition was assessed in the optimal range also due to little or no floodplain encroachment and ideal floodplain vegetation (Cashin Associates, P.C., 2007).

The area of the subwatershed that actually contributes surface runoff to waterbodies has been reduced by the installation of upgradient recharge basins and other drainage infrastructure that contain the storm runoff volume from roads and subdivisions. The drainage systems that discharge to waterbodies include two piped drainage systems that outfall to the west side of Shu Swamp and numerous individual catch basins and leaching structures located along the subwatershed roads, several of which have outfalls to waterbodies. Stormwater retrofits were recommended at several outfalls at the ice skating facility at the eastern end of Kaintuck Lane, an outfall located on the west side of Shu Swamp, concrete swales that contribute runoff to Upper Francis Pond, and catch basin inserts in several catch basin systems located on Chicken Valley Road, Glen Cove Oyster Bay Road, and Oyster Bay Road that outfall to Upper Francis Pond. The 2007 study report also recommends implementing non-structural measures similar to those recommended for the Bailey Arboretum subwatershed (Cashin Associates, P.C., 2007).

Kentuck Brook

The overall stream condition was assessed as being within the optimal range due to its ideal in-stream habitat and vegetative protection. The overall buffer and floodplain condition was assessed as being within the suboptimal to optimal range due to some buffer and floodplain encroachment from man-made structures (Cashin Associates, P.C., 2007).

The Kentuck Brook subwatershed is in optimal condition for most of the subwatershed but at the lower limit there are limited areas of buffer and floodplain encroachment and several outfalls that contribute road runoff to the brook (Cashin Associates, P.C., 2007).

The area of the subwatershed that actually contributes surface runoff to waterbodies has been reduced by the installation of upgradient recharge basins and other drainage infrastructure that contain the storm runoff volume from roads and subdivisions. The main areas of the subwatershed that contribute runoff to Kentuck Brook include the residential area in the northeastern section of the subwatershed and area roads including Oyster Bay Road and adjacent residential roads. Stormwater retrofits were recommended for a swale that carries road runoff from Kaintuck Lane, at outfalls associated with the high-density residential neighborhood located north of the railroad tracks including Valley Avenue and Maple Avenue, and at selected outfalls along Oyster Bay Road. Similar non-structural measures were also recommended for this subwatershed (Cashin Associates, P.C., 2007).

Mill River

The following stream reaches were assessed in the Mill River subwatershed:

- Reach 101-1: Muttontown Preserve to NYS Route 25A
- Reach 101-2: NYS Route 25A north to north side of small ponds
- Reach 101-3: Ponds north to Remsen Lane – pipe and roadside channel
- Reach 101-4: Remsen Lane north to Mohawk Drive – roadside channel
- Reach 101-5: Mohawk Drive north to Main Street -natural river channel and Mill Pond

Reach 101-1 has optimal overall stream conditions and optimal overall buffer and floodplain conditions. The overall stream condition for reach 101-2 was assessed to be in the optimal range with a suboptimal vegetative protection assessment of the right bank due to the adjacent roadway. Consequently, the overall buffer and floodplain conditions were assessed to be in the optimal range, although a suboptimal assessment of the right bank's vegetated buffer width was noted (Cashin Associates, P.C., 2007).

The overall stream condition of reach 101-3 was assessed to be in the marginal to suboptimal range due to inadequate in-stream habitat availability, little vegetative protection, and moderate levels of bank erosion, especially along the roadway. The overall buffer and floodplain condition was assessed in the poor to marginal range due to a small buffer zone width, inadequate floodplain vegetation, significant floodplain encroachment, and an uneven mix of wetland and non-wetland habitats (Cashin Associates, P.C., 2007).

The overall stream condition of reach 101-4 was assessed to be in the poor to suboptimal range due to poor vegetative protection, severe bank erosion areas, and inadequate floodplain connection. The overall buffer and floodplain condition was assessed to be in the marginal to poor range due to the lack of buffer zone and high levels of floodplain encroachment (Cashin Associates, P.C., 2007).

The overall stream condition of reach 101-5 was assessed to be in the suboptimal to optimal range because of a stable in-stream habitat, good vegetative protection, and very good floodplain connection. The overall buffer and floodplain condition was assessed to be in the suboptimal to optimal range due to a wide buffer zone and an even mix of wetland and non-wetland habitats (Cashin Associates, P.C., 2007).

Based on the conditions identified during the field assessment, a large segment of Mill River is in marginal condition and has been impacted by the surrounding land use and channelized stream banks. A number of candidate stormwater retrofit sites were identified based on the 2007 study, including:

- Town of Oyster Bay Highway Yard located on Lake Avenue
- Outfalls located in the vicinity of Glen Cove Road and Mill River Road Intersection
- Outfalls located along Lake Avenue
- Stabilization of the stream channel along Mill River Road
- Modification of the recharge basin #130 located on NYS Route 25A east of the Mill River

Similar non-structural measures were also recommended for this subwatershed (Cashin Associates, P.C., 2007).

Tiffany Creek

Two reaches were assessed in the Tiffany Creek subwatershed. The first reach (102-1) extends from Oyster Bay Cove south to a small pond located on private property. The overall buffer and floodplain condition in this reach was assessed to be in the poor to marginal range because of a small vegetated buffer zone, cultivated lawn floodplain vegetation, and a significant amount of floodplain encroachment. However, the floodplain habitat does provide an adequate mix of wetland and non-wetland habitats (Cashin Associates, P.C., 2007).

The second reach (102-2) extends from the south side of the pond in Reach 102-1 to Yellow Cote Road. The overall stream condition was assessed to be in the optimal range due to ideal in-stream habitat and vegetative protection. The overall buffer and floodplain condition was also assessed to be in the optimal range due to a wide, vegetated buffer with little or no floodplain encroachment (Cashin Associates, P.C., 2007).

The area of the subwatershed that actually contributes surface runoff to waterbodies has been reduced by the installation of upgradient recharge basins and other drainage infrastructure. Most of the development south of Route 25A appears to have recharge basins and/or drainage structures in place to contain the water quality volume. There are two recharge basins located north of Route 25A that appear to contain the water quality volume (at a minimum) and are assumed to be self-contained. An additional two basins located in close proximity to Tiffany Creek may have overflows that allow pollutants to reach the creek. The 2007 stream assessment study recommended further evaluation of these basins to determine if water quality modifications are warranted. Other candidate stormwater retrofit sites that were identified in the 2007 study report include a parcel located on the south corner of Cove Road and Shutter Lane and a number of vacant parcels located along roads close to Tiffany Creek. Similar non-structural measures were also recommended for this subwatershed (Cashin Associates, P.C., 2007).

White's Creek

Two reaches were assessed in the White's Creek subwatershed. Reach 100-1 is the tidal segment and Reach 100-2 is the freshwater segment.

The overall stream condition in reach 100-1 was assessed to be in the suboptimal range, with the east bank ranking higher because of the vegetated, stable bank and buffer width. The west bank was rated lower because of channelization and lack of vegetation. The overall buffer and floodplain condition was assessed to be in the marginal to suboptimal range because of the lack of buffer zone and floodplain encroachment along the west bank. It should be noted that although the open water segment of White's Creek is limited, an extensive upgradient drainage infrastructure system outfalls through OT-1. The system has been determined to be undersized for the flow, creating an upstream flooding condition during rainfalls events. Prior studies have been conducted to identify measures to mitigate the flooding conditions, but no solution has been implemented to date. Additional studies may be necessary to develop a solution to the flooding, which may also be able to address some of the water quality issues at this location (Cashin Associates, P.C., 2007).

Reach 100-2 is a small segment of the creek that extends south along the west side of White Street. The creek has been channelized through this section and carries storm flows from upgradient drainage infrastructure. There does not appear to be any aquatic habitat remaining in this reach. In several locations, the shoreline has been hardened by the installation of granite blocks. The reach has a commercial parking lot on the east side. On the west side, the northern segment is adjacent to a small open grass lot and the southern segment runs behind several residences. The overall stream condition was assessed to be in the suboptimal to marginal range because of disruption in vegetation and an area of bank erosion caused by high flows. The overall buffer and floodplain condition was assessed to be in the marginal to poor range because of the lack of buffer zone and floodplain encroachment (Cashin Associates, P.C., 2007).

The 2007 study report, which also cites recommendations from the Whites Creek Watershed Analysis & Stormwater Mitigation Plan dated March 1998, recommends removal of accumulated sediment and modification of NYSDOT recharge basin #15 and stormwater retrofits at outfalls that drain portions of White Street, East Main Street, and South Street. Similar non-structural measures were also recommended for this subwatershed (Cashin Associates, P.C., 2007).

10.3 Upland Assessments

Fuss and O'Neill conducted upland assessments in the harbor complex watershed on August 24 through 27, 2009. The field observations assist in identifying pollution prevention and potential restoration opportunities at hotspot land uses and residential neighborhoods in the watershed. Factors that were considered when determining which hotspots and neighborhood areas to prioritize for assessment include:

- Stream condition (assessed during stream corridor inventory)
- Site proximity to the stream and harbor complex
- Land use type and development density
- Land ownership
- Restoration potential

The assessment framework was adapted from the Unified Subwatershed and Site Reconnaissance (USSR) method developed by the Center for Watershed Protection. USSR is a "windshield survey" evaluation method in which field crews drive and walk through areas of the watershed to quickly identify pollution prevention and restoration opportunities. The three major components to the upland assessments conducted in the harbor complex watershed are: hotspots, residential neighborhoods, and streets and storm drains. All of the harbor complex subwatersheds were considered for the upland assessments, with the exception of Upper Kentuck Brook and Upper White's Creek since these subwatersheds are self-contained by existing recharge basins. Field data forms that were completed during the upland assessments are provided in *Appendix B*.

10.4 Neighborhood Source Assessment

Stormwater runoff from existing residential neighborhoods is an important consideration for this study, since residential land use is the predominant land use in the Oyster Bay/Cold Spring Harbor Complex watershed. Neighborhood source assessments were conducted to evaluate pollution source areas, stewardship behaviors, and residential restoration opportunities within individual residential neighborhoods throughout the watershed. The residential behaviors that contribute to stormwater quality were assessed by considering the following source areas for "representative" neighborhoods throughout the subwatershed:

- Yards and lawns
- Driveways, sidewalks, and curbs
- Rooftops
- Common areas

Neighborhoods were selected for assessment based on their proximity to stream corridors and the harbor complex and their overall potential to contribute pollutants to the receiving waters. The selected neighborhoods include a variety of residential types, including low- and high-density single-family residential and multi-family residential (apartments). One field sheet was completed for each neighborhood assessed. The selected neighborhoods are located in the Bailey Arboretum, Cold Spring Harbor, Centre Island, Mill Neck Creek, Mill River, Oyster Bay Harbor, and White's Creek subwatersheds, as summarized in *Table 10-5*.

Each neighborhood was assigned a score for pollution severity and restoration potential. Pollution severity is a measure of how much nonpoint source pollution a neighborhood is likely generating based on readily observable features such as lawn care practices, drainage patterns, pavement staining, etc. Restoration potential is a measure of the feasibility of on-site retrofits or behavior changes based on available space, number of opportunities, presence of a strong homeowners association, and other factors.

Table 10-5. Neighborhood Source Assessments Conducted in the Oyster Bay/Cold Spring Harbor Complex Watershed

Neighborhood/ Subdivision Name	Subwatershed	Residential Type	Pollution Severity	Restoration Potential
Matinecock Lane	Bailey Arboretum	Medium to high-density single family	Moderate	Low
Harbor Road, Huntington	Cold Spring Harbor	Medium-density, single-family	Moderate	Low
Centre Island	Centre Island	Low-density/ estate, single-family	None - poor access	Unknown-poor access
Bayview Avenue	Mill Neck Creek	High-density, single-family	Moderate	Moderate
Hernan Avenue	Mill Neck Creek	High-density, single-family	Moderate	Moderate
Oyster Bay Gardens	Mill River	Multifamily Townhouses	Moderate-high	Low
Ships Point Lane	Oyster Bay Harbor	High-density single-family	Moderate	Moderate
Maxwell Avenue	Oyster Bay Harbor	Multifamilty apartments	Moderate	Low
Singworth Street	White's Creek	High-density single family	Moderate	Moderate

Matinecock Lane

This medium to high-density single family neighborhood is approximately 6.6 acres in size. The neighborhood consists of three streets with residences of similar age, density, and other characteristics, including Egypt Lane, Matinecock Lane, and Cherrywood Lane south of Horse Hollow Road and east of Bayville Road. The assessment was performed on Matinecock Lane and Egypt Lane, although the characteristics of Cherrywood Lane are generally similar. The neighborhood is adjacent to a small pond that is tributary to Factory Hollow Pond.

The lots in the neighborhood vary in size from approximately 1/8 acre to 1/3 acre in size. Overall impervious cover is estimated at approximately 30 percent. The majority of lots include intensively maintained laws (approximately 35% of lot coverage) and many include significant landscaping consisting of mulched garden beds, shrubs, trees, and hedgerows. The neighborhood forest canopy cover is significant (approximately 50%). The streets in the neighborhood are unusually narrow with a typical width of approximately 15 feet. Residents appear to park on the street on a regular basis. No sidewalks are present. Roadway drainage appears to discharge to the small pond via overland flow (curb, gutter, and piped drainage are not present). A significant proportion of the existing driveways (25% estimated) are gravel or other pervious material.

The overall pollution severity of this neighborhood is rated as moderate due to potential nutrient loads. Although it is a moderate to densely-developed neighborhood, the quantity of impervious surface is relatively low since the streets are narrow, no sidewalks are present, not all driveways are paved, and few, if any, downspouts appeared to be connected directly to impervious surface. However, the coverage by well-maintained lawns and garden beds suggest a high level of fertilizer use.

This neighborhood has low restoration potential. The majority of potential retrofits would need to occur at the lot level, such as installing rain gardens to promote stormwater infiltration and provide treatment. A small quantity of undeveloped land may be available south of the end of Egypt Lane where stormwater treatment could be implemented on a larger scale, although the ownership status is unknown.

Views of Matinecock Lane showing intensively-landscaped lawns and planting beds adjacent to the relatively narrow road (left) and a typical residential lot (right).

Harbor Road

This neighborhood consists of single-family houses as well as multifamily residences in older woodframe structures that line Harbor Road in Huntington. Lots in this neighborhood are varied, although the lots to the north (approaching Terrance Place) are generally smaller (approximately ¼ acre) and tend to contain multi-family structures, while many of the lots to the south are larger than an acre. The residences appear to vary significantly in age and condition. Harbor Road is drained via curbs, gutters, and catch basins. Many of the downspouts discharge to lawns, although the topography slopes generally downward to Harbor Road such that lot runoff would discharge to the roadway drainage system during larger storm events. The yard of at least one multi-family residence appears to be used for parking, and evidence of irrigation water running off impervious surfaces was also observed in several cases.

The pollution severity index of this neighborhood was moderate, with the potential for sediment discharge from the more densely developed areas and potential for lawn chemical discharge from the less densely developed lots. Additionally, the roadway itself is likely a significant pollutant source.

The neighborhood restoration opportunity index for this neighborhood is generally low, since the sites are constrained by slopes, the location of the roadway, and little land is available between the roadway and the harbor. A notable exception is the Cold Spring Harbor State Park parking area, located at the southern end of this neighborhood, which is likely to be a significant sediment source and has reasonable restoration potential (see *Section 10.7*).

Views of Harbor Road residences, including potential sediment source (left) and lawn irrigation runoff (right).

Centre Island

Centre Island Village consists primarily of residential land use located in the Center of Oyster Bay and connected to Bayville via a narrow isthmus. The majority of residences are large estates with well-landscaped grounds and manicured lawns. A Neighborhood Source Assessment was not completed in this area since field staff were asked to leave the area by private security personnel.

Bayview Avenue

This neighborhood is located in the Mill Neck Creek subwatershed in the Village of Bayville and includes homes on the streets bounded by Ellison Lane, Mountain Avenue and Bayview Avenue. The neighborhood consists of single family detached homes on 1/8 acre lots. Mountain Avenue and Ellison Street are paved, and Bayview Avenue has gravel cover. The majority of the drainage from the subdivision is collected in a curb and gutter system which is conveyed directly to Mill Neck Creek via an outfall at the end of Mountain Avenue.

Approximately 80 percent of the homes have roof leaders that are directed to impervious areas such as a walkway or driveway to be conveyed to the street drainage system. Due to the small lot size, approximately 60 percent of the lots consist of impervious cover. The majority of the lots in the subdivision are miticulously maintained, with the exception of some overgrown lawns with various debris along Bayview Avenue. There is little open space in the vicinity of this neighborhood.

The pollution severity of the watershed is moderate due to the unpaved roadway and debris and lack of maintenace on Bayview Avenue. The restoration opportunity in this neighborhood is low since there is little available open space to implement a structural stormwater retrofit. However, some area is available on many lots downgradient of roof leaders for the installation of a rain garden.

Hernan Avenue

The Hernan Avenue neighborhood is located in the Mill Neck Creek subwatershed in the Village of Locust Valley. The neighborhood includes lots on both sides of Hernan Avenue, which extends from Bayville Road to a dead end at Oak Neck Creek (an arm of Mill Neck Creek), encompassing an area of approximately 8.2 acres. The storm drainage system consists of a curb and gutter system that conveys stormwater to an outfall at the end of Hernan Avenue into Oak Neck Creek.

The houses in this neighborhood are single family detached homes on ⅛ to ¼-acre lots. The properties have uniformly high management status, with a high percentage of the lot covered with landscaping, although the lots typically have less than 5% canopy cover. A majority (80%) of the roof leaders discharge to a pervious areas such as lawn or mulched areas. The neighborhood contains an approximately 2.4-acre wetland that is believed to provide treatment of stormwater from the neighborhood prior to discharging to Oak Neck Creek. A follow-up investigation is recommended to assess the performance of this wetland and the drainage system connectivity.

Oyster Bay Gardens

The Oyster Bay Gardens housing complex is a multi-family public housing building managed by the Oyster Bay Housing Authority. The complex is located in the Mill River subwatershed on Glen Cove Road. The grounds are generally well maintained and consist of landscaped and turf grass areas. Approximately half of the roof leaders drain to pervious areas such as the mulched areas around the buildings. Sidewalks are present along one side of the roadway.

Potential pollution sources at this location are associated with the impervious parking areas. The parking lot pavement is deteriorating in some places, and there is a significant amount of oil staining on the pavement in the parking spaces. The area for on-street parking near the building contains a significant quantity of accumulated sediment. One location on the roadway had accumulated approximately 3 inches of sediment. The cause of the sediment is believed to be a combination of inoperable vehicles being stored along the road which prevents street cleaning and the area of roadway is the low point in the road, with no catch basin for drainage.

Potential retrofit candidates for this site include a parking lot retrofit that incorporates permeable pavement and bioretention or other form of stormwater infiltration system to collect and infiltrate stormwater runoff from the parking lot.

Ships Point Lane

The Ships Point Lane neighborhood is in Oyster Bay Hamlet in the Oyster Bay Harbor subwatershed and includes single-family residences along Ships Point Lane, Melbourne Street, Sidney Street and Florence Avenue. The lots are typically ¼ acre in size with intensively-managed lawn areas, believed to include significant fertilizer use and irrigation practices.

This neighborhood is a good candidate for "green streets" retrofits. The typical street width in this neighborhood is 28 feet and had low utilization of on-street parking observed mid-morning on a weekday. A potential restoration candidate for this location includes stormwater curb extensions that can be easily retrofitted alongside the existing curb. Runoff from the street could be conveyed to these landscaped infiltration areas and would overflow into the existing drain inlets during larger storms. Since this street has a lot of unused on-street parking, the addition of curb extensions would not adversely impact existing parking. The curb extensions could provide stormwater infiltration, a more aesthetically pleasing roadway, and traffic calming.

Views of Ships Point Lane residences, which is a potential candidate for a green streets retrofit.

Maxwell Street

Maxwell Street is located in downtown Oyster Bay in the Oyster Bay Harbor subwatershed and is a mixed single family and multifamily neighborhood with lot sizes less than ¼ acre. The area is serviced by sanitary sewer. There are no catch basins located along the street and stormwater is conveyed by a curb system toward a large catch basin inlet on Shore Avenue. The lots have a high percentage of impervious cover since the buildings comprise in excess of 80 percent of the lot area, and some lots have cement walkways around the perimeter of the house to the edge of the lot making it 100 percent impervious. Several of the driveways on this street consist of a pervious material. There is a low potential for restoration in this neighborhood due to the narrow street width and small lot size, which do not typically have sufficient space for surface stormwater retrofits such as rain gardens, or landscaped areas that would benefit from irrigation from a rain barrel connected to the roof leaders.

Singworth Street

The Singworth Street neighborhood consists of the block bounded by Singworth Street, and Summers Street off of Berry Hill Road in Oyster Bay. The neighborhood subdivision has narrow, long lots approximately ¼ acre is size with well-maintained lawns. Some areas of the neighborhood have a mature tree canopy, covering upwards of 25 percent. However, there is evidence of infill and redevelopment occurring with new construction in progress. The lots in this neighborhood have potential for rain barrel implementation since the majority of the lawns are highly landscaped. Encouraging rain gardens may also be well-received in this neighborhood, and future educational efforts should target this and similar residential subdivisions.

10.5 Hotspot Site Investigation

Hotspot site investigations were conducted for representative sites with a high potential to contribute polluted stormwater runoff to the storm drainage system or receiving waters. The purpose of the investigation was to qualitatively assess the potential for stormwater pollution from previously identified commercial, industrial, municipal or transportation-related sites. The hotspot investigation was limited in scope to representative hotspot facilities in order to evaluate and illustrate common issues. The investigation was not intended to be an exhaustive review of all potential hotspot facilities in the entire watershed nor a detailed inspection or audit of each facility, which are beyond the scope of this study.

The hotspots examined in the field were located within the Bailey Arboretum, Cold Spring Harbor, Centre Island, Mill River, Oyster Bay Harbor, and White's Creek subwatersheds. Representative priority hotspots were selected to cover a range of watersheds and land uses, including transportation-related (highway/railroad/boat maintenance facilities and parking lots), commercial, industrial, and state/municipal sites. Sites are identified by the watershed abbreviation, followed by "HSI" and a numeric identifier. *Table 10-6* summarizes the selected hotspots that were evaluated. Several of the sites that were investigated are privately-owned, and field crews were unable to gain full access to the sites to closely evaluate the storm drainage and other site characteristics.

Table 10-6. Hotspot Site Investigation Summary

Site ID (Watershed)	Land Use Category	Description of Site Operations
BAI-HSI-01 (Bailey Arboretum)	State/Municipal	Locust Valley Intermediate School & Bus Maintenance Facility
CSH-HSI-01 (Cold Spring Harbor)	Transportation	Municipal Parking Lot, Main Street, Huntington
CTR-HSI-01 (Centre Island)	Transportation	Seawanhaka Yacht Club
MRV-HSI-01 (Mill River)	Municipal	Highway Maintenance Facility
OBH-HSI-01 (Oyster Bay Harbor)	Transportation	LIRR Maintenance Yard
OBH-HSI-02 (Oyster Bay Harbor)	State/Municipal	Oyster Bay High School
WCR-HSI-01 (White's Creek)	Industrial	Commander Oil Terminal
WCR-HSI-02 (White's Creek)	Commercial	Pine Hollow Shopping Center

Locust Valley Intermediate School & Bus Maintenance Facility

The Locus Valley Intermediate School is located in the Bailey Arboretum subwatershed on Ryefield Road. The property consists of a school and a regional bus storage and maintenance facility in the rear of the school. Approximately 15 school buses and 10 other vehicles are stored outdoors at the site. A small garage is located on site for the repair and maintenance of the vehicles. An uncovered outdoor fueling area is located in the center of the parking area, which is believed to be indirectly connected to the storm drainage system. The facility stores waste oil outdoors (within secondary containment) as well as miscellaneous used parts and garbage dumpsters.

The pavement and gravel areas where buses are stored were in good condition with some evidence of oil staining. A follow-up inspection or future education effort is recommended to examine the used equipment stored along the fence on Ryefield Road and in the rear of the facility along the wooded area. The outdoor storage of waste equipment is a potential source of oil pollution into the storm drainage system. It is recommended that the outdoor fueling station be covered to decrease the potential for gasoline discharges to be conveyed to the storm drainage system. This site may be a higher priority for follow-up since the stormwater appears to drain from the maintenance facility toward the school playground.

Covering the outdoor fueling station at the bus maintenance facility would decrease the stormwater pollution potential of the fueling activities.

Municipal Parking Lot, Main Street, Huntington

The municipal parking lot in the commercial district along Main Street in Huntington is approximately 35,000 square feet, with approximately 95 parking spaces. This potential hotspot was assessed mid-morning on a weekday and the lot was approximately one-third full. The parking lot was not determined to be a hotspot for pollution sources, although the area is a potential stormwater retrofit candidate since the parking lot drains to two curb inlets along Main Street. There is a small grass island between the parking area and Main Street that has approximately 10 trees planted in a brick and concrete surface.

Seawanhaka Yacht Club

The Seawanhaka Yacht Club is located on Centre Island on Seawanhaka Road. The club provides members with boat storage and launching. The facility is regulated under the state and federal NPDES program. Access to the site for further investigation was denied, and a follow-up interview or inspection is recommended.

Highway Maintenance Facility

The Town of Oyster Bay highway maintenance facility is located in the Mill River subwatershed on Lake Avenue. Stormwater discharge from the facility drains directly to the Mill River via a series of outfalls. The facility is used for the maintenance, fueling, washing and storage of fleet vehicles. Vehicles and the fueling station are located outdoors with no cover. The maintenance and repair of vehicles occurs in a covered garage. Sand and salt storage and loading operations are located outdoors and uncovered. Garbage dumpsters on-site were observed to be uncovered and overflowing with garbage.

Uncovered materials storage

Uncovered fueling station

Uncovered and overflowing dumpster

This facility was also identified during the 2007 stream assessments conducted on behalf of Nassau County as a candidate site for significant retrofits and operational improvements. The 2007 study report recommended that the entire yard be redeveloped to contain all storm runoff onsite and to bring the facilities into conformance with current hazardous materials regulations (Cashin Associates, P.C., October 1, 2007).

A follow-up on-site investigation is recommended to further assess the pollution potential from the salt and sand stockpile, the fueling station, outdoor vehicle storage, the sand and salt loading operation, and any current stormwater controls that may exist at the facility. Recommended best management practices include construction of containment berms and/or a covered structure for the sand and salt stockpile, the addition of a canopy over the fueling station, and installing structural controls such as oil/water separators and stormwater management controls for site runoff. This site is a high priority for follow-up since stormwater from the facility discharges directly to the Mill River.

LIRR Maintenance Yard

The Long Island Railroad Maintenance Yard is located in the White's Creek subwatershed in Oyster Bay Hamlet. The yard contains many electrical boxes and has seven divided tracks for the temporary storage and maintenance of railway cars. No confirmed sources of pollution were observed from outside the fence of the property. Potential pollution sources include motor oil and lubricating oil associated with railcar maintenance. A follow-up inspection of this facility is recommended.

Oyster Bay High School

Oyster Bay High School is located on Main Street in Oyster Bay and includes the school building, administration building and associated parking lots. There were no observed sources of pollution at the site, other than the parking areas and maintained lawn. There are large areas of turf grass adjacent to the parking areas that can be seen from Main Street, which could be an ideal location for a high-visibility structural stormwater retrofit that could also have educational benefits. An infiltration basin on the property could collect runoff from the parking area associated with the administration building.

Commander Oil Terminal

The Commander Oil Terminal is a bulk oil receiving and storage facility located at the end of South Street in the White's Creek subwatershed. The facility is regulated under the National Pollutant Discharge Elimination System (NPDES) permit program and is registered with the

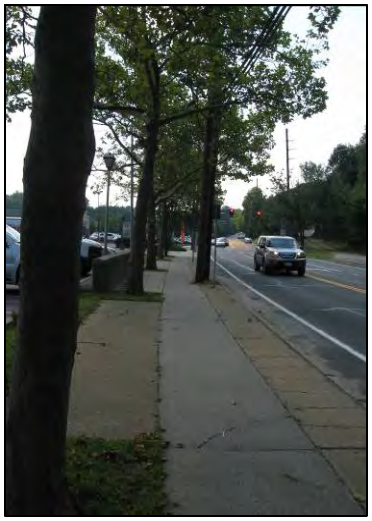
NYSDEC under the Oil Spill Prevention, Control and Compensation Act for Major Oil Storage Facilities. Under these and federal oil pollution prevention regulations, the facility must implement a Spill Prevention, Control and Countermeasure Plan and potentially a facility response plan in the event of an oil spill to navigable waters.

Pine Hollow Shopping Center

A hotspot site investigation was conducted at the commercial stores at the Pine Hollow Shopping Center located on Pine Hollow Road (Route 106) in the White's Creek subwatershed. The focus of the investigation was the Stop & Shop located at the south end of the shopping complex and the Rite Aid, which is located one building north of the Stop & Shop. Stormwater from the rooftops and paved areas, including the parking lot, discharges to the drainage system along Pine Hollow Road.

Uncovered, overflowing dumpster

Outdoor storage of materials



Pine Hollow Shopping Center along Pine Hollow Road

Many stormwater pollutant sources were observed on this site. Vehicles, pallets, cardboard, and various bakery racks and store shelving are being stored outdoors uncovered in the rear of the buildings. The waste is not managed properly, and dumpsters were left uncovered with overflowing trash left in trash bags on the ground next to the dumpster. The parking lot and paved area behind the building is stained with oil and has a buildup of sediment.

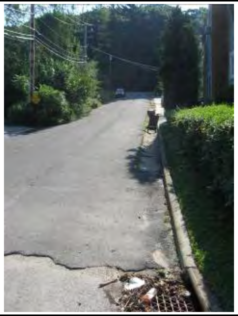
The Pine Hollow Shopping Center is a confirmed hotspot. A follow-up inspection should be conducted. This and similar commercial retail centers should be included as targets for future education and outreach efforts. This site is also a good candidate for structural stormwater retrofits since the stormwater is conveyed toward the drainage system along Pine Hollow Road. Potential retrofits include parking lot bioretention, particularly along the perimeter of the parking lot adjacent to Pine Hollow Road.

10.6 Streets and Storm Drain Assessment

Urban streets and storm drains can be a source of stormwater pollutants if not maintained on a regular basis. The condition of the local road and storm drain infrastructure can be assessed to determine if existing maintenance practice could reduce pollutant accumulation. Selected streets and storm drains were assessed during the upland field inventories conducted the week of August 3, 2009. Most of the streets and storm drains that were assessed are located in or near hotspot or neighborhood source assessment locations. Findings of the street and storm drain assessment are summarized below. Photographs of the storm drains and the street conditions evaluated are provided as *Table 10-7*.

Approximately half of the streets and storm drains evaluated were clean, free of sediment and debris, and in good condition. The other half had varying degrees of sediment and organic matter accumulated on top of the catch basin grates, either partially or fully prohibiting stormwater from entering the drainage system and sediment accumulation on the street. Many of the inspected catch basins had varying degrees of sediment accumulation and nearly all could benefit from increased clean-out and street sweeping. Many of the storm drains observed during the field assessments were stenciled. However, other areas of the watershed could benefit from storm drain stenciling and similar watershed stewardship signage, particularly along Harbor Road in Huntington, the Pine Hollow Shopping Complex in Oyster Bay, along Hernan Avenue, and other residential and commercial locations throughout the watershed.

Table 10-7. Streets and Storm Drain Assessment Photographs

Location	Storm Drains		Comments
Harbor Road, Huntington (Cold Spring Harbor)			
Mountain Road, Bayville (Mill Neck Creek			Catch basin grates are clean; however sediment accumulation is present on the roadway.
Hernan Avenue, Locust Valley (Mill Neck Creek)			Catch basin grates are partially or completely covered by accumulated organic material
Ships Point Lane, Oyster Bay (Oyster Bay Harbor)			
Pine Hollow Shopping Center, Oyster Bay (White's Creek)			The parking lot pavement is cracked around some of the catch basins located in the parking lot.

11 Land Use Regulatory Controls

11.1 Introduction

Municipal land use plans and regulations help shape the development patterns within a watershed and can play a significant role in protecting water quality and other natural resources at the watershed scale. These commonly include municipal comprehensive plans, zoning regulations, subdivision regulations, and stormwater regulations, all of which influence the type and density of development that can occur within a watershed. Local land use regulations often vary by municipality within a watershed, and regulations are periodically revised in response to development pressure, shifts in attitude toward natural resource protection, and political and socioeconomic factors.

In addition to municipalities, other governmental agencies also have jurisdiction over lands and activities within the harbor complex watershed. The regulatory programs and policies of these agencies also play an important role in addressing land use, water quality, and natural resource issues facing the watershed.

A key element in the development of a watershed management plan is to identify potential land use regulatory and planning mechanisms (i.e., new or modified land use regulations and planning approaches) that can be implemented by the watershed municipalities and other governmental entities to strengthen existing land use controls and better protect natural resources within the watershed. Communities in urbanized areas are also faced with a mandate to meet State and Federal Phase II stormwater permit requirements under the National Pollutant Discharge Elimination System (NPDES) program, as well as addressing local concerns about the damaging effects of increased impervious cover and uncontrolled stormwater runoff from land development and suburban sprawl.

An opportunity exists for the watershed municipalities to strengthen existing regulatory mechanisms and satisfy Phase II stormwater requirements, while also updating and improving upon existing land use regulations and land use planning strategies to help protect and restore water quality and other valuable natural resources in the Oyster Bay/Cold Spring Harbor complex and its watershed.

This section summarizes the various governmental entities with jurisdiction over land use or resources within the watershed boundaries, including existing land use regulatory and planning mechanisms. The information presented in this section is based on responses obtained from a land use questionnaire distributed by Friends of the Bay in 2008, as well as existing regulatory and planning documents made available by the watershed municipalities and other government entities (Town of Oyster Bay, Town of Huntington, City of Glen Cove, and their incorporated villages, and Nassau and Suffolk Counties).

11.2 Summary of Regulatory Jurisdictions

This section describes the various land use regulatory jurisdictions within the Oyster Bay/Cold Spring Harbor Complex watershed. Information in this section is summarized from the Oyster Bay/Cold Spring Harbor Complex Harbor Management Plan (Cashin Associates, 2002), the Mill River Watershed Study and Public Stewardship Program (Cashin Associates, 2007), and information provided by local, county, state, and federal government entities with jurisdiction over land use or resources in the watershed.

11.2.1 Federal

United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) is responsible for the regulation, management, and preservation of the Oyster Bay National Wildlife Refuge. USFWS management responsibilities include, but are not limited to, restoring wetlands and managing the impoundment. In addition, the USFWS has regulatory jurisdiction over federally endangered wildlife species that could be affected by activities within the harbor complex.

United States Army Corps of Engineers

The U.S. Army Corps of Engineers (ACOE) exercises regulatory authority over actions undertaken within the waters of the United States (e.g., dredging and the placement of structures such as docks and bulkheads). Often, a separate permit is required from ACOE for actions that also require a tidal wetlands permit from NYSDEC.

11.2.2 State

New York State Department of Conservation

The New York State Department of Conservation (NYSDEC) regulates land development and other activities through their wetlands (freshwater and tidal) and State Pollution Discharge Elimination System (SPDES) programs. In general, NYSDEC is responsible for maintaining and improving the quality of New York's natural environment. NYSDEC regulates activities in and within 100 feet of New York State-designated tidal and freshwater wetlands (Part 661 of Title 6 of the New York Code of Rules and Regulations [6 NYCRR 661]). The current SPDES regulations allow NYSDEC to regulate some municipal stormwater systems, all construction activities disturbing one or more acres of land (GP-0-08-002 and GP-0-08-001 respectively), and all traditional water discharges including those from wastewater treatment plants and industrial facilities. As an example, the Oyster Bay STP effluent is regulated under this program.

New York State Department of State

The New York State Department of State (NYSDOS), Division of Coastal Resources provides technical assistance to local governments in the areas of land use regulations, site plan review and design guidelines, and provides general information on new planning techniques. NYSDOS also administers the Federal Coastal Zone Management Act of 1972 and the State Waterfront Revitalization Act of 1981, including responsibility for reviewing Local Waterfront

Revitalization Programs (LWRP), Harbor Management Plans (HMP), Watershed Management Plans, and various coastal zone projects for consistency with the State's Coastal Management Plan. NYSDOS is also responsible for the development and implementation of the Long Island Sound Coastal Management Program.

New York State Department of Health

The New York State Department of Health (NYSDOH) regulates the design and construction of sanitary sewer systems, which is a key factor that affects development patterns, land use, and pollutant sources in a watershed.

New York State Department of Transportation

Although not a directly involved in regulating land use, the New York State Department of Transportation (NYSDOT) designs and maintains state roads and the associated drainage infrastructure within the Oyster Bay/Cold Spring Harbor Complex watershed. The NYSDOT is also considered a Municipal Separate Storm Sewer System (MS4) and, therefore, regulated under NYSDEC's SPDES Phase II program.

11.2.3 County

Nassau County

Department of Public Works

The Nassau County Department of Public Works (NCDPW) is responsible for the design and maintenance of the county's roadways and associate storm drainage infrastructure. Upon the request of the Planning Commission or a municipality the NCDPW will be asked to review and approve proposed land development applications, which may be reviewed by one or more of the divisions of the NCDPW. This review may include, but is not limited to, impacts to county and local roadways and stormwater infrastructure, general site grading and drainage, and proposed sanitary facilities.

Under Municipal Law, the County Department of Public Works must review any construction for which a municipality is issuing a building permit that fronts on or abuts County roads, properties or right-of-ways (Rules and Regulations Governing Approval for Erection of Buildings on County Highways, Nassau County Department of Public Works).

The NCDPW also administers and implements the Nassau County Stormwater Management Program since the county is a regulated small MS4 under the SPDES Phase II program. The County has established an inter-municipal coalition of municipal entities within the County to implement the SPDES Phase II program regionally, consistent with the Nassau County Stormwater Management Program.

Department of Health

The Nassau County Department of Health (NCDH) is responsible for the review and approval of the design and installation of on-site sewage disposal systems that are proposed for subdivisions of five or more lots. Towns and Villages in the region may also impose NCDH design requirements for smaller systems.

Planning Commission

The Nassau County Planning Commission maintains jurisdictional authority for subdivisions of five or more lots proposed in the unincorporated areas of the County. The Planning Commission, when it deems fit, may forward land development applications to the Commissioner of Public Works and/or the Nassau County Department of Health (as per the Real Property Law, Section 334a) for review and approval.

Parks, Recreation and Museums

The Nassau County Department of Parks, Recreation and Museums is responsible for operation, maintenance, and preservation of County-owned park and preserve facilities, such as the Muttontown Preserve.

Soil and Water Conservation District

Although not a regulatory agency, the Nassau County Soil and Water Conservation District is a resource to County residents and employees providing technical assistance and information on many topics including land use practices, stormwater management, and nonpoint source pollution prevention.

Suffolk County

Department of Public Works

The Suffolk County Department of Public Works (SCDPW) constructs, maintains and operates county properties and designs, constructs and maintains county roads, sewerage systems, buildings and other facilities, such as waterways, bridges, docks and marinas. The SCDPW has responsibility primarily for projects on County-maintained roads and properties, but also has the authority to review projects that are subject to Suffolk County Planning Commission review, such as large subdivisions, projects adjacent to municipal boundaries, or those near airports.

The SCDPW, in cooperation with the Cornell University Cooperative Extension, is responsible for implementing the Suffolk County Stormwater Management Program to reduce stormwater pollution from County-owned roads and properties, as Suffolk County is also a regulated small MS4 under the SPDES Phase II program.

Department of Health Services

The Suffolk County Department of Health Services, Division of Environmental Quality (Office of Wastewater Management) is also responsible for the review and approval of the design and installation of on-site sewage disposal systems for all development, including single-family residences. The Office of Pollution Control is responsible for enforcing regulations concerning toxic and hazardous materials storage, inspection of commercial and industrial facilities, and new and existing swimming pool plan reviews and inspections.

Planning Commission

The Suffolk County Planning Commission has regulatory review authority over any municipal zoning/subdivision action that would affect real property lying within one mile of an airport or a nuclear power plant or within five hundred feet from the boundary of any village or town; the boundary of any existing or proposed county, state or federal park or other recreation area; the right-of-way of any existing or proposed county or state parkway, thruway, expressway, road or highway; existing or proposed right-of-way of any stream or drainage channel owned by the county or for which the county has established channel lines; the existing or proposed boundary of any other county, state, or federally owned land held or to be held for governmental use; or certain designated bodies of water.

Soil and Water Conservation District
Similar to Nassau County, the Suffolk County Soil and Water Conservation District is a resource to County residents and employees providing technical assistance and information on topics related to the protection and preservation of natural resources.

Department of Environment and Energy
The primary mission of the Suffolk County Department of Environment and Energy is to safeguard the natural resources of Suffolk County and to provide a centralized office for consideration of issues and activities from the perspective of their impact on the environment. Although serving primarily an advisory role, the Department of Environment and Energy has jurisdiction over environmental protection laws enforced by the County, the County brownfields program, open space acquisition, farmland preservation, and conservation easements. The Division of Water Quality Improvement also interfaces with the SCDPW on issues related to the Suffolk County Stormwater Management Program.

11.2.4 Municipal

Local municipalities exert the most direct influence on land use and watershed development and redevelopment within their political boundaries. Typical local land use review functions that can affect water quality and natural resources include zoning, site plan review, subdivision review, sediment and erosion control, vegetation protection, and open space preservation. The degree of land use regulatory controls, which can vary significantly between municipalities, is established in the municipal code, primarily the zoning code and development-related regulations (usually amendments to the overall zoning code). Typical land use regulatory controls within the zoning code include minimum lot size, minimum building setbacks, off-street parking requirements, and maximum lot coverage, impervious cover limits, stormwater management design standards, vegetated buffer requirements, etc.

As indicated in *Section 2.1* of this document, the Town of Oyster Bay has the authority to regulate land use and the underwater lands within its boundary and within unincorporated villages and hamlets. The Town also has authority to regulate over-water use of coastal waters within its boundaries, but which lie outside of the 1,500-foot area of over-water jurisdiction of the incorporated villages. The Town of Oyster Bay shares regulatory responsibilities with the United States Fish and Wildlife Service within the Oyster Bay National Wildlife Refuge. These responsibilities extend to several Town agencies and departments, as summarized later in this section.

The Town of Huntington and the City of Glen Cove have similar regulatory authorities and jurisdictions as the Town of Oyster Bay within the harbor complex watershed and coastal areas.

The incorporated villages have authority to regulate land use activities and the use of underwater lands within their respective boundaries, as well as authority to regulate the over-water use of coastal waters within 1,500 feet of their corporate boundaries.

11.3 Land Use Regulatory Survey

Friends of the Bay distributed a land use survey to county and municipal entities in the watershed in 2008. The purpose of the questionnaire was to obtain information on the current land use regulations, policies, and planning documents related to zoning and subdivision review, wetlands and natural resources, comprehensive plans, open space, and stormwater management. The following sections summarize information obtained from the land use survey and subsequent coordination with the municipalities.

Table 11-1 summarizes the various land use departments and commissions of the county and municipal entities within the Oyster Bay/Cold Spring Harbor Complex watershed.

Table 11-1. Land Use Departments and Commissions within the Oyster Bay/Cold Spring Harbor Watershed

County or Municipality	Land Use Departments and Commissions
Oyster Bay	• Town Board • Environmental Resources Department ➢ Environmental Control Commission (E.C.C.) ➢ Environmental Quality Review Division (formerly Environmental Quality Review Commission) • Planning and Development Department ➢ Zoning Board of Appeals ➢ Planning Advisory Board • Department of Public Works including the Divisions of Environmental Control, Engineering, and Highways • Department of Parks • Department of Public Safety • Landmarks Preservation Commission • "SEA" Fund Committee • Hempstead Harbor Protection Committee • Eastern Waterfront Steering Committee
Huntington	• Town Board • Planning and Environment Department ➢ Zoning Board of Appeals ➢ Planning Board • Engineering Services • Parks & Recreation Department • Public Safety Department • Public Works Department • Environmental Open Space and Park Fund Review Advisory (EOSPA) Committee • Huntington Conservation Board • Historic Preservation Commission

Table 11-1. Land Use Departments and Commissions within the Oyster Bay/Cold Spring Harbor Watershed

County or Municipality	Land Use Departments and Commissions
Glen Cove	• City Board • Planning Advisory Board • Zoning Board of Appeals • Parks & Recreation Department • Public Safety Department • Public Works Department • Beautification Commission
Villages	• Village Board • Planning Board • Zoning Board of Appeals • Highway Department • Environmental Conservation Commission (not all have) • Landmark Preservation Commission (not all have)
Nassau County	• Planning Commission • Department of Public Works • Health Department • Parks, Recreation and Museums • Public Works Department • Environmental Program Bond Act Advisory Committee
Suffolk County	• Environment and Energy Department ➢ Division of Water Quality Improvement ➢ Water Quality Review Committee (WQRC) • Parks, Recreation, and Conservation Department • Health Services Department ➢ Division of Environmental Quality ➢ Office of Water Resources • Planning Department ➢ Council on Environmental Quality ➢ Environmental Analysis

Table 11-2 summarizes the current status of comprehensive master plans and key municipal land use regulations for the county and municipal entities within the harbor complex watershed.

Table 11-2. Municipal Land Use Regulations

Plan/Regulation	Oyster Bay	Huntington	Glen Cove	Villages	Nassau County	Suffolk County
Comprehensive Master Plan	Being Prepared	Yes (Being Updated)	Draft	No	Yes	Being Prepared
Subdivision Regulations	Yes	Yes	Yes	Yes	Yes	Yes
Zoning Regulations	Yes	Yes	Yes	Yes	No	No
Floodplain Management	Yes	Yes	Yes	Some	No	No
Stormwater Regulations	Yes	Yes	Yes	Yes	Yes	No
Wetland Regulations	Yes*	Yes*	Yes*	Yes*	No	No

* Pursuant to §24-0501 of the New York State Freshwater Wetland Act (Article 24 of the New York State Environmental Conservation Law)

11.3.1 Wetland Resources

Regulations that protect wetland resources are essential to protecting and restoring the water quality and overall health of the Oyster Bay/Cold Spring Harbor Complex. In New York, activities affecting wetlands are primarily regulated at the state level and federal level. Freshwater wetlands are regulated under the Freshwater Wetlands Act (under Article 24 of the Environmental Conservation Law), while tidal wetlands are regulated under the Tidal Wetland Act of 1973.

11.3.2 Site Development

Land development and redevelopment activities in the watershed are regulated by local zoning codes and subdivision regulations. Municipal zoning and subdivision requirements dictate site development characteristics such as minimum lot size, minimum setback distances, impervious cover, roadway and drainage design standards, open space, and vegetative buffers, as well as the site plan review process itself. Local zoning and subdivision regulations vary considerably by municipality. As an example, *Table 11-3* summarizes lot specifications for each municipality in the watershed, including minimum lot size.

Table 11-3. Municipal Zoning Lot Specifications

Jurisdiction	Zone	Uses Permitted	Minimum Lot Area (SF)
Town of Huntington	C-6 General Business	All uses	--
	R-5 Residence	One & Two-family	5,000
	R-7 Residence	All uses	7,500
	R-10 Residence	All uses	10,000
	R-20 Residence	All uses	20,000
	R-40 Residence	All uses	1 acre
	R-80 Residence	All uses	2 acres
Village of Lloyd Harbor	Residence A-1	[1]	[1]
	Public Beach	Recreation	--
	Conservation Recreation	Recreation	--
	Parkland	Recreation	--
Town of Oyster Bay Includes Villages of: East Norwich Hamlet of Oyster Bay Locust Valley Syosset Woodbury	R1-5A One-Family Residence	Single family	5 acres
	R1-2A One-Family Residence	Single family	2 acres
	R1-1A One-Family Residence	Single family	1 acre
	R1-20 One-Family Residence	Single family	20,000
	R1-15 One-Family Residence	Single family	15,000
	R1-10 One-Family Residence	Single family	10,000
	R1-7 One-Family Residence	Single family	7,000
	R1-6 One-Family Residence	Single family	6,000
	RMF-6 Multi-Family Residence	Multi-family	5 acres
	RMF-10 Multi-Family Residence	Multi-family	5 acres
	RMF-16 Multi-Family Residence	Multi-family	5 acres
	RPH-20 Multi-Family Public Housing Residence	Multi-family	2 acres
	RSC-25 Multi-Family Senior Citizen Residence	Multi-family	2 acres

Table 11-3. Municipal Zoning Lot Specifications

Jurisdiction	Zone	Uses Permitted	Minimum Lot Area (SF)
	REC Recreation	Recreation	20 acres
	RO Residence-Office	Office	6,000
	NB Neighborhood Business	Business	10,000
	GB General Business	Business	--
	LI Light Industry	Industry	1 acre
Village of Mill Neck	Residence R1	Single family	8,000
	Residence R2	Single family	3 acres
	Estate E1 Districts	Single family	5 acres
Village of Bayville	Residence B	Single family	5,000
	Residence C	Single family	75,000
	Residence D	Single family	15,000
	Residence E	Single family	20,000
	Residence F	Single family	40,000
	Business	Business	--
City of Glen Cove	R-1 Residence	Single family	1 acre
	R-2 Residence	Single family	0.5 acre
	R-3 Residence	Single family	0.25 acre
	R-3A Residence	Single family	6,500
	R-4 Residence	One & Two-family	6,500-7,500
Village of Muttontown	A-1 Residence	Single family	2 acres
	E-3 Residence	Single family	3 acres
	E-5 Residence	Single family	5 acres
Village of Upper Brookville	R1 Residence	Single family	2 acres
	OP1 Open District (Suburban Estate)	Single family	5 acres
Village of Old Brookville	R-3A Residence	Single family	3 acres
	R-2A Residence	Single family	2 acres
Village of Brookville	R2	Single family[2]	2 acres[2]
	R4	Single family[2]	4 acres[2]
	R5	Single family[2]	5 acres[2]
Village of Centre Island	Residence A1	Single family[2]	3 acres
	Residence A2	Single family[2]	0.5 acre
Village of Lattingtown	R-15	Single family	15,000
	R-2A	Single family	2 acres
	R-4A	Single family	4 acres
Village of Laurel Hollow	R/I Residential/Industrial	Industrial	75 acres
	R Residential	Single family	15,000
Village of Oyster Bay Cove	A-1 Residence	Single family	2 acres
	A-2 Residence	Single family	6,000

[1] Unknown at the time of printing.
[2] Inferred from information provided on the municipal zoning maps.

11.3.3 Open Space

Open space plays a critical role in protecting and preserving the health of a watershed by limiting development and impervious coverage, preserving natural pollutant attenuation characteristics, and supporting other planning objectives such as farmland preservation, community preservation, and passive recreation. Open space includes preserved natural areas as well as lightly developed parks and playgrounds.

While approximately 15 percent of the Oyster Bay/Cold Spring Harbor Complex watershed consists of undeveloped land uses, not all of this land is considered open space because it may be privately owned and ultimately developed. Protected open space areas include deeded open space that is privately owned, parcels owned by land trusts, state and federally-owned land, and municipal park land. Such land is protected against future development. Several of the watershed county and municipal entities have prepared open space plans for their respective jurisdictions (*Table 11-4*).

Table 11-4. Open Space Plans

Jurisdiction	Open Space Plan
Town of Oyster Bay	Yes
Town of Huntington	Yes
City of Glen Cove	No
Villages	Some
Nassau County	No
Suffolk County	Yes*

*Open Space Acquisition Policy Plan

In addition to the designation of protected open space through donation, purchase of land by a municipality, conservation or land trusts, or other private and/or public agencies, municipalities may also require that new development projects set aside some land as dedicated open space. The subdivision regulations of many of the municipalities in the Oyster Bay/Cold Spring Harbor Complex watershed require the set-aside of a percentage of new subdivisions as open space, and some also have provisions for fee-in-lieu-of open space. *Table 11-5* summarizes responses from the surveyed watershed communities regarding their current open space regulations.

A majority of the surveyed watershed municipalities also allow cluster development, open space or conservation subdivisions, or other variations to standard lot layouts in their subdivision regulations. These are compact forms of development that concentrate density in one portion of the site in exchange for reduced density elsewhere, thereby reducing overall site imperviousness and associated stormwater impacts and potentially avoiding development in sensitive areas of a site.

Table 11-5. Open Space Regulations

Jurisdiction	Allow Cluster Development	Allow Open Space Subdivisions	Subdivision Open Space	
			Required	Fee in lieu of
Town of Oyster Bay	Yes	Yes	*	Yes
Town of Huntington	Yes	Yes	No	Yes
City of Glen Cove	Yes	Yes	Yes	Yes
Villages	No	No	Some	Some
Nassau County	N/A	N/A	N/A	N/A
Suffolk County	N/A	N/A	N/A	N/A

*In Aquifer Protection Overlay District only.
N/A - Not Applicable

11.3.4 Stormwater Management

Development of the landscape with impervious surfaces can alter the hydrology of a watershed and has the potential to adversely affect water quality and aquatic habitat. As a result of development, vegetated and forested land that consists of pervious surfaces is largely replaced by land uses with impervious surfaces. This transformation increases the amount of stormwater runoff from a site, decreases infiltration and groundwater recharge, and alters natural drainage patterns. Natural pollutant removal mechanisms provided by on-site vegetation and soils have less opportunity to remove pollutants from stormwater runoff. During construction, soils are also exposed to rainfall, which increases the potential for erosion and sedimentation. Development can also introduce new sources of pollutants from everyday activities associated with residential, commercial, and industrial land.

Stormwater runoff both during construction and following completion of construction for new development and redevelopment projects is regulated at the local and state levels. As shown in *Table 11-6*, all of the watershed municipalities have erosion and sediment control regulations as mandated by the NYSDEC Phase II Program (GP-0-08-002). All watershed municipalities have adopted regulations requiring that a soil erosion and sediment control plan be submitted with any application for development when the disturbed area of such development is more than one acre. Projects that disturb greater than one acre of land are subject to regulation under the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-08-001). This permit applies to discharges of stormwater from construction activities including, but not limited to, clearing, grading, and excavation that result in the disturbance of one or more acres of total land area as part of a development or redevelopment plan.

Post-construction stormwater quantity and quality are also regulated by the watershed municipalities through municipal planning and zoning regulations. All of the watershed municipalities are subject to the requirements of the NYSDEC SPDES Phase II stormwater program, which is regulated under the NYSDEC SPDES General Permit for the Discharge of Stormwater from Municipal Separate Storm Sewer Systems (MS4s)(GP-0-08-002). The Phase II General Permit regulates the quality of municipal stormwater discharges and requires the implementation of a Stormwater Management Program that addresses the following six minimum control measures:

1. Public education and outreach;
2. Public involvement/participation;
3. Illicit discharge detection and elimination including mapping all stormwater discharges from a pipe, conduit, or ditch owned or operated by the municipality;
4. Construction site runoff control;
5. Post-construction storm water management; and
6. Pollution prevention and good housekeeping for municipal operations.

All of the municipal entities within the watershed, including the Town of Oyster Bay, the Town of Huntington, the City of Glen Cove, and the villages and hamlets are regulated small MS4s under the NYSDEC SPDES Phase II program. This designation requires each municipal entity to develop and implement a Stormwater Management Program. As described previously, the municipal entities within Nassau County have formed a stormwater coalition with Nassau County for implementing their Stormwater Management Programs.

The NYSDEC has developed the *New York State Stormwater Management Design Manual* (as revised), which provides guidance on the measures necessary to protect the waters of the State of New York from the adverse impacts of post-construction stormwater runoff. It is intended for use as a planning tool and design guidance document by the regulated and regulatory communities involved in stormwater quality management in New York. The manual provides uniform guidance for developers, engineers, and review agencies on the selection, design, and application of stormwater control measures. All of the watershed municipalities in the Oyster Bay/Cold Spring Harbor Complex watershed have indicated that they use the stormwater manual in reviewing land development proposals.

Table 11-6. Municipal Stormwater Management Regulations

Controls	Oyster Bay	Huntington	Glen Cove	Villages	Nassau County	Suffolk County
On-Site Stormwater Management Requirements/Stormwater Management Plans	Yes	Yes	Yes	Yes	Yes	No
Erosion and Sediment Control Plans	Yes	Yes	Yes	Yes	Yes	No
Site Plan Review	Yes	Yes	Yes	Yes	Yes	No
Illicit Discharge Detection and Elimination Requirements	Yes (pending)	Yes	Yes	Yes	Yes	Yes
Environmental Assessment (SEQR)	Yes	Yes	Yes	Yes	Yes	No

11.3.5 On-Site Wastewater Disposal

As described in Section 6.3, significant portions of the Oyster Bay/Cold Spring Harbor Complex watershed are served by individual on-site sewage disposal systems, including cesspools and septic tank systems. These types of systems are a potential source of nitrogen, pathogens, and other pollution to surface waters and groundwater as a result of system failure (inadequately treating sewage or by creating potential for direct or indirect contact between sewage and the public) or malfunction (typically a slow loss of function that is difficult to detect).

All of the municipalities within the watershed rely on the County Health Departments for design guidelines and the approval of on-site wastewater disposal systems. Larger systems (e.g., 3+ family development; residential buildings housing 10 or more people; commercial, industrial, and residential development generating more than 1,000 gallons/day) are required to obtain approval from the NYSDEC SPDES program. Once constructed and operational, on-site wastewater disposal systems are no longer regulated by the County Health Department and are only inspected if a failure complaint is submitted to the County. The Towns and Villages also do not have requirements for ongoing inspection or maintenance of existing systems.

11.3.6 Aquifer Protection

Several of the county and municipal entities in the watershed have enacted aquifer protection regulations to protect drinking water supplies, in addition to the state-designated Special Groundwater Protection Areas, as defined in Article 55 of the NYS Environmental Conservation Law. As summarized in *Table 11-7*, the Town of Oyster Bay has an Aquifer Protection Overlay (APO) District, adopted in 2004, which affords added protection to both the quality and quantity of groundwater resources by restricting disturbance to natural vegetation, impervious surface coverage, hazardous material storage, creation, and disposal. The Town Code also states that the use of fertilizers, pesticides, and irrigation be minimized. Suffolk County also has designated Special Groundwater Protection Areas and associated regulations, which allow the County to acquire or purchase development rights on land within designated Special Groundwater Protection Areas and establish a Suffolk County Panel on Groundwater Protection.

Table 11-7 Aquifer/Groundwater Protection Regulations

Jurisdiction	Aquifer/Groundwater Protection Regulation
Oyster Bay	Yes
Huntington	No
Glen Cove	No
Villages	No
Nassau County	No
Suffolk County	Yes

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Appendix A

Pollutant Loading Documentation

Pollutant Loading Analysis
Oyster Bay Watershed
State of the Watershed Report

1.0 INTRODUCTION

A pollutant loading analysis was performed for the Oyster Bay watershed in support of the State of the Watershed Report to assess the potential for increases in nonpoint source (NPS) pollutant loads. The model was used to compare existing nonpoint source (NPS) pollutant loads from the watershed to projected future pollutant loads that would occur under a watershed buildout scenario. The predicted change in pollutant loadings in each of the subwatersheds was then examined to assess their relative vulnerability to future development.

2.0 MODEL DESCRIPTION

A pollutant loading model was developed using the land use/land cover data described in Section 7.0 of the State of the Watershed Report (Fuss & O'Neill 2009). The model was used to compare pollutant loadings from the watershed under existing land use conditions to future pollutant loadings under a watershed buildout scenario. It is important to note that the results of this screening-level analysis are intended for the purposes of comparing existing to future conditions and not to predict future water quality.

The Spreadsheet Tool for the Estimation of Pollutant Load (STEPL), Version 4.0, was used for this analysis. This model was developed for US EPA by Tetra Tech in EPA Region 5 and has since been modified for use in other areas of the country. The model calculates watershed pollutant loads based on land use-related pollutant sources, including urban runoff, septic system failures, stream bank erosion, and agricultural activities. The model also allows simulation of best management practices (BMPs) and Low Impact Development (LID) practices to reduce pollutant loads.

The focus of the Oyster Bay watershed pollutant loading model was future development of presently undeveloped land and re-development of developed land with higher-intensity land uses (See Section 7.2 of Fuss & O'Neill 2009), since these are likely sources of increased pollutant loads. Agricultural NPS pollutant loadings were not considered in the analysis since agricultural land comprises a very small percentage of the land uses within the watershed.

The pollutants modeled in this analysis are the default pollutants contained in the STEPL model: total phosphorus, total nitrogen, biological oxygen demand, and total suspended solids. These pollutants are the major parameters of concern in environmental systems.

Nitrogen and phosphorus are nutrients that promote the growth of algae and plants in water. When this biomass dies and settles to the bottom of water bodies, its decomposition consumes oxygen which is needed by other organisms for survival. Nitrogen is generally present in relatively small quantities compared to other nutrients in salt water systems, such as Oyster Bay/Cold Spring Harbor and Long Island Sound, so limiting its concentration limits the growth of algae. In fresh water systems, such as the stream and impoundments in the Oyster Bay River watershed, phosphorus is the nutrient that is relatively scarce and thus limits algal growth.

Biological oxygen demand (BOD) is a measure of the amount of oxygen that a pollutant consumes as it decomposes (e.g., one pound of BOD consumes one pound of oxygen). A given BOD loading to a water body effectively consumes an equivalent amount of oxygen from that water body, making it unavailable to aquatic organisms.

Total suspended solids (TSS) is a measure of both biodegradable and mineral sediment. Its discharge to a water body results in turbidity and sedimentation. TSS may also have secondary effect; biodegradable TSS exerts a BOD load, and mineral TSS can be associated with particulate phosphorus.

3.0 MODEL PARAMETER SELECTION

STEPL uses algorithms that calculate nutrient and sediment loads from different land uses to determine watershed pollutant loadings. The user specifies several model parameters for each land use in the watershed that are used to estimate runoff quantity and pollutant levels. These parameters include:

- Event Mean Concentrations (EMCs), which are literature values for the mean concentration of a pollutant in stormwater runoff for each land use, and
- Curve Number (CN), which is a measure of the runoff potential of the land surface and is a function of soil type, cover condition, and slope.

The model uses these parameters to estimate the runoff quantity and pollutant loading using data specific to each subwatershed, supplied by the user, as well as default climate data for the subject county In addition to these parameters, the model includes percent impervious surface values for each land use. As part of this project, the model was modified to accept user-specified impervious surface values for each land use.

A literature review was conducted to determine EMCs values for use in the study. STEPL includes default EMC values for each land use within the watershed. Since comparison between existing and proposed watershed conditions is the focus of this project, EMC values were selected to reflect the relative difference in NPS pollutant characteristics between the existing and future land use. Table 1 shows EMC values from several sources for the pollutants of interest.

Table 1. Runoff Event Mean Concentrations (EMCs)

Source	Pollutant	Land Use										
		Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units
STEPL	N	1.9	1.5	2	2.2	1.8	2.5	2.2	0.2	3	1.5	mg/L
	P	0.3	0.15	0.2	0.4	0.3	0.4	0.4	0.1	0.5	0.15	mg/L
	BOD	4	4	9.3	10	7.8	9	10	0.5	9.3	4	mg/L
	TSS	-	70	75	100	67	120	100	-	150	70	mg/L
NSQD	N*	-	1.2	2.2	2	-	2.1	-	-	2.3	-	mg/L
	P	-	0.25	0.22	0.3	-	0.26	-	-	0.25	-	mg/L
	BOD	-	4.2	11.9	9	-	9	-	-	8	-	mg/L
	TSS	-	51	43	48	-	77	-	-	99	-	mg/L
NURP	N*	-	1.5	1.75	2.6	-	-	-	-	-	-	mg/L

Source	Pollutant	Land Use										
		Cropland	Open Space	Commercial	High Density Residential	Institutional	Industrial	Low Density Residential	Forest	Transport	Vacant	Units
	P	-	0.1	0.201	0.38	-	-	-	-	-	-	mg/L
	BOD	-	-	9.3	10	-	-	-	-	-	-	mg/L
	TSS	-	70	57	101	-	-	-	-	-	-	mg/L
WTM	N*	-	-	2	2	-	-	2	-	2	-	mg/L
	P	-	-	0.26	0.26	-	-	0.26	-	0.26	-	mg/L
	BOD	-	-			-	-		-		-	mg/L
	TSS	-	-	55	55	-	-	55	-	55	-	mg/L
BEC	N*	-	-	13.7	13.7	-	10.6	10.0	-	-	-	kg/ha/yr
	P	-	-	2.7	2.7	-	2.6	1.9	-	-	-	kg/ha/yr
	BOD	-	-			-			-	-	-	kg/ha/yr
	TSS	-	-	748.0	748.0	-	802.5	456.0	-	-	-	kg/ha/yr
Selected	N*	1.9	1.5	2.2	2	1.8	2.5	1.8	0.2	3	1.5	mg/L
	P	0.3	0.15	0.4	0.2	0.3	0.4	0.3	0.1	0.5	0.15	mg/L
	BOD	4	4	10	9.3	7.8	9	7.8	0.5	9.3	4	mg/L
	TSS	-	70	100	75	67	120	67	-	150	70	mg/L

See References for Source Information

The majority of selected values were obtained from STEPL, with adjustments to ensure consistency with other sources. These adjustments include exchanging the multi-family and commercial values, since development included in the multi-family category is assumed to be less intensive in the Oyster Bay/Cold Spring Harbor Complex watershed (See Section 4.0) than typical, and since the default commercial sediment EMC value was lower than sediment levels of other less sediment-intensive land uses. Similarly, since the single-family land use category selected for the watershed includes a majority of large lot residential areas (> 1 acre), the selected EMCs for these areas were reduced to Institutional land use levels.

As part of this project, the impervious surface coefficients in STEPL were adjusted for use in generating existing and proposed impervious surface estimates. The default factors, literature values for factors, and selected factors are presented in Table 2.

Table 2. Impervious Surface Coefficients

	Impervious Cover Coefficients		
Land Use	STEPL	NEMO[1]	Selected
Commercial	0.85	0.205 - 0.557	0.50
Industrial	0.70	0.264 - 0.557	0.40
Institutional	0.50	-	0.30
Transportation	0.95	0.433	0.43
Multi-family	0.75	0.09 - 0.39	0.24
Single-family	0.30	0.065 - 0.12	0.10
Vacant (developed)	0.70	-	0.41
Open Space	0.01	0.001 - 0.094	0.01

[1] *Sleavin et al. (2000) and Prisloe et al. (2003)*

The STEPL model also includes input parameters related to failing septic systems in the watershed. Parameters include the typical population per household and septic system failure rate. Default values were used for the typical population per household and septic system failure rate due to the limited availability of local data.

4.0 MODEL INPUT DATA

Land use/land cover data that is described in Section 7.0 of the State of the Watershed Report was adapted for integration into the STEPL model. Data was prepared in this manner for both the existing conditions and future conditions (watershed buildout) pollutant loading scenarios. STEPL allows fewer land use categories than contained in the land use/land cover data obtained from other sources, so several data categories were combined for use in the model. Table 3 summarizes the assignment of STEPL land use categories for each of the land use/land cover data categories.

Table 3. Source Data - STEPL Category Correlation

STEPL Category	Oyster Bay Land Use Category	Huntington Land Use Category
Urban		
Commercial	Commercial	Commercial
Industrial	Industrial	Industrial
Institutional	Community Service; Public Services	Institutional
Transportation	Transportation	Transportation; Utilities
Multi family	--	--
Single family	Residential	Residential
Agriculture	--	--
Vacant (developed)	--	--
Open Space	Recreation & Entertainment	--
Cropland	Agriculture	Agriculture
Pastureland	--	--
Forest	Vacant; Wild conservation & Parks	Open

STEPL defines urban land uses differently from agriculture and forest. All urban land uses are lumped into a single land use category, and urban land cover characteristics are distinguished based on land use subcategories, which include commercial, industrial, institutional, transportation, multi-family residential, single-family residential, urban cultivated, vacant (developed), and open space land uses. Almost all of the residential land use in the watershed is single-family so the residential category is considered all single-family in STEPL. Community Service and Public Service in Oyster Bay includes schools and other public buildings consistent with Institutional land use. Recreation and Entertainment land use includes golf courses and country clubs that are characterized as sub-category open space in the Urban land use category. Forest land in STEPL is distinguished from open space by including the Open land use in Huntington, which includes committed open space and is mostly forested, and vacant and wild, conservation and parkland in the Town of Oyster Bay.

Artificial infiltration of stormwater runoff by use of basins or sumps has been practiced on Long Island since the 1930s to recharge collected stormwater back to the groundwater system. In the 1950s, Nassau and Suffolk Counties adopted regulations requiring stormwater to be retained and infiltrated onsite. The drainage areas to recharge basins are determined using delineations from the Nassau County Stormwater Management Reports for subwatersheds, where available, and Nassau County Department of Public Works delineations otherwise. Therefore, the total land area contributing to the pollution runoff model in any particular subwatershed may be greatly reduced from the actual land area. The areas of land included in the STEPL model are outside of the drainage areas to stormwater recharge basins and are assumed to contribute direct runoff to the streams, estuary and harbor. Areas that drain to stormwater basin are considered fully treated, and not contributing to pollutant loads. Data was not available for Huntington, although aerial photographs show that recharge basins are not typically used on the western side of Suffolk County.

Although STEPL is not capable of modeling various densities of residential land use, Table 4 summarizes the composition of single-family residential land use based on parcel size ranges.

Table 4. Composition of Single-Family Residential Land Use Based on Parcel Size

Watershed	Residential Parcels	0 - 22k sf	22k sf - 2 ac	2 - 5 acres	> 5 acres
Bailey Arboretum	220	33.6%	39.5%	20.0%	6.8%
Beaver Brook	1230	23.5%	19.8%	42.3%	14.4%
Center Island	369	63.4%	10.6%	20.9%	5.1%
Cold Spring Brook*	1603*	41.2%	45.7%	12.9%	0.2%
Cold Spring Harbor*	342*	12.6%	30.1%	51.8%	5.6%
Kentuck Brook	1798	83.2%	10.5%	5.5%	0.8%
Lloyd Neck*	--	--	--	--	--
Mill Neck Creek	1686	90.0%	5.9%	2.4%	1.7%
Mill River	863	66.4%	12.4%	16.8%	4.4%
Oyster Bay Harbor	864	69.7%	6.3%	18.4%	5.7%
Tiffany Brook	554	6.9%	34.3%	54.0%	4.9%
Upper Kentuck Brook	310	40.3%	33.5%	24.8%	1.3%
Upper White's Creek	1215	71.5%	16.3%	11.9%	0.2%
White's Creek	628	96.5%	2.1%	1.4%	0%

* Parcel data is not available for the portion of the watershed in Huntington. Therefore, there is no data for the Lloyd Neck subwatershed and only partial data for the Cold Spring Brook and Cold Spring Harbor subwatersheds. The residential parcel size counts and area distributions presented are from parcels in the town of Oyster Bay only, which comprises 57% of the Cold Spring Harbor subwatershed and 42% of the Cold Spring Brook subwatershed.

Septic system data is also required for the STEPL model. The majority of the Oyster Bay/Cold Spring Harbor Complex Watershed is not serviced by sewer systems. The Oyster Bay Sewage Treatment Plant services the downtown area of Oyster Bay Hamlet in the subwatershed White's Creek and a portion of Oyster Bay Harbor and Mill River. A small portion of the southern watershed is also services by sewer system in the Cold Spring Brook subwatershed. None of the villages in the Town of Huntington inside the Oyster Bay/Cold Spring Harbor Complex watershed have sewer service. The sewer service area GIS data from the Town of Oyster Bay was used to screen out developed parcels in the Oyster Bay/Cold Spring Harbor Complex Watershed watershed; parcels located completely outside of mapped sewer service areas were assumed to be served by septic systems. Since the majority of the watershed is residential properties, it was assumed that each parcel not within a sewer service area was serviced by one septic tank. The number of septic systems in Huntington was estimated by multiplying the density of septic systems in Oyster Bay in each watershed area by the area of the subwatershed in Huntington. The number of septic systems in Lloyd Harbor was estimated by multiplying the density of septic systems in Cold Spring Harbor by the residential area in the subwatershed.

Hydrologic Soil Group (HSG) data are also required by the model. This data, which is available from the U.S. Natural Resource Conservation Service (NRCS), describes the infiltration characteristics of most soils in the county. Identifiers for the soil groups range from Type A soils, including sands and other soils that are very well drained and result in little runoff, to Type D soils, which are poorly drained, often being compacted, having high clay content and high groundwater levels. Soils data were compiled for each subwatershed and assimilated into an average HSG value. Each subwatershed was found to have Type B soil characteristics on average.

5.0 CURRENT POLLUTANT LOADINGS

5.1 Input

The following land use data were entered into the STEPL spreadsheet to create an existing conditions pollutant loading model. These inputs were reduced form the data presented in Section 7.1 of the Baseline Watershed Assessment. In general, agricultural land use (i.e. cropland) was the least common of the non-urban uses. Urban uses dominate in all subwatersheds, although forests compose significant areas in Lloyd Neck and Mill River subwatersheds.

Table 5. Land Use Input Data

	Land Use Area (ac)				Land Use Area Composition		
Watershed	**Urban**	**Cropland**	**Forest**	**Total**	**Urban**	**Cropland**	**Forest**
Bailey Arboretum	428	--	74	502	85%	--	15%
Beaver Brook	2,729	--	596	3,325	82%	--	18%
Center Island	656	--	106	762	86%	--	14%
Cold Spring Brook	1,849	54	1,090	2,993	62%	1.8%	36%
Cold Spring Harbor	2,652	--	300	2,952	90%	--	10%
Kentuck Brook	440	--	95	535	82%	--	18%
Lloyd Neck	684	--	211	895	76%	--	24%
Mill Neck Creek	827	--	94	921	90%	--	10%
Mill River	1,132	15	656	1,803	63%	0.8%	36%
Oyster Bay Harbor	1,389	--	185	1,574	88%	--	12%
Tiffany Brook	1,132	--	180	1,312	86%	--	14%
Upper Kentuck Brook	--	--	--	--	--	--	--
Upper White's Creek	--	--	--	--	--	--	--
White's Creek	272	--	20	292	93%	--	7%
Total	14,190	69	3,607	17,866	79%	0.4%	20%

Table 6 presents the composition of the urban land use areas listed in Table 5. In general, residential land use is the most prevalent in the urbanized areas, although institutional and transportation corridors are a significant portion of the urban land use throughout the watershed. As discussed in Section 4, only land area outside of the drainage areas to recharge basins are included in the pollutant loading analysis. Since Upper Kentuck Brook and Upper White's Creek are completely self-contained and drain to recharge basins, there is no land area contributing to pollutant loads from these subwatersheds.

Table 6. Urban Land Use Composition

Watershed	**Urban Land Use Composition (%)**						
	Commercial	**Industrial**	**Institutional**	**Transport-ation**	**Dense Residential**	**Rural Residential**	**Open Space**
Bailey Arboretum	--	--	9.9	6.5	27.9	55.7	--
Beaver Brook	--	--	3.8	4.6	9.9	62.7	19.0
Center Island	--	--	10.9	7.4	11.7	63.9	6.2
Cold Spring Brook	1.9	--	4.7	11.1	52.8	29.6	--
Cold Spring Harbor	0.9	0.2	11.5	6.4	14.2	66.9	--
Kentuck Brook	2.7	--	8.6	11.1	42.9	34.6	--
Lloyd Neck	--	--	--	6.5	--	93.5	--
Mill Neck Creek	0.6	--	3.1	12.1	42.8	41.0	0.3
Mill River	1.5	--	7.5	6.4	17.6	57.7	9.3
Oyster Bay Harbor	1.8	0.2	8.2	7.8	13.0	68.6	0.4
Tiffany Brook	0.1		20.7	5.6	17.7	55.7	0.1
Upper Kentuck Brook	--	--	--	--	--	--	--
Upper White's Creek	--	--	--	--	--	--	--
White's Creek	19.8	2.4	10.7	15.9	42.3	8.5	0.4

Table 7 presents the total estimated number of septic systems in the Oyster Bay/Cold Spring Harbor Complex watershed, determined using the methods described in Section 4.0. Septic systems are assumed to be present at lots not included in or abutting the sewer service area shown in the Baseline Watershed Assessment report. As discussed in Section 4.0, estimates were made for the number of septic systems in Lloyd Harbor and the portions of Cold Spring Harbor and Cold Spring Brook in Huntington for which no parcel data was available based on the average septic system density within the subwatershed in Oyster Bay. Note that these septic system estimates and are intended only for estimating increases in NPS pollutant loads and should not be used for other purposes. The majority of W

Table 7. Estimated Number of Septic Systems

Watershed	Number of Septic Systems
Bailey Arboretum	231
Beaver Brook	1345
Center Island	409
Cold Spring Brook	1926
Cold Spring Harbor	830
Kentuck Brook	237
Lloyd Neck	110
Mill Neck Creek	1803
Mill River	868

Watershed	Number of Septic Systems
Oyster Bay Harbor	345
Tiffany Brook	658
Upper Kentuck Brook	237
Upper White's Creek	929
White's Creek	35

5.2 Results

Table 8 presents total estimated loadings of total nitrogen, total phosphorus, and TSS for each subwatershed, as well as the loading rate for each subwatershed. In terms of total existing loads, the largest loads of pollutants originate in the larger subwatersheds Cold Spring Brook, Cold Spring Harbor, and Beaver Brook. As such, pollutants from these areas are likely to have the largest effect on water quality in Oyster Bay/Cold Spring Harbor Complex.

Since these watersheds are large compared to others, it is useful to look at the data in terms of the loading rate, which is the load of pollutant per unit land area. A high loading rate indicates dense pollutant sources, which suggests that implementation of best management practices (BMPs) in these areas would be more effective in reducing pollutant loads. Pollutant loading rates are relatively uniform between many of the watersheds. The highest loading rates for Nitrogen, Phosphorus and sediment are from White's Creek, Mill Neck Creek, Center Island and, Cold Spring Harbor. These subwatersheds have low percentages of the stormwater runoff treated in recharge basins, dense residential populations (presented in Table 4), and commercial and institutional land uses.

Table 8. Estimated Existing Pollutant Loads

Watershed	% Contributing to Recharge Basins	N	P	Sediment	N	P	Sediment
		lb/yr	lb/yr	t/yr	lb/ac-yr	lb/ac-yr	t/ac-yr
Cold Spring Brook (4,851 ac)	39%	17,479	3,113	324	3.6	0.6	0.07
Cold Spring Harbor (2,953 ac)	0%	16,476	2,834	314	5.6	1.0	0.11
Beaver Brook (4,862 ac)	31%	14,789	2,677	269	3.0	0.6	0.06
Oyster Bay Harbor (1,612 ac)	2%	8,769	1,494	173	5.4	0.9	0.11
Mill Neck Creek (968 ac)	5%	8,491	1,765	132	8.8	1.8	0.14
Mill River (2,175 ac)	17%	7,796	1,494	140	3.6	0.7	0.06
Tiffany Brook (1,923 ac)	31%	7,670	1,386	137	4.0	0.7	0.07
Kentuck Brook (1,538 ac)	65%	5,942	1,483	71	3.9	1.0	0.05
Center Island (762 ac)	0%	4,307	799	78	5.7	1.0	0.10
Lloyd Neck (894 ac)	0%	3,661	697	69	4.1	0.8	0.08
Bailey Arboretum (527 ac)	5%	2,929	504	53	5.6	1.0	0.10
White's Creek (292 ac)	0%	2,814	436	61	9.6	1.5	0.21
Upper White's Creek (1,317 ac)	100%	1,155	452	0	0.9	0.3	0.00
Upper Kentuck Brook (451 ac)	100%	295	115	0	0.7	0.3	0.00

- *White's Creek*. Although the White's Creek subwatersheds is the smallest in the study area, it is characterized by the dense residential and highest percent composition of commercial (18.4%) and industrial (2.2%) land uses in the watershed. For comparison, the next highest percentage of commercial land use is Cold Spring Brook with only 3.8% of the total subwatershed area. Transportation and other land uses are in comparable proportions to other subwatersheds in Oyster Bay. White's Creek does not contain any recharge basins, and is therefore characterized by high pollutant loading rates.

- *Mill Neck Creek*. Mill Neck Creek is characterized by both relatively high total pollutant loads and pollutant loading rates due to a high proportion of dense residential land use (42.8%). Other land uses are similar to other subwatershed areas. A major factor contributing the high pollutant loading rates in this subwatershed is that only 2 recharge basins are present in the watershed, with only 5% of the total area treated through recharge basins.

- *Center Island*. Center Island is characterized by rural residential land uses and no recharge basins within the subwatershed. The high loading rates for nitrogen and phosphorus are due to the septic systems.

- *Cold Spring Harbor and Oyster Bay Harbvor*. Cold Spring Harbor and Oyster Bay Harbor are moderately-sized subwatersheds in which stormwater is conveyed to the harbor complex through stormwater collection systems and overland flow. These coastal areas are heavily developed, and only very small portions of these subwatersheds are served by recharge basins. Consequently, existing pollutant loads and loading rates for these subwatersheds are relatively high.

5.3 Discussion

The sources of pollutants in the watershed are generally associated with urban land use, as presented in Table 9. Note that urban areas are estimated to account for between 71.3% and 98.1% of the NPS pollutant load in the watershed and comprises 82% of the total watershed land use area (See Table 5). Significant nutrient loads are contributed by septic systems in the watershed, with close to 12.0% of the nitrogen load and 26.1% of the phosphorus load.

Table 9. Pollutant Source by Land Use

Source	N Load	P Load	Sediment Load
Urban	84.3%	67.0%	98.1%
Septic	14.4%	30.1%	0.0%
Forest	0.9%	2.4%	0.7%
Cropland	0.4%	0.4%	1.2%

By subdividing the urban pollutant loads into the distinct urban categories that were included in the model (See Table 10), it is apparent that dense residential and transportation land uses account for the largest NPS pollutant loads in the watershed, with transportation use being the largest source of pollutant loads. The combined residential land uses are significant sources since it is the predominant land uses in the watershed (See Table 6). Institutional land uses also contribute approximately 7% of the total pollutant loads. Transportation use is a significant source since it has the highest pollutant EMCs (See Table 1).

Table 10. Pollutant Loads and Sources for Urban Categories

Urban Land Use	N Load	P Load	Sediment Load	N Load	P Load	Sediment Load
	lb/year	lb/year	tons/year	%	%	%
Commercial	875	159	20	2%	3%	2%
Industrial	67	11	2	0%	0%	0%
Institutional	3,735	622	70	10%	11%	9%
Transportation	11,195	1,866	280	29%	32%	35%
Dense Residential	9,590	959	180	24%	16%	22%
Rural Residential	12,968	2,161	241	33%	37%	30%
Open Space	804	80	19	2%	1%	2%
Total	39,233	5,859	811	100%	100%	100%

6.0 FUTURE POLLUTANT LOADINGS

6.1 Input

Future land use estimates, presented in Table 11, were used in the STEPL model to simulate a watershed buildout scenario. Also summarized in Table 11 is the predicted "increase" in urban land use for each subwatershed. These model inputs were derived form the data presented in the State of the Watershed report. There is a limited amount of developable land in the watershed and all of it is currently forested, such that the increase in urban area for each subwatershed includes a corresponding reduction in forested land.

Table 11. Future Land Use Input Data

Watershed	Land Use Area (ac)				Land Use Area Composition			Urban Increase
	Urban	Cropland	Forest	Total	Urban	Cropland	Forest	
Bailey Arboretum	453	--	49	502	90%	--	10%	5.8%
Beaver Brook	2,826	--	499	3,325	85%	--	15%	3.6%
Center Island	695	--	67	762	91%	--	9%	5.9%
Cold Spring Brook	1,852	54	1,087	2,993	62%	1.8%	36%	0.2%
Cold Spring Harbor	2,677	--	275	2,952	91%	--	9%	0.9%
Kentuck Brook	480	--	55	535	90%	--	10%	9.1%
Lloyd Neck	684	--	211	895	76%	--	24%	0.0%
Mill Neck Creek	835	--	85	920	91%	--	9%	1.0%
Mill River	1,273	15	515	1,803	71%	0.8%	29%	12.5%
Oyster Bay Harbor	1,517	--	57	1,574	96%	--	4%	9.2%
Tiffany Brook	1,209	--	103	1,312	92%	--	8%	6.8%
Upper Kentuck Brook	--	--	--	--	--	--	--	--
Upper White's Creek	--	--	--	--	--	--	--	--
White's Creek	280	--	12	292	96%	--	4%	2.9%
Total	14,781	69	3,015	17,865	83%	0.4%	17%	4.2%

The same break-down of the urban land uses presented in Table 5 will be used for the future pollutant analysis. Much of the future development is anticipated in areas that are currently zoned for residential uses, and that is the majority of the current land use type.

6.2 Results

Table 12 presents projected future pollutant loads under a watershed buildout scenario. A slight increase in pollutant loads is predicted in many subwatersheds. The Mill River subwatershed is predicted to have the highest increase in nitrogen and sediment loads. Large increases are also predicted in nitrogen and phosphorus in the Oyster Bay Harbor subwatershed. Upper Kentuck Brook is anticipated to have no change in pollutant loads since no developable land exists in the subwatershed.

Table 12. Projected Future Pollutant Loads and Load Increases

Watershed	**Total Future Load**			**Projected Load Increase**		
	N	P	Sediment	N	P	Sediment
	lb/yr	lb/yr	t/yr	lb/yr	lb/yr	t/yr
Bailey Arboretum (527 ac)	3,076	523	56	147	19	3
Beaver Brook (4,862 ac)	15,224	2,733	278	435	57	9
Center Island (762 ac)	4,521	829	83	214	30	5
Cold Spring Brook (4,851 ac)	17,502	3,115	325	23	3	0
Cold Spring Harbor (2,953 ac)	16,614	2,853	317	138	19	3
Kentuck Brook (1,538 ac)	6,239	1,521	78	297	38	6
Lloyd Neck (894 ac)	3,661	697	69	0	0	0
Mill Neck Creek (968 ac)	8,549	1,772	133	58	7	1
Mill River (2,175 ac)	8,563	1,596	157	767	102	16
Oyster Bay Harbor 1,612 ac)	9,499	1,597	188	730	103	15
Tiffany Brook (1,923 ac)	8,112	1,447	146	443	61	9
Upper Kentuck Brook (451 ac)	295	115	0	0	0	0
Upper White's Creek (1,317 ac)	1,155	452	0	0	0	0
White's Creek (292 ac)	2,893	447	63	79	11	2
Total	105,903	19,700	1,891	3,332	451	70

Table 13 presents the projected future pollutant loads in terms of the projected load increase based on existing loads (percent increase) and loading rate increase for each subwatershed. These criteria were selected to determine the most significant changes in watershed loadings since they control for the existing load quantities (percent increase) and watershed size (rate increase). The highlighting in Table 13 identifies areas with the high (orange), moderate (yellow), and low (green) pollutant loadings or loading rate increases in the Oyster Bay watershed.

Table 13. Projected Pollutant Loading Rate Increases and Load Increases

Watershed	Projected Future Loading Rate			Projected Load Increase		
	N	P	Sediment	N	P	Sediment
	lb/ac-yr	lb/ac-yr	lb/ac-yr	lb/yr	lb/yr	t/yr
Bailey Arboretum (527 ac)	5.8	0.99	0.107	5%	4%	6%
Beaver Brook (4,862 ac)	3.1	0.56	0.057	3%	2%	3%
Center Island (762 ac)	5.9	1.09	0.109	5%	4%	6%
Cold Spring Brook 4,851 ac)	3.6	0.64	0.067	0%	0%	0%
Cold Spring Harbor (2,953 ac)	5.6	0.97	0.107	1%	1%	1%
Kentuck Brook (1,538 ac)	4.1	0.99	0.051	5%	3%	9%
Lloyd Neck (894 ac)	4.1	0.78	0.077	0%	0%	0%
Mill Neck Creek (968 ac)	8.8	1.83	0.137	1%	0%	1%
Mill River (2,175 ac)	3.9	0.73	0.072	10%	7%	11%
Oyster Bay Harbor (1,612 ac)	5.9	0.99	0.117	8%	7%	9%
Tiffany Brook (1,923 ac)	4.2	0.75	0.076	6%	4%	7%
Upper Kentuck Brook (451 ac)	0.7	0.26	0.000	0%	0%	0%
Upper White's Creek (1,317 ac)	0.9	0.34	0.000	0%	0%	0%
White's Creek (292 ac)	9.9	1.53	0.214	3%	3%	3%

Several of the subwatersheds are predicted to experience significantly higher increases in pollutant loads and loading rates under a watershed buildout scenario. These include Tiffany Brook, Mill River, Oyster Bay Harbor, and Kentuck Brook watersheds. The build-out conditions of the Mill River and Oyster Bay Harbor subwatersheds are projected to result in greater than 5% increase in pollutant loading rates for nitrogen, phosphorus and sediment loads. The increase in urban land use with a corresponding decrease in forest, with a proportion of the new urban land is likely to consist of new residential and industrial development. The increase in pollutant loads is the future is relatively small across the watershed because there is little opportunity for redevelopment in existing residential areas and for development in forested or vacant areas.

7.0 REFERENCES

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Appendix B

Watershed Field Inventory Documentation

Hotspot Site Investigation **HSI**

ATERSHED: Oyster Bay	**SUBWATERSHED:** Bailey Arboretum	**UNIQUE SITE ID:** BAI-HSI-01
ATE: 8/26/09	**ASSESSED BY:** KMB **CAMERA ID:**	**PIC#:** 182-188
MAP GRID:	**LAT** 40° 53 ' 2.7 " **LONG** 73 ° 35 ' 12.3 "	**LMK #**

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address: Intermediate school
Ryefield Rd
Bus parking/main facility

SIC code (if available): ________

NPDES Status: ☐ Regulated ☒ Unregulated ☐ Unknown

Category: ☐ Commercial ☐ Industrial ☒ Institutional ☐ Municipal ☒ Transport-Related

Miscellaneous: ☐ Golf Course ☐ Marina ☐ Animal Facility

Basic Description of Operation: Locust Valley Int. School / Bus storage & garage

	INDEX*
B. VEHICLE OPERATIONS ☐ **N/A** *(Skip to part C)*	**Observed Pollution Source?** N
B1. Types of vehicles: ☐ Fleet vehicles ☒ School buses ☒ Other: ______	
B2. Approximate number of vehicles: 15 + 10 vans/other	
B3. Vehicle activities *(circle all that apply)*: [✓ Maintained] [✓ Repaired] Recycled [✓ Fueled] Washed [✓ Stored]	●
B4. Are vehicles stored and/or repaired outside? ☐ Y ☒ N ☐ Can't Tell Are these vehicles lacking runoff diversion methods? ☑ Y ☐ N ☐ Can't Tell	○
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☒ Can't Tell	○
B6. Are uncovered outdoor fueling areas present? ☒ Y ☐ N ☐ Can't Tell	●
B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☒ Can't Tell	○
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☒ Can't Tell Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☒ Can't Tell	○
OUTDOOR MATERIALS ☐ **N/A** *(Skip to part D)*	**Observed Pollution Source?** N
C1. Are loading/unloading operations present? ☐ Y ☒ N ☐ Can't Tell If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell	○
C2. Are materials stored outside? ☒ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description: ______ Where are they stored? ☒ grass/dirt area ☒ concrete/asphalt ☐ bermed area	○
C3. Is the storage area directly or [✓ indirectly] connected to storm drain (circle one)? ☒ Y ☐ N ☐ Can't Tell	○
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☒ Can't Tell	○
C5. Does outdoor storage area lack a cover? ☒ Y ☐ N ☐ Can't Tell	●
C6. Are liquid materials stored *without* secondary containment? ☒ Y ☐ N ☐ Can't Tell	●
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☒ Can't Tell	○
D. WASTE MANAGEMENT ☐ **N/A** *(Skip to part E)*	**Observed Pollution Source?** N
D1. Type of waste *(check all that apply)*: ☒ Garbage ☒ Construction materials ☐ Hazardous materials	●
D2. Dumpster condition *(check all that apply)*: ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing	○
D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☒ Can't Tell If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☒ Can't Tell	○
E. PHYSICAL PLANT ☐ **N/A** *(Skip to part F)*	**Observed Pollution Source?** N
E1. Building: Approximate age: 50 yrs. Condition of surfaces: ☐ Clean ☒ Stained ☐ Dirty ☐ Damaged	○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☒ N ☐ Don't know	○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

BAI-HSI-01

Hotspot Site Investigation **HSI**

Parking Lot: Approximate age 10 yrs. Condition: ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☒ Paved/Concrete ☒ Gravel ☐ Permeable ☐ Don't know ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☒ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☒ Don't know ○

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☒ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☒ N/A *(skip to part G)* 0% turf

Observed Pollution Source? N

F1. % of site with: Forest canopy ____% Turf grass _____% Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)*

Observed Pollution Source? N

G1. Are storm water treatment practices present? ☐ Y ☐ N ☒ Unknown If yes, please describe: ________________ ○

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☒ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

G3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☒ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

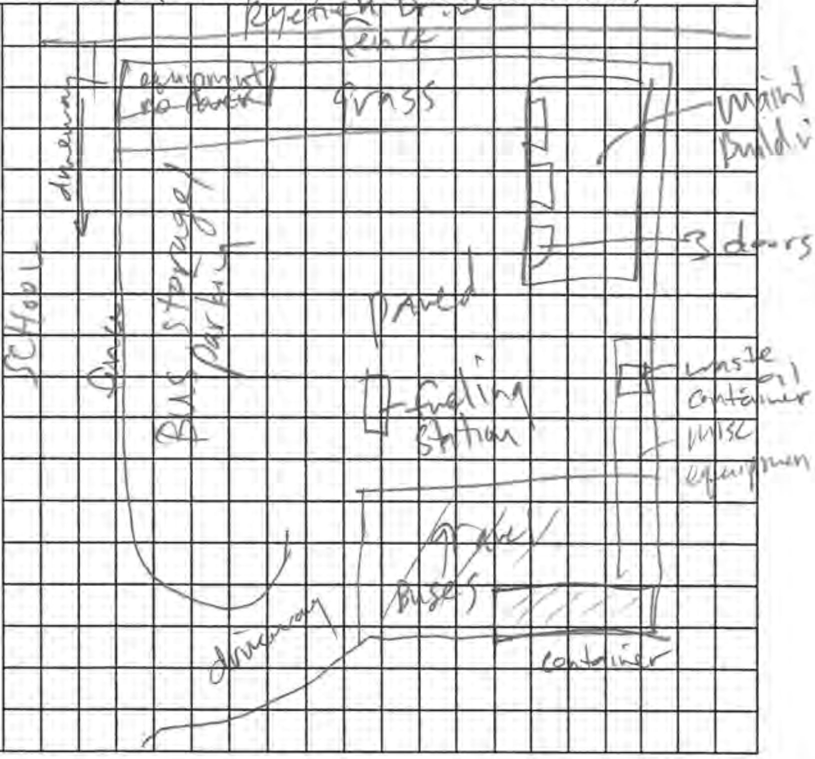
Follow-up Action:

☐ Refer for immediate enforcement
☒ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☒ Include in future education effort
☒ Check to see if hotspot is an NPDES non-filer
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record
Unique Site ID here: ____________________
☐ Schedule a review of storm water pollution prevention plan

Notes:

pavement/gravel looks clean where buses are stored

In front and along perimeter, storage of misc. oil storage, old equipment, plows, container for garbage & smaller 10 CY trash containers.



Hotspot Site Investigation **HSI**

ATERSHED: ~~[illegible]~~ Oyster Bay | **SUBWATERSHED:** Cold Spring Harbor | **UNIQUE SITE ID:** CSH-~~[illegible]~~HSI-01

ATE: 8/25/09 | **ASSESSED BY:** KMB | **CAMERA ID:** | **PIC#:** 72-78

MAP GRID: | ~~[illegible]~~ **LAT** ~~[illegible]~~ **LONG** ~~[illegible]~~ | **LMK #**

A. SITE DATA AND BASIC CLASSIFICATION [illegible] 40 52 14.5 73 27 29.7

Name and Address: ~~Main Street~~ - Huntington ✓ Municipal Lot

Category: ☒ ~~Commercial~~ ☐ Industrial ☐ Institutional ☒ Municipal ☒ Transport-Related

Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

SIC code (if available): ____

NPDES Status: ☐ Regulated ☒ Unregulated ☐ Unknown

Basic Description of Operation: ~~Outdoor mall - boutiques~~ Parking

INDEX*

B. VEHICLE OPERATIONS ☒ N/A *(Skip to part C)* **Observed Pollution Source?** N

B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☒ Other: CARS

B2. Approximate number of vehicles: 35 cars

B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed Stored ○

B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell ○

B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell ○

B6. Are uncovered outdoor fueling areas present? ☐ Y ☐ N ☐ Can't Tell ○

B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell ○

B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell ○

OUTDOOR MATERIALS ☒ N/A *(Skip to part D)* **Observed Pollution Source?** N

C1. Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell
If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell ○

C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description: ____
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area ○

C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell ○

C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell ○

C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell ○

C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☐ Can't Tell ○

C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell ○

D. WASTE MANAGEMENT ☒ N/A *(Skip to part E)* **Observed Pollution Source?** N

D1. Type of waste *(check all that apply)*: ☐ Garbage ☐ Construction materials ☐ Hazardous materials ○

D2. Dumpster condition *(check all that apply)*: ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing ○

D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell ○

E. PHYSICAL PLANT ☒ N/A *(Skip to part F)* **Observed Pollution Source?** N

E1. Building: Approximate age: ____ yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged ○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

CSH - HSI - 01

Hotspot Site Investigation **HSI**

2. Parking Lot: Approximate age _____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up ○
Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☐ None visible ○
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☐ N/A *(skip to part G)* **Observed Pollution Source?** ☐

F1. % of site with: Forest canopy 5 % Turf grass _____ % Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☒ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☒ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☒ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)* **Observed Pollution Source?** ☐

G1. Are storm water treatment practices present? ☐ Y ☒ N ☐ Unknown If yes, please describe: ________________ ○

G2. Are private storm drains located at the facility? ☒ Y ☐ N ☐ Unknown 2 curb inlets on ROAD-side ○
Is trash present in gutters leading to storm drains? If so, complete the index below.

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5

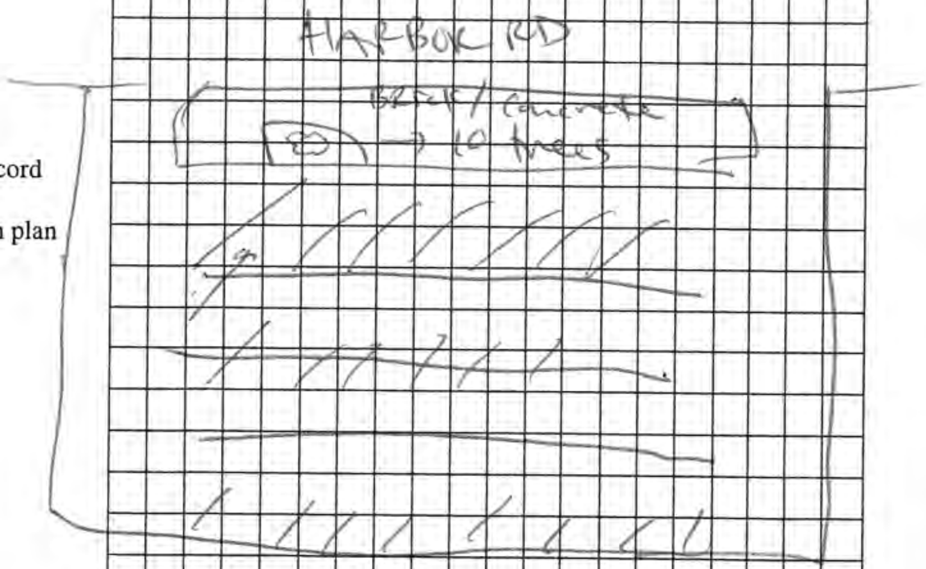
3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

. INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☒ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:

☐ Refer for immediate enforcement
☐ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☐ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☒ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record Unique Site ID here: ____________________
☐ Schedule a review of storm water pollution prevention plan



Notes:

check how many total parking spots

Hotspot Site Investigation **HSI**

WATERSHED:
SUBWATERSHED: Center Island
UNIQUE SITE ID: CTR-HSI-01
DATE: 8/26/2009
ASSESSED BY: DRB
CAMERA ID: Canon
PIC#: 161-167
MAP GRID:
LAT 41° 54' 8.8" **LONG** 73° 30' 55.6"
LMK #

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address:
Seawanhaka Yacht Club

Category: ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

Miscellaneous: ☐ Golf Course ☒ Marina ☐ Animal Facility

SIC code (if available):

NPDES Status: ☒ Regulated ☐ Unregulated ☐ Unknown

Basic Description of Operation: Boat Storage, Launching
DENIED ACCESS!

INDEX*

B. VEHICLE OPERATIONS ☐ N/A *(Skip to part C)*

Observed Pollution Source? ☐

B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☐ Other:

B2. Approximate number of vehicles:

B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed Stored ○

B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell ○

B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell ○

B6. Are uncovered outdoor fueling areas present? ☐ Y ☐ N ☐ Can't Tell ○

B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell ○

B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell ○

C. OUTDOOR MATERIALS ☐ N/A *(Skip to part D)*

Observed Pollution Source? ☐

C1. Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell
If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell ○

C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description:
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area ○

C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell ○

C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell ○

C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell ○

C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☐ Can't Tell ○

C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell ○

D. WASTE MANAGEMENT ☐ N/A *(Skip to part E)*

Observed Pollution Source? ☐

D1. Type of waste *(check all that apply)*: ☐ Garbage ☐ Construction materials ☐ Hazardous materials ○

D2. Dumpster condition *(check all that apply)*: ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing ○

D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell ○

E. PHYSICAL PLANT ☐ N/A *(Skip to part F)*

Observed Pollution Source? ☐

E1. Building: Approximate age: ________ yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged ○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know ○

NO ACCESS

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

CTR-HSI-01

Parking Lot: Approximate age _____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know ○

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☐ N/A *(skip to part G)*

Observed Pollution Source? ☐

F1. % of site with: Forest canopy ____% Turf grass _____ % Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)*

Observed Pollution Source? ☐

G1. Are storm water treatment practices present? ☐ Y ☐ N ☐ Unknown If yes, please describe: ________________ ○

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☐ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

G3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:

☐ Refer for immediate enforcement
☐ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☐ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record
Unique Site ID here: ________________
☐ Schedule a review of storm water pollution prevention plan

Notes:

Hotspot Site Investigation **HSI**

ATERSHED: Oyster Bay	**SUBWATERSHED:** Mill River		**UNIQUE SITE ID:** MRV-HSI-01
ATE: 8/27/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 234-243
MAP GRID:	**LAT** 40° 52' 12.4" **LONG** 73° 32' 30.5"		**LMK #**

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address:
50 Lake Ave

Category: ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

SIC code (if available):

NPDES Status: ☐ Regulated ☐ Unregulated ☐ Unknown

Basic Description of Operation: Oyster Bay Highway Yard - Maintenance Facility

	INDEX*
B. VEHICLE OPERATIONS ☐ **N/A** *(Skip to part C)* — **Observed Pollution Source?** Y	
B1. Types of vehicles: ☒ Fleet vehicles ☐ School buses ☐ Other:	
B2. Approximate number of vehicles: 10	
B3. Vehicle activities *(circle all that apply)*: [✓ Maintained] Repaired Recycled [✓ Fueled] [✓ Washed] [✓ Stored]	●
B4. Are vehicles stored and/or repaired outside? ☒ Y ☐ N ☐ Can't Tell stored, repaired in garage Are these vehicles lacking runoff diversion methods? ☒ Y ☐ N ☐ Can't Tell	●
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☒ Can't Tell	○
B6. Are uncovered outdoor fueling areas present? ☒ Y ☐ N ☐ Can't Tell	●
B7. Are fueling areas directly connected to storm drains? ☒ Y ☐ N ☐ Can't Tell	●
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☒ Can't Tell Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☒ Can't Tell	○
OUTDOOR MATERIALS ☐ **N/A** *(Skip to part D)* — **Observed Pollution Source?** Y	
C1. Are loading/unloading operations present? ☒ Y ☐ N ☐ Can't Tell If yes, are they uncovered *and* draining towards a storm drain inlet? ☒ Y ☐ N ☐ Can't Tell Salt	●
C2. Are materials stored outside? ☒ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☒ Solid Description: Salt Where are they stored? ☐ grass/dirt area ☒ concrete/asphalt ☐ bermed area	●
C3. Is the storage area [✓ directly] or indirectly connected to storm drain (circle one)? ☒ Y ☐ N ☐ Can't Tell	●
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☒ Can't Tell	○
C5. Does outdoor storage area lack a cover? ☒ Y ☐ N ☐ Can't Tell	●
C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☒ Can't Tell	○
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☒ Can't Tell	○
D. WASTE MANAGEMENT ☐ **N/A** *(Skip to part E)* — **Observed Pollution Source?** N	
D1. Type of waste *(check all that apply)*: ☒ Garbage ☐ Construction materials ☐ Hazardous materials	○
D2. Dumpster condition *(check all that apply)*: ☒ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☒ Overflowing	●
D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell	○
E. PHYSICAL PLANT ☐ **N/A** *(Skip to part F)* — **Observed Pollution Source?** N	
E1. Building: Approximate age: 10 yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☒ Don't know	○ ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

MRV-HSI-01

.. Parking Lot: Approximate age ? yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up ○
Surface material ☒ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know

E3. Do downspouts discharge to impervious surface? ☒ Y ☐ N ☐ Don't know ☐ None visible ○
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☒ Don't know

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☒ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☒ N/A *(skip to part G)*

Observed Pollution Source? ☐

F1. % of site with: Forest canopy ____% Turf grass _____ % Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)*

Observed Pollution Source? ☐

G1. Are storm water treatment practices present? ☐ Y ☒ N ☐ Unknown If yes, please describe: ________________ ●

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☒ Unknown ○
Is trash present in gutters leading to storm drains? If so, complete the index below.

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

G3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked)
☒ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:

☐ Refer for immediate enforcement
☒ Suggest follow-up on-site inspection
☒ Test for illicit discharge
☒ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record
Unique Site ID here: ____________________
☒ Schedule a review of storm water pollution prevention plan

Notes:

Follow up for fueling station, storm water drainage and storage of materials. esp. salt/sand pile and vehicles

Hotspot Site Investigation **HSI**

ATERSHED: Oyster Bay | **SUBWATERSHED:** OBH | **UNIQUE SITE ID:** OBH-HSI-01

ATE: 8/25/09 | **ASSESSED BY:** EMB | **CAMERA ID:** | **PIC#:** 109-119

MAP GRID: | **LAT** 40° 52' 26.9" **LONG** 73° 31' 44.8" | **LMK #**

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address:
LIRR OysterBay Yard
1 Rail Road Plaza,

Category: ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☒ Transport-Related
Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

SIC code (if available): 4011

NPDES Status: ☒ Regulated ☐ Unregulated ☐ Unknown

Basic Description of Operation: Railyard

INDEX*

B. VEHICLE OPERATIONS ☐ N/A *(Skip to part C)*

Observed Pollution Source? N

B1. Types of vehicles: ☒ Fleet vehicles ☐ School buses ☒ Other: trains

B2. Approximate number of vehicles: 3+ trains 10 employee parking

B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed Stored ○

B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☐ Can't Tell
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell ○

B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☐ Can't Tell ○

B6. Are uncovered outdoor fueling areas present? ☒ Y ☐ N ☐ Can't Tell for trains ○

B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☐ Can't Tell ○

B8. Are vehicles washed outdoors? ☐ Y ☐ N ☐ Can't Tell
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell ○

OUTDOOR MATERIALS ☐ N/A *(Skip to part D)*

Observed Pollution Source? N

C1. Are loading/unloading operations present? ☒ Y ☐ N ☐ Can't Tell
If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell ○

C2. Are materials stored outside? ☒ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☒ Solid Description: pallets + bags of something
Where are they stored? ☐ grass/dirt area ☒ concrete/asphalt ☐ bermed area ○

C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☒ Can't Tell ○

C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell ○

C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell ○

C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☐ Can't Tell ○

C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell ○

D. WASTE MANAGEMENT ☐ N/A *(Skip to part E)*

Observed Pollution Source? N

D1. Type of waste *(check all that apply)*: ☒ Garbage ☐ Construction materials ☐ Hazardous materials ○

D2. Dumpster condition *(check all that apply)*: ☒ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☒ Overflowing ●

D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☒ Can't Tell
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell ○

E. PHYSICAL PLANT ☐ N/A *(Skip to part F)*

Observed Pollution Source? N

E1. Building: Approximate age: 80 yrs. Condition of surfaces: ☐ Clean ☐ Stained ☐ Dirty ☐ Damaged ○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☐ Don't know ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

0BH-HSI-01

Hotspot Site Investigation **HSI**

2. Parking Lot: Approximate age _____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know ○

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☒ N/A *(skip to part G)*

Observed Pollution Source? N/A

F1. % of site with: Forest canopy ____% Turf grass _____ % Landscaping ____% Bare Soil ____% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)*

Observed Pollution Source? N

G1. Are storm water treatment practices present? ☐ Y ☐ N ☒ Unknown If yes, please describe: ________________ ○

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☒ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

Index Rating for Accumulation in Gutters

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

. INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:

☐ Refer for immediate enforcement
☐ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☐ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record Unique Site ID here: ____________________
☐ Schedule a review of storm water pollution prevention plan

Notes:

Hotspot Site Investigation **HSI**

WATERSHED: Oyster Bay
SUBWATERSHED: Oyster Bay Harbor
UNIQUE SITE ID: OBH-HSI-02
E: 8/25/09
ASSESSED BY: KMB
CAMERA ID:
PIC#: 94-103
MAP GRID:
LAT 40 ° 52 ' 14.6 " **LONG** 73 ° 31 '28.7"
LMK#

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address: Oyster Bay High School
Main St

Category: ☐ Commercial ☐ Industrial ☒ Institutional ☐ Municipal ☐ Transport-Related
Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

SIC code (if available):

Basic Description of Operation: school buildings & parking

NPDES Status: ☐ Regulated ☐ Unregulated ☐ Unknown

INDEX*

B. VEHICLE OPERATIONS ☐ N/A *(Skip to part C)*

Observed Pollution Source? N

B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☒ Other: CARS

B2. Approximate number of vehicles: 20 school not in session

B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed Stored ○

B4. Are vehicles stored and/or repaired outside? ☐ Y ☒ N ☐ Can't Tell
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☐ Can't Tell ○

B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☒ N ☐ Can't Tell ○

B6. Are uncovered outdoor fueling areas present? ☐ Y ☒ N ☐ Can't Tell ○

B7. Are fueling areas directly connected to storm drains? ☐ Y ☒ N ☐ Can't Tell ○

B8. Are vehicles washed outdoors? ☐ Y ☒ N ☐ Can't Tell
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell ○

OUTDOOR MATERIALS ☒ N/A *(Skip to part D)*

Observed Pollution Source? N

Are loading/unloading operations present? ☐ Y ☐ N ☐ Can't Tell
If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell ○

C2. Are materials stored outside? ☐ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☐ Solid Description:
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☐ bermed area ○

C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☐ Can't Tell ○

C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☐ Can't Tell ○

C5. Does outdoor storage area lack a cover? ☐ Y ☐ N ☐ Can't Tell ○

C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☐ Can't Tell ○

C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☐ N ☐ Can't Tell ○

D. WASTE MANAGEMENT ☐ N/A *(Skip to part E)*

Observed Pollution Source? N

D1. Type of waste *(check all that apply)*: ☒ Garbage ☐ Construction materials ☐ Hazardous materials ○

D2. Dumpster condition (*check all that apply)*: ☒ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing ●

D3. Is the dumpster located near a storm drain inlet? ☒ Y ☐ N ☐ Can't Tell
If yes, are runoff diversion methods (berms, curbs) lacking? ☒ Y ☐ N ☐ Can't Tell ○

E. PHYSICAL PLANT ☐ N/A *(Skip to part F)*

Observed Pollution Source? N

E1. Building: Approximate age: circa 1928 addition 2008 yrs. Condition of surfaces: ☒ Clean ☐ Stained ☐ Dirty ☐ Damaged ○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☒ N ☐ Don't know ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

OBH-HSI-02

Parking Lot: Approximate age 20 yrs. Condition: ☐ Clean ☐ Stained ☒ Dirty ☒ Breaking up ●
Surface material ☒ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☐ Don't know ☒ None visible ●
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☐ Don't know

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☒ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☐ N/A *(skip to part G)* **Observed Pollution Source?** N

F1. % of site with: Forest canopy 5 % Turf grass 85 % Landscaping 10 % Bare Soil 0 % ○

F2. Rate the turf management status: ☐ High ☒ Medium ☐ Low covered ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☒ N ☐ Can't Tell crab grass ○

F4. Do landscaped areas drain to the storm drain system? ☒ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☒ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)* **Observed Pollution Source?** N

G1. Are storm water treatment practices present? ☐ Y ☐ N ☒ Unknown If yes, please describe: probably NOT ○

G2. Are private storm drains located at the facility? ☒ Y ☐ N ☐ Unknown ○
Is trash present in gutters leading to storm drains? If so, complete the index below.

Index Rating for Accumulation in Gutters

	Clean				Filthy	
Sediment	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5	
Organic material	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5	leaf matter
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5	

G3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☒ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:

☐ Refer for immediate enforcement
☐ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☐ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☒ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record
Unique Site ID here: ____________________
☐ Schedule a review of storm water pollution prevention plan

Notes:

possible rooftop leader disconnection
no leaders visible

Hotspot Site Investigation **HSI**

WATERSHED: White Creek | **SUBWATERSHED:** W | **UNIQUE SITE ID:** WCR-HSI-01

E: 8/25/09 | **ASSESSED BY:** DCB | **CAMERA ID:** Canon | **PIC#:** 0053-0035

MAP GRID: | **LAT** 40 ° 52 ' 31.0 " **LONG** 73 ° 31 ' 32.6 " | **LMK#**

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address: Commander
Oil Terminal
1 Commander Square

SIC code (if available): 5171

NPDES Status: ☒ Regulated ☐ Unregulated ☐ Unknown

Category: ☐ Commercial ☐ Industrial ☒ Institutional ☐ Municipal ☒ Transport-Related

Miscellaneous: ☐ Golf Course ☐ Marina ☐ Animal Facility

Basic Description of Operation: Bulk oil receiving & storage

INDEX*

B. VEHICLE OPERATIONS ☐ N/A *(Skip to part C)*

Observed Pollution Source? N

B1. Types of vehicles: ☐ Fleet vehicles ☐ School buses ☐ Other: Barge

B2. Approximate number of vehicles: 0 (On barge: Bay side of facility only can be viewed

B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled [✓ Fueled] Washed Stored ○

B4. Are vehicles stored and/or repaired outside? ☐ Y ☐ N ☒ Can't Tell
Are these vehicles lacking runoff diversion methods? ☐ Y ☐ N ☒ Can't Tell ○

B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☒ Can't Tell ○

B6. Are uncovered outdoor fueling areas present? ☒ Y ☐ N ☐ Can't Tell ○

B7. Are fueling areas directly connected to storm drains? ☐ Y ☐ N ☒ Can't Tell Unlikely ○

B8. Are vehicles washed outdoors? ☐ Y ☐ N ☒ Can't Tell
Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☒ Can't Tell ○

C. OUTDOOR MATERIALS ☐ N/A *(Skip to part D)*

Observed Pollution Source? N

. Are loading/unloading operations present? ☒ Y ☐ N ☐ Can't Tell Directly over water
If yes, are they uncovered *and* draining towards a storm drain inlet? ☐ Y ☒ N ☐ Can't Tell ○

C2. Are materials stored outside? ☒ Y ☐ N ☐ Can't Tell If yes, are they ☒ Liquid ☐ Solid Description: oil
Where are they stored? ☐ grass/dirt area ☐ concrete/asphalt ☒ bermed area ○

C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☐ Y ☐ N ☒ Can't Tell Unlikely ○

C4. Is staining or discoloration around the area visible? ☐ Y ☒ N ☐ Can't Tell ○

C5. Does outdoor storage area lack a cover? ☒ Y ☐ N ☐ Can't Tell ○

C6. Are liquid materials stored *without* secondary containment? ☐ Y ☒ N ☐ Can't Tell ○

C7. Are storage containers missing labels or in poor condition (rusting)? ☒ Y ☐ N ☐ Can't Tell Very minor rusting ○

D. WASTE MANAGEMENT ☒ N/A *(Skip to part E)*

Observed Pollution Source? Can't Tell

D1. Type of waste *(check all that apply)*: ☐ Garbage ☐ Construction materials ☐ Hazardous materials ○

D2. Dumpster condition (*check all that apply)*: ☐ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☐ Overflowing ○

D3. Is the dumpster located near a storm drain inlet? ☐ Y ☐ N ☐ Can't Tell
If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☐ N ☐ Can't Tell ○

E. PHYSICAL PLANT ☐ N/A *(Skip to part F)*

Observed Pollution Source?

E1. Building: Approximate age: 50 yrs. Condition of surfaces: ☐ Clean ☒ Stained ☐ Dirty ☐ Damaged ○
Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☐ N ☒ Don't know ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

NCR-HSI-01

Parking Lot: Approximate age _____ yrs. Condition: ☐ Clean ☐ Stained ☐ Dirty ☐ Breaking up
Surface material ☐ Paved/Concrete ☐ Gravel ☐ Permeable ☒ Don't know Cannot view ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☐ N ☒ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☐ Y ☐ N ☒ Don't know ○

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☒ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☒ N/A *(skip to part G)* **Observed Pollution Source?** N/A

F1. % of site with: Forest canopy ___% Turf grass _____% Landscaping ___% Bare Soil ___% ○

F2. Rate the turf management status: ☐ High ☐ Medium ☐ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☐ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☐ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☐ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ N/A *(skip to part H)* **Observed Pollution Source?** ☐

G1. Are storm water treatment practices present? ☐ Y ☐ N ☒ Unknown If yes, please describe: ________________ ○

G2. Are private storm drains located at the facility? ☐ Y ☐ N ☒ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

Index Rating for Accumulation in Gutters Cannot view

	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

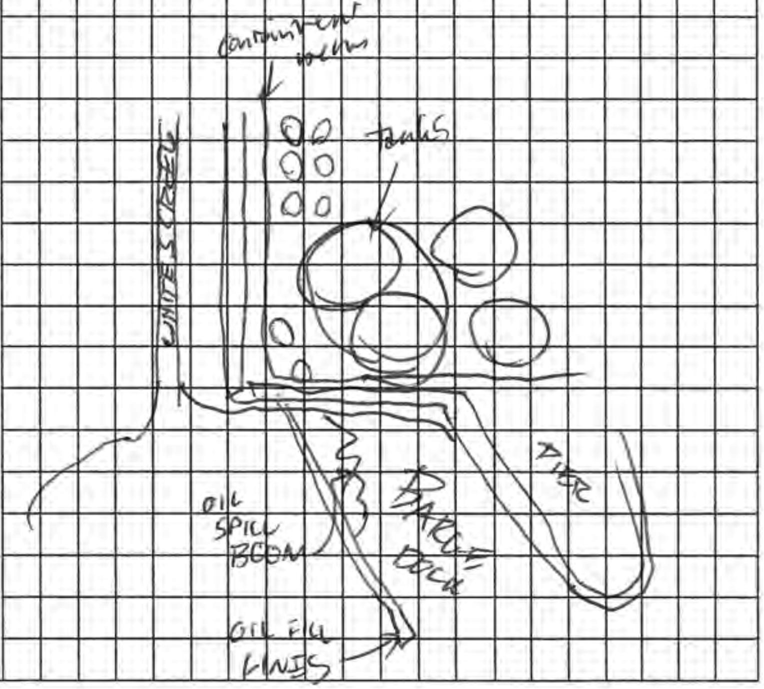
G3. Catch basin inspection – Record SSD Unique Site ID here: ________ Condition: ☐ Dirty ☐ Clean

INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☒ Potential hotspot (5 to 10 circles but no boxes checked)
☐ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:
☐ Refer for immediate enforcement
☒ Suggest follow-up on-site inspection
☐ Test for illicit discharge
☒ Include in future education effort
☐ Check to see if hotspot is an NPDES non-filer
☐ Onsite non-residential retrofit
☐ Pervious area restoration; complete PAA sheet and record Unique Site ID here: ____________________
☐ Schedule a review of storm water pollution prevention plan

Notes:



Hotspot Site Investigation **HSI**

WATERSHED: Oyster Bay	**SUBWATERSHED:** White's Creek		**UNIQUE SITE ID:** WCR-HSI-02
ATE: 8/16/04	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 163 — 173
MAP GRID:	**LAT** 40° 51' 26.3" **LONG** 73° 32' 06.0" (CB)		**LMK #**

A. SITE DATA AND BASIC CLASSIFICATION

Name and Address:
Stop & Shop Plaza / Rite Aid
Pine Hollow Shopping Center

SIC code (if available): ________

NPDES Status: ☐ Regulated ☒ Unregulated ☐ Unknown

Category: ☒ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

Miscellaneous ☐ Golf Course ☐ Marina ☐ Animal Facility

Basic Description of Operation: Commercial Shops (not Getty Stn or McDs)

	INDEX*
B. VEHICLE OPERATIONS ☐ **N/A** *(Skip to part C)* — **Observed Pollution Source?** N	
B1. Types of vehicles: ☒ Fleet vehicles ☐ School buses ☒ Other: employee cars, delivery vehicles	
B2. Approximate number of vehicles: 10 | 1 small truck, 1 haul truck	
B3. Vehicle activities *(circle all that apply)*: Maintained Repaired Recycled Fueled Washed [✓ Stored]	●
B4. Are vehicles stored and/or repaired outside? ☒ Y ☐ N ☐ Can't Tell Stored Are these vehicles lacking runoff diversion methods? ☐ Y ☒ N ☐ Can't Tell	●
B5. Is there evidence of spills/leakage from vehicles? ☐ Y ☐ N ☒ Can't Tell	○
B6. Are uncovered outdoor fueling areas present? ☐ Y ☒ N ☐ Can't Tell	○
B7. Are fueling areas directly connected to storm drains? ☐ Y ☒ N ☐ Can't Tell	○
B8. Are vehicles washed outdoors? ☐ Y ☐ N ☒ Can't Tell Does the area where vehicles are washed discharge to the storm drain? ☐ Y ☐ N ☐ Can't Tell	○
OUTDOOR MATERIALS ☐ **N/A** *(Skip to part D)* — **Observed Pollution Source?** Y	
C1. Are loading/unloading operations present? ☒ Y ☐ N ☐ Can't Tell If yes, are they uncovered *and* draining towards a storm drain inlet? ☒ Y ☐ N ☐ Can't Tell	●
C2. Are materials stored outside? ☒ Y ☐ N ☐ Can't Tell If yes, are they ☐ Liquid ☒ Solid Description: pallets, cardboard, baking racks, metal shelving Where are they stored? ☐ grass/dirt area ☒ concrete/asphalt ☐ bermed area	●
C3. Is the storage area directly or indirectly connected to storm drain (circle one)? ☒ Y ☐ N ☐ Can't Tell	○
C4. Is staining or discoloration around the area visible? ☐ Y ☐ N ☒ Can't Tell	○
C5. Does outdoor storage area lack a cover? ☒ Y ☐ N ☐ Can't Tell	●
C6. Are liquid materials stored *without* secondary containment? ☐ Y ☐ N ☒ Can't Tell prob NOT	○
C7. Are storage containers missing labels or in poor condition (rusting)? ☐ Y ☒ N ☐ Can't Tell	○
D. WASTE MANAGEMENT ☐ **N/A** *(Skip to part E)* — **Observed Pollution Source?** Y	
D1. Type of waste *(check all that apply)*: ☒ Garbage ☐ Construction materials ☐ Hazardous materials	○
D2. Dumpster condition *(check all that apply)*: ☒ No cover/Lid is open ☐ Damaged/poor condition ☐ Leaking or evidence of leakage (stains on ground) ☒ Overflowing bags near dumpster on ground	●
D3. Is the dumpster located near a storm drain inlet? ☒ Y ☐ N ☐ Can't Tell If yes, are runoff diversion methods (berms, curbs) lacking? ☐ Y ☒ N ☐ Can't Tell	●
E. PHYSICAL PLANT ☐ **N/A** *(Skip to part F)* — **Observed Pollution Source?**	
E1. Building: Approximate age: 30-40 yrs. Condition of surfaces: ☐ Clean ☒ Stained ☐ Dirty ☐ Damaged Evidence that maintenance results in discharge to storm drains (staining/discoloration)? ☐ Y ☒ N ☐ Don't know	● ○

*Index: ○ denotes potential pollution source; ☐ denotes confirmed polluter (evidence was seen)

WCR-HSI-02

Hotspot Site Investigation **HSI**

2. Parking Lot: Approximate age 30 yrs. Condition: ☐ Clean ☒ Stained ☒ Dirty ☐ Breaking up
Surface material ☒ Paved/Concrete ☐ Gravel ☐ Permeable ☐ Don't know ○

E3. Do downspouts discharge to impervious surface? ☐ Y ☒ N ☐ Don't know ☐ None visible
Are downspouts directly connected to storm drains? ☒ Y ☐ N ☐ Don't know ●

E4. Evidence of poor cleaning practices for construction activities (stains leading to storm drain)? ☐ Y ☐ N ☐ Can't Tell ○

F. TURF/LANDSCAPING AREAS ☐ **N/A** *(skip to part G)* **Observed Pollution Source?** ☐

F1. % of site with: Forest canopy 0 % Turf grass 0 % Landscaping 5 % Bare Soil 0 % ○

F2. Rate the turf management status: ☐ High ☐ Medium ☒ Low ○

F3. Evidence of permanent irrigation or "non-target" irrigation ☐ Y ☒ N ☐ Can't Tell ○

F4. Do landscaped areas drain to the storm drain system? ☒ Y ☐ N ☐ Can't Tell ○

F5. Do landscape plants accumulate organic matter (leaves, grass clippings) on adjacent impervious surface? ☐ Y ☒ N ☐ Can't Tell ○

G. STORM WATER INFRASTRUCTURE ☐ **N/A** *(skip to part H)* **Observed Pollution Source?** ☐

G1. Are storm water treatment practices present? ☐ Y ☒ N ☐ Unknown If yes, please describe: ____________ ○

G2. Are private storm drains located at the facility? ☐ Y ☒ N ☐ Unknown
Is trash present in gutters leading to storm drains? If so, complete the index below. ○

	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

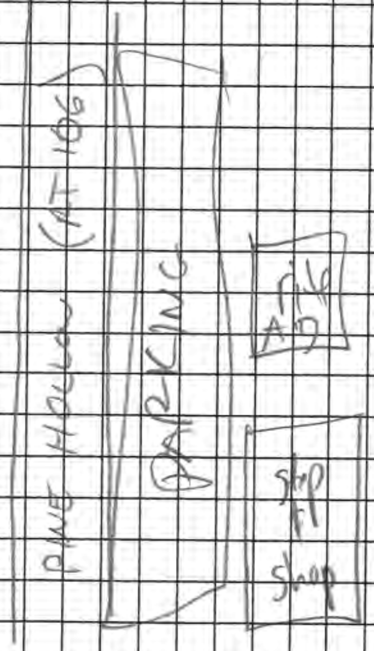
3. Catch basin inspection – Record SSD Unique Site ID here: WCR-SSD10 Condition: ☐ Dirty ☒ Clean

. INITIAL HOTSPOT STATUS - INDEX RESULTS

☐ Not a hotspot (fewer than 5 circles and no boxes checked) ☐ Potential hotspot (5 to 10 circles but no boxes checked)
☒ Confirmed hotspot (10 to 15 circles and/or 1 box checked) ☐ Severe hotspot (>15 circles and/or 2 or more boxes checked)

Follow-up Action:
- ☐ Refer for immediate enforcement
- ☒ Suggest follow-up on-site inspection
- ☐ Test for illicit discharge
- ☒ Include in future education effort
- ☐ Check to see if hotspot is an NPDES non-filer
- ☒ Onsite non-residential retrofit
- ☐ Pervious area restoration; complete PAA sheet and record Unique Site ID here: ____________
- ☐ Schedule a review of storm water pollution prevention plan

Notes:



Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Bailey Arb.	**UNIQUE SITE ID:** BAI - NSA - 01	
DATE: 06/26/09	**ASSESSED BY:** DRB/KMB	**CAMERA ID:** Canon	**PIC#:** 151-153

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Matinecock Lane Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed: Matinecock Lane, Park Ave, Egypt Ln

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached <¼ [✓ ¼ ½] 1 >1 acre ☐ Mobile Home Park

				INDEX*
Estimated Age of Neighborhood: 50-60 years	Percent of Homes with Garages: 50 % With Basements 100 %			
Sewer Service? ☐ Y ☒ N ?				○
Index of Infill, Redevelopment, and Remodeling ☒ No Evidence ☐ <5% of units ☐ 5-10% ☐ >10%				○
Record percent observed for each of the following indicators, depending on applicability and/or site complexity		**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS				
B1. % of lot with impervious cover		30		
B2. % of lot with grass cover		35		●
B3. % of lot with landscaping (e.g., mulched bed areas)		35		◇
B4. % of lot with bare soil		0		○
**Note: B1 through B4 must total 100%*				
B5. % of lot with forest canopy		50		◇
B6. Evidence of permanent irrigation or "non-target" irrigation		50		●
B7. Proportion of *total neighborhood* turf lawns with following management status:		High: 80		○
		Med: 20		
		Low: 0		
B8. Outdoor swimming pools? ☐ Y ☐ N ☒ Can't Tell Estimated # ____				○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell				○
C. DRIVEWAYS, SIDEWALKS, AND CURBS				
C1. % of driveways that are impervious ☐ N/A 75%				
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up				○
C3. Are sidewalks present? ☐ Y ☒ N If yes, are they on one side of street ☐ or along both sides ☐				
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation				○
What is the distance between the sidewalk and street? ____ ft.				◇
Is pet waste present in this area? ☐ Y ☐ N ☐ N/A				○
C4. Is curb and gutter present? ☐ Y ☒ N If yes, check all that apply:				
☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment				○
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy				◇

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

BA1-NSA-01

Neighborhood Source Assessment **NSA**

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	10 %		◇ ○
D2. Downspouts are directed to impervious surface	50		
D3. Downspouts discharge to pervious area	50		
D4. Downspouts discharge to a cistern, rain barrel, etc.	0		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N	80		◇

E. COMMON AREAS

E1. Storm drain inlets? ☐ Y ☒ N If yes, are they stenciled? ☐ Y ☐ N Condition: ☐ Clean ☐ Dirty ◇

Catch basins inspected? ☐ Y ☐ N If yes, include Unique Site ID from SSD sheet: ________ ○

E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N
What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre ◇

E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☒ N dumping? ☐ Y ☐ N ○

Buffers/floodplain present: ☐ Y ☒ N If yes, is encroachment evident? ☐ Y ☐ N

F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)*
☒ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ________ ○

Recommended Actions

Specific Action

- ☒ Onsite retrofit potential?
- ☒ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:

Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☒ Low (Fewer than 3 diamonds checked)

NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Cold Spring Harbor	**UNIQUE SITE ID:** CSH-NSA-01	
DATE: 8/25/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 55-69

A. NEIGHBORHOOD CHARACTERIZATION START 40 51 47.6 73 27 43.9

Neighborhood/Subdivision Name: Harbor Road - West of CSHSP Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:

____

Homeowners Association? ☐ Y ☒ N ☒ Unknown If yes, name and contact information: ______________________

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached [✓ <¼] ¼ [✓ ½] 1 >1 acre ☐ Mobile Home Park

Estimated Age of Neighborhood: 80-100 years		Percent of Homes with Garages: ____% With Basements ____%	**INDEX***
Sewer Service? ☒ Y ☐ N (check this)			●
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☐ <5% of units ☐ 5-10% ☒ >10%			○
Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	40	Huge	
B2. % of lot with grass cover	40		○
B3. % of lot with landscaping (e.g., mulched bed areas)	10		◇
B4. % of lot with bare soil	0		○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	10		◇
B6. Evidence of permanent irrigation or "non-target" irrigation	80	water flow down driveways	●
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 100	clean & cared for	○
	Med: ____		
	Low: ____		
B8. Outdoor swimming pools? ☐Y ☐N ☒ Can't Tell Estimated # ____			○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	100		
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ■ Y ☒ N If yes, are they on one side of street ☐ or along both sides ☐			
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			○
What is the distance between the sidewalk and street? _____ ft.			◇
Is pet waste present in this area? ☐ Y ☐ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply: upper portion			
☒ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment			○
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◇

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

CSH-NSA-01

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer 0%			◇ ○
D2. Downspouts are directed to impervious surface	10%		
D3. Downspouts discharge to pervious area 90%		except #149 to driveway	
D4. Downspouts discharge to a cistern, rain barrel, etc.			
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N		private property	◆

E. COMMON AREAS

E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☐ Y ☒ N Condition: ☐ Clean ☐ Dirty ◇

Catch basins inspected? ☐ Y ☐ N If yes, include Unique Site ID from SSD sheet: ________ ○

E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N
What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre ◇

E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N ○

Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N

F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: (*check all that apply*)
☒ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ________ ●

Recommended Actions

Specific Action

- ☐ Onsite retrofit potential?
- ☐ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:

rain barrels for irrigation
likely use fertilizers on lawns

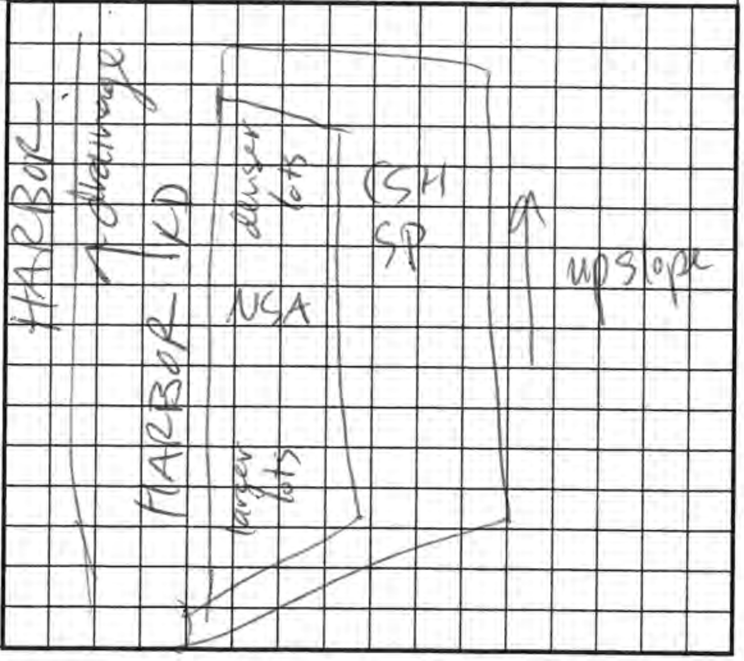
Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☒ Low (Fewer than 3 diamonds checked)



NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay | **SUBWATERSHED:** Centre Island | **UNIQUE SITE ID:** CTR-NSA-01

DATE: 8/24/09 | **ASSESSED BY:** KMB | **CAMERA ID:** | **PIC#:** 160

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Centre Island Rd Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed: only center Island Rd.

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):* ≥20 acres

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached <¼ ¼ ½ 1 [✓ >1] acre ☐ Mobile Home Park

Estimated Age of Neighborhood: >100 years | Percent of Homes with Garages: 100% With Basements 100% | **INDEX***

Sewer Service? ☐ Y ☒ N			●
Index of Infill, Redevelopment, and Remodeling ☒ No Evidence ☐ <5% of units ☐ 5-10% ☐ >10%			○
Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	20	driveway & house	
B2. % of lot with grass cover	60		○
B3. % of lot with landscaping (e.g., mulched bed areas)	20		◇
B4. % of lot with bare soil	0		○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	30		◇
B6. Evidence of permanent irrigation or "non-target" irrigation	100		○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 100		○
	Med: 0		
	Low: 0		
B8. Outdoor swimming pools? ☒ Y ☐ N ☐ Can't Tell Estimated # ____		likely	○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	100	long driveways	
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ☐ Y ☒ N If yes, are they on one side of street ☐ or along both sides ☐			
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			○
What is the distance between the sidewalk and street? _____ ft.			◇
Is pet waste present in this area? ☐ Y ☐ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:			
☒ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment			○
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☒ Overhead tree canopy			◆

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

CTR-NSA-01

Neighborhood Source Assessment **NSA**

D. ROOFTOPS Not assessed – no access			
D1. Downspouts are directly connected to storm drains or sanitary sewer			◇ ○
D2. Downspouts are directed to impervious surface			
D3. Downspouts discharge to pervious area			
D4. Downspouts discharge to a cistern, rain barrel, etc.			
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☐ Y ☐ N			◇

E. COMMON AREAS No access

E1. Storm drain inlets? ☐ Y ☐ N If yes, are they stenciled? ☐ Y ☐ N Condition: ☐ Clean ☐ Dirty	◇
Catch basins inspected? ☐ Y ☐ N If yes, include Unique Site ID from SSD sheet: ______	○
E2. Storm water pond? ☐ Y ☐ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre	◇
E3. Open Space? ☐ Y ☐ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N	○
Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N	

F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)* ○

☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ______

Recommended Actions

Specific Action

- ☐ Onsite retrofit potential?
- ☐ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ______

Describe Recommended Actions:

no recommendations

Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☒ Low (Fewer than 3 diamonds checked)

NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Mill Neck Creek	**UNIQUE SITE ID:** MNC-NSA-01	
DATE: 6/25/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 142

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Bayview Avenue Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:
Bayview / Mountain / Ellison

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached <¼ [✓ ¼] ½ 1 >1 acre ☐ Mobile Home Park

		INDEX*
Estimated Age of Neighborhood: 50 years	Percent of Homes with Garages: 20 % With Basements ____%	
Sewer Service? ☐ Y ☐ N		○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☒ <5% of units ☐ 5-10% ☐ >10%		○

Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	60		
B2. % of lot with grass cover	20	Some not cared for	○
B3. % of lot with landscaping (e.g., mulched bed areas)	10		◇
B4. % of lot with bare soil	10		○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	<5		◇
B6. Evidence of permanent irrigation or "non-target" irrigation			○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 80		●
	Med: 10		
	Low: 10	few really overgrown	
B8. Outdoor swimming pools? ☐ Y ☒ N ☐ Can't Tell Estimated # ____			○
B9. Junk or trash in yards? ☒ Y ☐ N ☐ Can't Tell			●
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	90	Some gravel	
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☒ Breaking up			○
C3. Are sidewalks present? ☐ Y ☒ N If yes, are they on one side of street ☐ or along both sides ☐			
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			○
What is the distance between the sidewalk and street? _____ ft.			◇
Is pet waste present in this area? ☐ Y ☒ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply: Only on Mountain			
☒ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☒ Sediment			●
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◇

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

MNC-NSA-01

Neighborhood Source Assessment **NSA**

D. ROOFTOPS

D1. Downspouts are directly connected to storm drains or sanitary sewer	0		◇ ○
D2. Downspouts are directed to impervious surface	80	mm to driveway sidewalk	
D3. Downspouts discharge to pervious area	20	mulched areas	
D4. Downspouts discharge to a cistern, rain barrel, etc.	0		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N			◆

E. COMMON AREAS

E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☒ Y ☐ N Condition: ☒ Clean ☐ Dirty ◇

Catch basins inspected? ☒ Y ☐ N If yes, include Unique Site ID from SSD sheet: MNK-SSD-01 ○

E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N
What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre ◆

E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N ○

Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N

F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: (*check all that apply*)
☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ________ ○

Recommended Actions

Specific Action

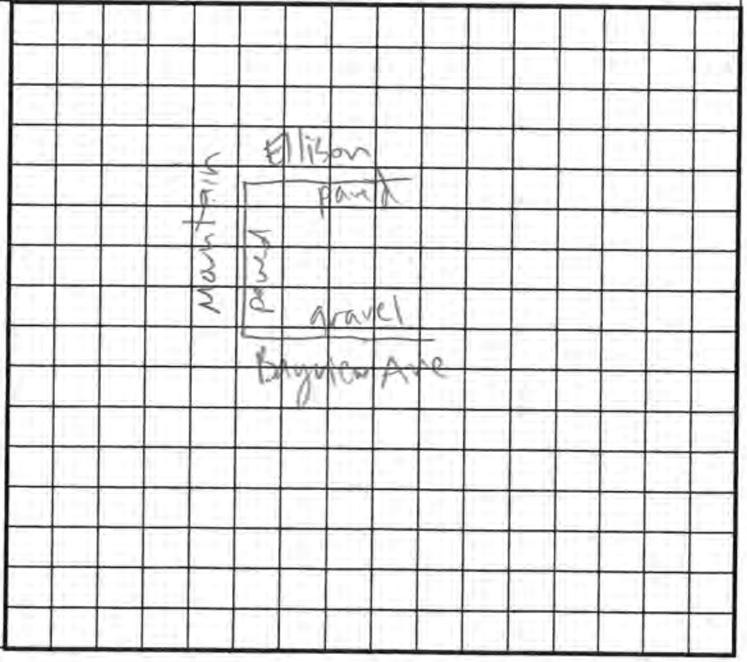
- ☐ Onsite retrofit potential?
- ☒ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:
Bayview Ave not paved, only gravel very broken up - but narrow
Landscaping on some lawns close to shore had lots of debris and long grass. Sediment in road

Initial Assessment

NSA Pollution Severity Index
- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index
- ☒ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☐ Low (Fewer than 3 diamonds checked)



NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Mill Neck Creek	**UNIQUE SITE ID:** MNC-NSA-02	
DATE: 8/26/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 154-159

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Hernan Ave   Neighborhood Area (acres) ____

If unknown, address (or streets) surveyed:
Hernan Ave   Outfall @ end to OAK Neck Creek (Arm of MNK)

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ____

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached [✓ <¼] ¼ ½ 1 >1 acre ☐ Mobile Home Park

	INDEX*
Estimated Age of Neighborhood: 50 years | Percent of Homes with Garages: ____% With Basements ____%	
Sewer Service? ☐ Y ☐ N ?	○
Index of Infill, Redevelopment, and Remodeling ☒ No Evidence ☐ <5% of units ☐ 5-10% ☐ >10%	○

Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	60		
B2. % of lot with grass cover	10		○
B3. % of lot with landscaping (e.g., mulched bed areas)	30		◇
B4. % of lot with bare soil	0		○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	<5		◇
B6. Evidence of permanent irrigation or "non-target" irrigation			○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 100		○
	Med: 0		
	Low: 0		
B8. Outdoor swimming pools? ☐Y ☐N ☒ Can't Tell Estimated # ____		probably-fence	○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	100		

C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up	○
C3. Are sidewalks present? ☐ Y ☒ N If yes, are they on one side of street ☐ or along both sides ☐	
☐ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation	○
What is the distance between the sidewalk and street? ____ ft.	◇
Is pet waste present in this area? ☐ Y ☐ N ☐ N/A	○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply: end of Hernan	
☒ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☐ Sediment	○
☐ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☒ Overhead tree canopy	◆

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

MNC-NSA-02

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	—		◇ ○
D2. Downspouts are directed to impervious surface	20		
D3. Downspouts discharge to pervious area	80	below grad dry wells?	
D4. Downspouts discharge to a cistern, rain barrel, etc.	0		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☐ Y ☒ N		Small yards	◇

E. COMMON AREAS	
E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☐ Y ☒ N Condition: ☐ Clean ☒ Dirty	◆
Catch basins inspected? ☒ Y ☐ N If yes, include Unique Site ID from SSD sheet: MNK-SSD-02	●
E2. Storm water pond? ☒ Y ☐ N Is it a ☒ wet pond or ☐ dry pond? Is it overgrown? ☒ Y ☐ N What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☒ > 1 acre wetland	◆
E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☒ N dumping? ☒ Y ☐ N small trash	○
Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N	
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS	
Based on field observations, this neighborhood has significant indicators for the following: (*check all that apply)* ☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ______	○

Recommended Actions

Specific Action

☐ Onsite retrofit potential?
☐ Better lawn/landscaping practice?
☐ Better management of common space?
☒ Pond retrofit? wetland area
☐ Multi-family Parking Lot Retrofit?
☐ Other action(s) ______

Describe Recommended Actions:

follow up on drainage system for neighborhood to Oak Neck end of Herman and wetland area beyond 1st house on Bayview Place

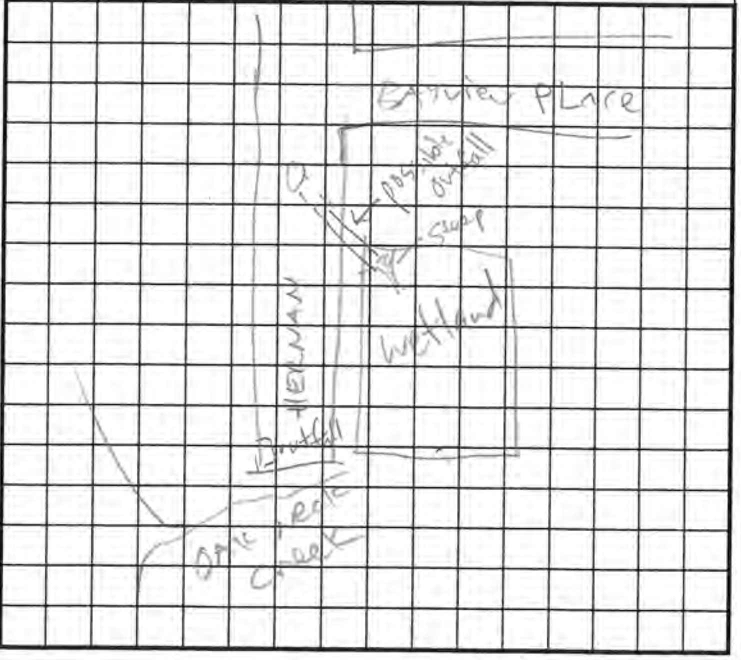
Initial Assessment

NSA Pollution Severity Index

☐ Severe (More than 10 circles checked)
☐ High (5 to 10 circles checked)
☒ Moderate (Fewer than 5 circles checked)
☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

☐ High (More than 5 diamonds checked)
☒ Moderate (3-5 diamonds checked)
☐ Low (Fewer than 3 diamonds checked)



NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Mill River	**UNIQUE SITE ID:** MRV-NSA-01	
DATE: 8/27/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 229-233

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Oyster Bay Gardens – OB Housing Auth. Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:

50 glen Cove ROAD

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☒ Multifamily (Apts, Townhomes, Condos)

☐ Single Family Detached <¼ ¼ ½ 1 >1 acre ☐ Mobile Home Park

	INDEX*
Estimated Age of Neighborhood: 40 years Percent of Homes with Garages: 0 % With Basements N/A %	
Sewer Service? ☐ Y ☐ N Check	○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☐ <5% of units ☐ 5-10% ☐ >10%	○

Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	40		
B2. % of lot with grass cover	40		○
B3. % of lot with landscaping (e.g., mulched bed areas)	20		◇
B4. % of lot with bare soil			○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	10		◇
B6. Evidence of permanent irrigation or "non-target" irrigation			○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: ___		○
	Med: ___		
	Low: ___		
B8. Outdoor swimming pools? ☐Y ☐N ☐ Can't Tell Estimated # ___			○
B9. Junk or trash in yards? ☐ Y ☐ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☒ N/A		parking lots	
C2. Driveway Condition ☐ Clean ☐ Stained ☒ Dirty ☐ Breaking up			●
C3. Are sidewalks present? ☒ Y ☐ N If yes, are they on one side of street ☒ or along both sides ☐			
☒ Spotless ☐ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			○
What is the distance between the sidewalk and street? 2.5 ft.			◇
Is pet waste present in this area? ☐ Y ☒ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:			
☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☒ Sediment 3 inches			●
☒ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◇

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	0		◇ ○
D2. Downspouts are directed to impervious surface	50		
D3. Downspouts discharge to pervious area	50	Mulched bed	
D4. Downspouts discharge to a cistern, rain barrel, etc.	0		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☐ Y ☒ N			◇
E. COMMON AREAS			
E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☐ Y ☐ N Condition: ☐ Clean ☐ Dirty			◇
Catch basins inspected? ☐ Y ☐ N If yes, include Unique Site ID from SSD sheet: ________			○
E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre			◇
E3. Open Space? ☒ Y ☐ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N ?			○
Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N			
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS			
Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)* ☐ Nutrients ☒ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☒ Sediment ☐ Other ________			●

Recommended Actions

Specific Action

- ☐ Onsite retrofit potential?
- ☐ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☒ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:

make parking areas pervious
lots of oil stains on parking spots

Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☒ Low (Fewer than 3 diamonds checked)

NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** OB Harbor	**UNIQUE SITE ID:** OBH-NSA-01	
DATE: 8/25/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 79-93

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Ships Point Lane Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:
Ships Pt Lane, Melbourne, Sidney, Florence

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached [✓ <¼] ¼ ½ 1 >1 acre ☐ Mobile Home Park

		INDEX*
Estimated Age of Neighborhood: 80-100 years	Percent of Homes with Garages: 50 % With Basements ____%	
Sewer Service? ☐ Y ☐ N		○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☐ <5% of units ☐ 5-10% ☒ >10%		●

Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	50		
B2. % of lot with grass cover	20	fertilizers	●
B3. % of lot with landscaping (e.g., mulched bed areas)	20		◇
B4. % of lot with bare soil			○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	10	fertilizer runoff	◇
B6. Evidence of permanent irrigation or "non-target" irrigation	50	very green lawns	●
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 90	fertilizing	●
	Med: 10		
	Low: ____		
B8. Outdoor swimming pools? ☐ Y ☒ N ☐ Can't Tell Estimated # ____			○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	80	many gravel/ rock	
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ☒ Y ☐ N If yes, are they on one side of street ☒ or along both sides ☐ Mixed age & presence			
☐ Spotless ☒ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation overgrown			○
What is the distance between the sidewalk and street? 1-2 ft.			◇
Is pet waste present in this area? ☐ Y ☒ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:			
☐ Clean and Dry ☐ Flowing or standing water ☐ Long-term car parking ☒ Sediment			○
☒ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◆

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

OBH-NSA-01

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	10 - unknown		◇ ○
D2. Downspouts are directed to impervious surface	20		
D3. Downspouts discharge to pervious area	70		
D4. Downspouts discharge to a cistern, rain barrel, etc.	0	Should implement	
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N	100		◇
E. COMMON AREAS			
E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☒ Y ☐ N Condition: ☒ Clean ☐ Dirty			◇
Catch basins inspected? ☒ Y ☐ N If yes, include Unique Site ID from SSD sheet: OBH-SSD-01			○
E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre			◇
E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N			○
Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N			
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS			
Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)* ☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☐ Sediment ☐ Other ________			○

Recommended Actions

Specific Action

- ☒ Onsite retrofit potential?
- ☐ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:

green streets retrofit.
rain barrel program implementation

Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☐ Moderate (Fewer than 5 circles checked)
- ☒ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☒ Moderate (3-5 diamonds checked)
- ☐ Low (Fewer than 3 diamonds checked)

NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** OBH	**UNIQUE SITE ID:** OBH-NSA-02	
DATE: 8/26/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PIC#:** 205-210

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Maxwell Street Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:

Maxwell St, Oyster Bay

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☒ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached [✓ <¼] ¼ ½ 1 >1 acre ☐ Mobile Home Park

		INDEX*
Estimated Age of Neighborhood: _____ years	Percent of Homes with Garages: 50% With Basements ____%	
Sewer Service? ☒ Y ☐ N		○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☒ <5% of units ☐ 5-10% ☐ >10%		○

Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	80	100 on some	
B2. % of lot with grass cover	5		○
B3. % of lot with landscaping (e.g., mulched bed areas)	15		◇
B4. % of lot with bare soil	0		○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	5		◇
B6. Evidence of permanent irrigation or "non-target" irrigation	0		○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 20		○
	Med: 50		
	Low: 30		
B8. Outdoor swimming pools? ☐ Y ☒ N ☐ Can't Tell Estimated # ____			○
B9. Junk or trash in yards? ☒ Y ☐ N ☐ Can't Tell			●
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	90		
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ☒ Y ☐ N If yes, are they on one side of street ☐ or along both sides ☒			
☐ Spotless ☒ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			●
What is the distance between the sidewalk and street? _____ ft.			◇
Is pet waste present in this area? ☐ Y ☒ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:			
☐ Clean and Dry ☐ Flowing or standing water ☒ Long-term car parking ☒ Sediment			○
☒ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☐ Overhead tree canopy			◆

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

OBH-NSA-02

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	0		◇ ○
D2. Downspouts are directed to impervious surface	90		
D3. Downspouts discharge to pervious area	10		
D4. Downspouts discharge to a cistern, rain barrel, etc.	0		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N	50%		◇
E. COMMON AREAS			
E1. Storm drain inlets? ☐ Y ☒ N If yes, are they stenciled? ☐ Y ☐ N Condition: ☐ Clean ☐ Dirty			◇
Catch basins inspected? ☐ Y ☒ N If yes, include Unique Site ID from SSD sheet: ________			○
E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre			◇
E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N			○
Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N			
F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS			
Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)* ☐ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☒ Sediment ☐ Other ________			○

Recommended Actions

Specific Action

- ☒ Onsite retrofit potential?
- ☐ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ________

Describe Recommended Actions:

drainage swale between sidewalk & road

Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ☒ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ☐ Moderate (3-5 diamonds checked)
- ☒ Low (Fewer than 3 diamonds checked)

NOTES:

Neighborhood Source Assessment **NSA**

WATERSHED: Oyster Bay	**SUBWATERSHED:** White's Crk	**UNIQUE SITE ID:** WCR-NSA-01	
DATE: 8/26/09	**ASSESSED BY:** DRB	**CAMERA ID:**	**PIC#:** 148

A. NEIGHBORHOOD CHARACTERIZATION

Neighborhood/Subdivision Name: Singworth Street Neighborhood Area (acres) ______

If unknown, address (or streets) surveyed:
Singworth Street / Summer Street

Homeowners Association? ☐ Y ☒ N ☐ Unknown If yes, name and contact information: ______

Residential *(circle average single family lot size):*

☐ Single Family Attached (Duplexes, Row Homes) <⅛ ⅛ ¼ ⅓ ⅓ acre ☐ Multifamily (Apts, Townhomes, Condos)

☒ Single Family Detached [✓ <¼] ¼ ½ 1 >1 acre ☐ Mobile Home Park

Estimated Age of Neighborhood: 50-60 years	Percent of Homes with Garages: 20 % With Basements 100 %		**INDEX***
Sewer Service? ☒ Y ☐ N			○
Index of Infill, Redevelopment, and Remodeling ☐ No Evidence ☐ <5% of units ☒ 5-10% ☐ >10%			●
Record percent observed for each of the following indicators, depending on applicability and/or site complexity	**Percentage**	**Comments/Notes**	
B. YARD AND LAWN CONDITIONS			
B1. % of lot with impervious cover	50		
B2. % of lot with grass cover	25		○
B3. % of lot with landscaping (e.g., mulched bed areas)	25		◇
B4. % of lot with bare soil			○
**Note: B1 through B4 must total 100%*			
B5. % of lot with forest canopy	25		◇
B6. Evidence of permanent irrigation or "non-target" irrigation	25		○
B7. Proportion of *total neighborhood* turf lawns with following management status:	High: 90		○
	Med: 10		
	Low: ____		
B8. Outdoor swimming pools? ☐ Y ☒ N ☐ Can't Tell Estimated # ____			○
B9. Junk or trash in yards? ☐ Y ☒ N ☐ Can't Tell			○
C. DRIVEWAYS, SIDEWALKS, AND CURBS			
C1. % of driveways that are impervious ☐ N/A	70		
C2. Driveway Condition ☒ Clean ☐ Stained ☐ Dirty ☐ Breaking up			○
C3. Are sidewalks present? ☒ Y ☐ N If yes, are they on one side of street ☒ or along both sides ☐			
☐ Spotless ☒ Covered with lawn clippings/leaves ☐ Receiving 'non-target' irrigation			●
What is the distance between the sidewalk and street? 3 ft.			◇
Is pet waste present in this area? ☐ Y ☒ N ☐ N/A			○
C4. Is curb and gutter present? ☒ Y ☐ N If yes, check all that apply:			
☐ Clean and Dry ☐ Flowing or standing water ☒ Long-term car parking ☒ Sediment			●
☒ Organic matter, leaves, lawn clippings ☐ Trash, litter, or debris ☒ Overhead tree canopy			◆

* INDEX: ○ denotes potential pollution source; ◇ denotes a neighborhood restoration opportunity

WCR-NSA-01

Neighborhood Source Assessment **NSA**

D. ROOFTOPS			
D1. Downspouts are directly connected to storm drains or sanitary sewer	N		◇ ○
D2. Downspouts are directed to impervious surface	Y	typical	
D3. Downspouts discharge to pervious area	Y	in some cases	
D4. Downspouts discharge to a cistern, rain barrel, etc.	N		
**Note: C1 through C4 should total 100%*			
D5. Lawn area present downgradient of leader for rain garden? ☒ Y ☐ N	Some cases		◆

E. COMMON AREAS

E1. Storm drain inlets? ☒ Y ☐ N If yes, are they stenciled? ☒ Y ☒ N Condition: ☐ Clean ☐ Dirty ◆

Catch basins inspected? ☐ Y ☒ N If yes, include Unique Site ID from SSD sheet: ______ ○

E2. Storm water pond? ☐ Y ☒ N Is it a ☐ wet pond or ☐ dry pond? Is it overgrown? ☐ Y ☐ N
What is the estimated pond area? ☐ <1 acre ☐ about 1 acre ☐ > 1 acre ◆

E3. Open Space? ☐ Y ☒ N If yes, is pet waste present? ☐ Y ☐ N dumping? ☐ Y ☐ N ○

Buffers/floodplain present: ☐ Y ☐ N If yes, is encroachment evident? ☐ Y ☐ N

F. INITIAL NEIGHBORHOOD ASSESSMENT AND RECOMMENDATIONS

Based on field observations, this neighborhood has significant indicators for the following: *(check all that apply)*
☒ Nutrients ☐ Oil and Grease ☐ Trash/Litter ☐ Bacteria ☒ Sediment ☐ Other ______ ○

Recommended Actions

Specific Action

- ☒ Onsite retrofit potential?
- ☒ Better lawn/landscaping practice?
- ☐ Better management of common space?
- ☐ Pond retrofit?
- ☐ Multi-family Parking Lot Retrofit?
- ☐ Other action(s) ______

Describe Recommended Actions:

Lot-level LID
RAIN BARREL DISTRIBUTION

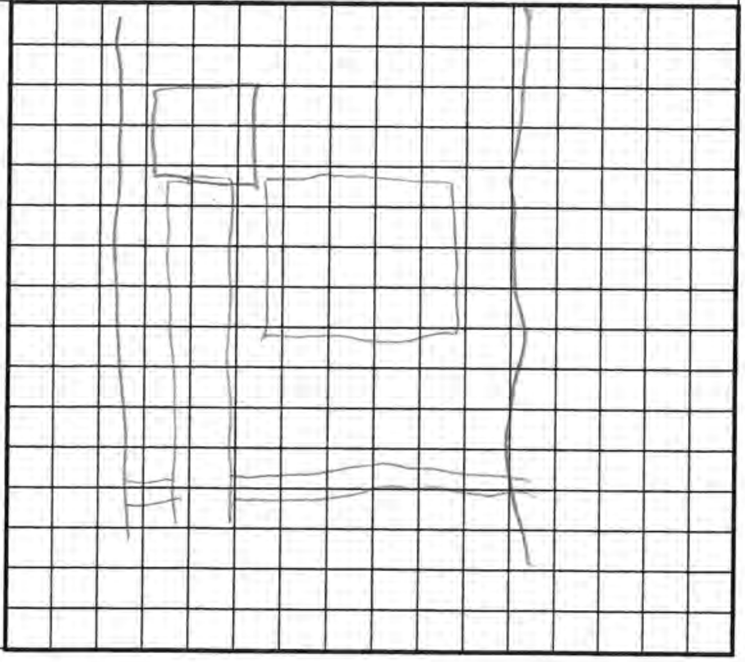
Initial Assessment

NSA Pollution Severity Index

- ☐ Severe (More than 10 circles checked)
- ☐ High (5 to 10 circles checked)
- ■ Moderate (Fewer than 5 circles checked)
- ☐ None (No circles checked)

Neighborhood Restoration Opportunity Index

- ☐ High (More than 5 diamonds checked)
- ■ Moderate (3-5 diamonds checked)
- ☐ Low (Fewer than 3 diamonds checked)



NOTES:

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: BAI		**SUBWATERSHED:**	**UNIQUE SITE ID:** BAI-TCCT-01
DATE: 8/26/09	**ASSESSED BY:** TKB	**CAMERA ID:** Canon	**PICTURES:** 187-192
GPS ID:	**LMK ID:**	**LAT:** 40°53'4.60"N	**LONG:** 73°35'9.56"W

SITE DESCRIPTION

Name: Locust Valley Intermediate School
Address: 119 Ryefield Rd, Locust Valley

Ownership: ☒ Public ☐ Private ☒ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Corresponding USSR/USA Field Sheet? ☒ Yes ☐ No If yes, Unique Site ID BAI-HSI-01

Proposed Retrofit Location:

Storage
☐ Existing Pond
☐ Below Outfall
☐ In Road ROW
☐ Other:
☐ Above Roadway Culvert
☐ In Conveyance System
☒ Near Large Parking Lot

On-Site
☐ Hotspot Operation
☐ Small Parking Lot
☐ Individual Street
☐ Underground
☒ Individual Rooftop
☒ Small Impervious Area
☒ Landscape / Hardscape
☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes:

Drainage Area Land Use:
☐ Residential
  ☐ SFH (< 1 ac lots)
  ☐ SFH (> 1 ac lots)
  ☐ Townhouses
  ☐ Multi-Family
☐ Commercial
☐ Institutional
☐ Industrial
☐ Transport-Related
☐ Park
☐ Undeveloped
☐ Other:

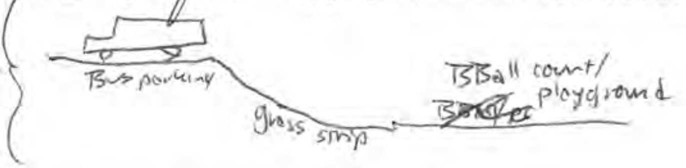
EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

- School Drainage via enclosed catch basin
- Bus parking via overland flow to North ?? onto grassed area upstream of playground

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

10-15 feet available across site.



Existing Head Available and Points Where Measured:

BAI-RRI-01

Retrofit Reconnaissance Investigation **RRI**

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☑ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☒ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:
Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No
If Yes, Describe: Safety of children

Access:
☒ No Constraints
Constrained due to
☐ Slope ☐ Space
☒ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☒	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☒ Probable	☐ Not Probable

How many? 2+
Approx. DBH 18-24"

Other factors: adjacent playground

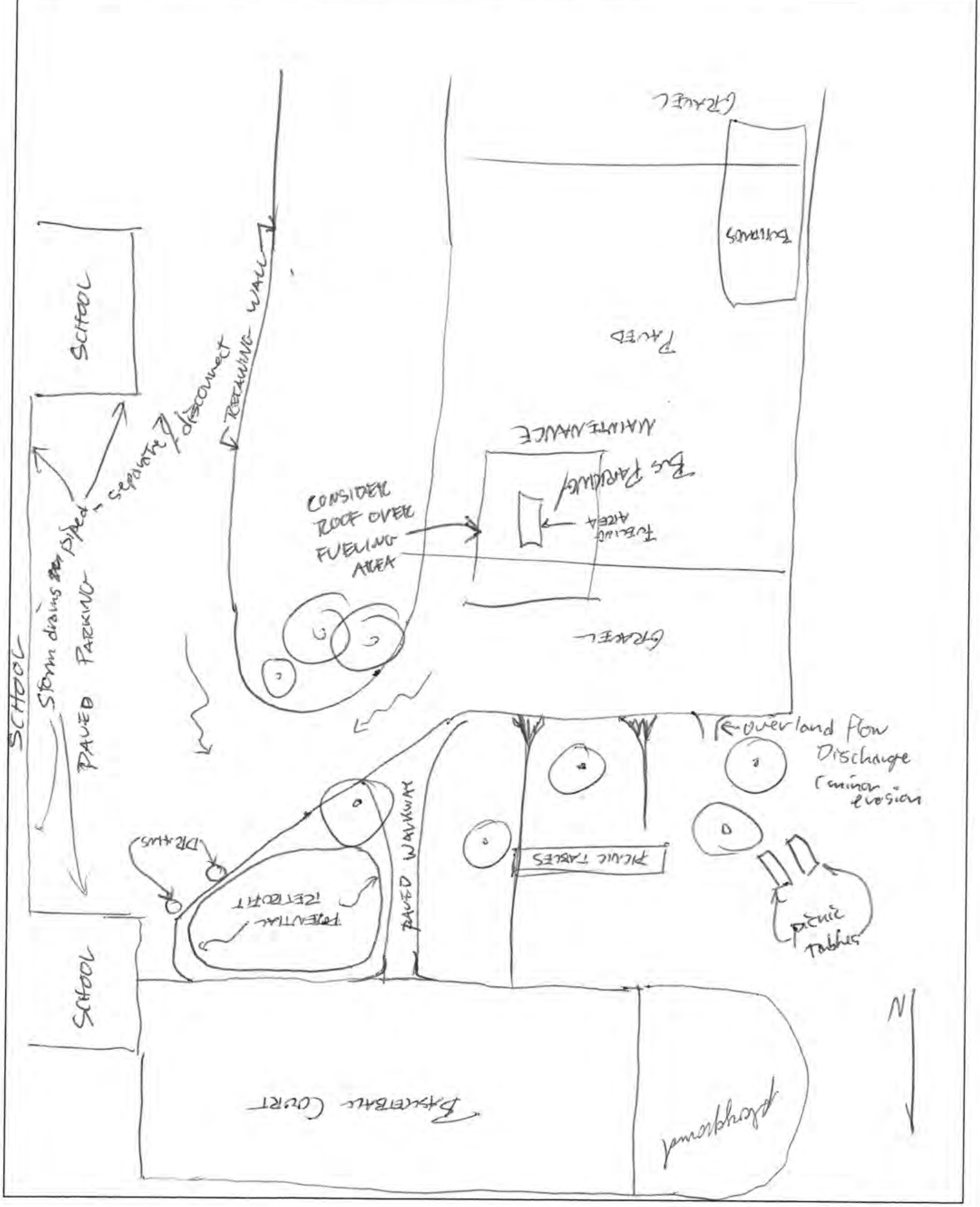
Soils:

Soil auger test holes:	☐ Yes	☐ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No
Evidence of shallow bedrock:	☐ Yes	☐ No
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No

Unique Site ID: RRI-01

BA1-RRI-01

SKETCH



BAI-RRI-01

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types

☐ Other: ALL ABOVE

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE

IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF YES, TYPE(S):

Unique Site ID: RRI-01

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: BAI-TRT-02 | **SUBWATERSHED:** BAILEY'S | **UNIQUE SITE ID:** BAI-TRT-02

DATE: 8/26/09 | **ASSESSED BY:** DB/KB | **CAMERA ID:** Canon | **PICTURES:** 92-95

GPS ID: | **LMK ID:** | **LAT:** 40°52'56.6"N | **LONG:** 73°35'14.5"W

SITE DESCRIPTION

Name: Ann MacArthur Primary School
Address: 100 Ryefield Road, Locust Valley

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☒ Local ☐ State ☐ DOT ☐ Other:______

Corresponding USSR/USA Field Sheet? ☐ Yes ☒ No If yes, Unique Site ID:______

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☑ Other: Near roofs
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☒ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☑ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☑ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:______

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ ______
Imperviousness ≈ ______ %
Impervious Area ≈ ______

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:______

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

One story, sprawling elementary school, w/ some roof leaders to ground surface, but ~~most~~ most ~~must~~ may be internal to building. Parking (small lots) and access roads surround building.

Existing Head Available and Points Where Measured: Internal roof leaders (majority) likely poor candidate, since likely to pass below building slab. Some head available for external downspouts and parking lot controls.

BA1-RRI-02

PROPOSED RETROFIT

Purpose of Retrofit:
☐ Water Quality ☑ Recharge ☐ Channel Protection ☐ Flood Control
☑ Demonstration / Education ☐ Repair ☐ Other:__________

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☑ Extended Detention ☐ Wet Pond ☐ Created Wetland ☑ Bioretention
☐ Filtering Practice ☑ Infiltration ☐ Swale ☐ Other:__________

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☒ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:__________
Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No
If Yes, Describe: Child safety

Access:
☑ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:__________

Conflicts with Existing Utilities:
☐ None
☑ Unknown

Yes	**Possible**	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:__________

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☑ Not Probable
Impacts to Wetlands	☐ Probable	☑ Not Probable
Impacts to a Stream	☐ Probable	☑ Not Probable
Floodplain Fill	☐ Probable	☑ Not Probable
Impacts to Forests	☐ Probable	☑ Not Probable
Impacts to Specimen Trees	☑ Probable	☐ Not Probable

How many? Depends
Approx. DBH__________

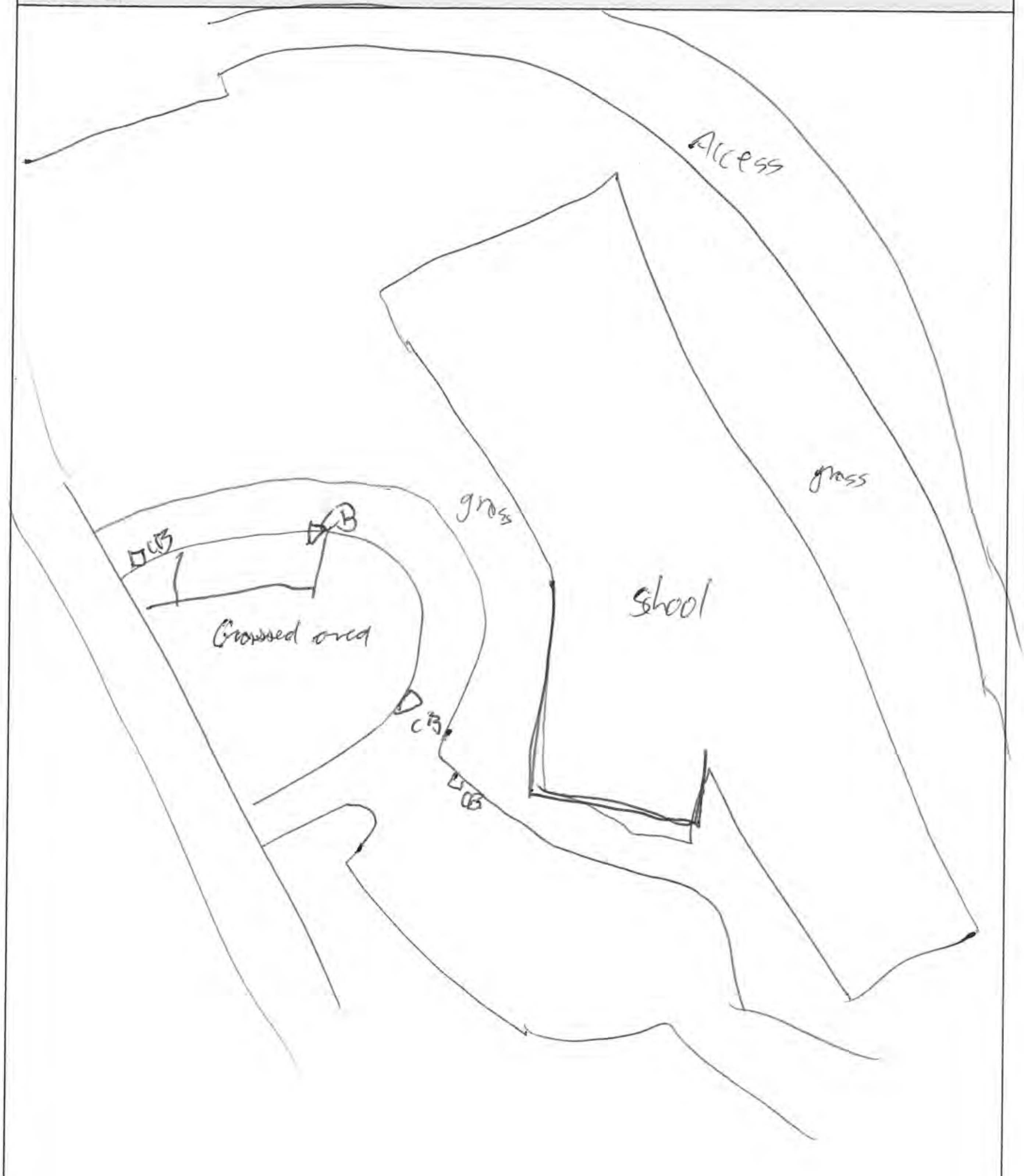
Other factors:__________

Soils:
Soil auger test holes: ☐ Yes ☐ No
Evidence of poor infiltration (clays, fines): ☐ Yes ☐ No
Evidence of shallow bedrock: ☐ Yes ☐ No
Evidence of high water table (gleying, saturation): ☐ Yes ☐ No

Unique Site ID:______

BAI-RRI-02

SKETCH



Unique Site ID:______

BAI-RRI-02

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership
☐ Confirm drainage area
☐ Confirm drainage area impervious cover
☐ Confirm volume computations
☐ Complete concept sketch

☐ Other: ALL OF ABOVE

☐ Obtain existing stormwater practice as-builts
☐ Obtain site as-builts
☐ Obtain detailed topography
☐ Obtain utility mapping
☐ Confirm storm drain invert elevations
☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF YES, TYPE(S):

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Cold Spring Bk		**SUBWATERSHED:**	**UNIQUE SITE ID:** CSB-RRI-01
DATE: 8/27/09	**ASSESSED BY:** DRB	**CAMERA ID:** Canon	**PICTURES:** 211-218
GPS ID:	**LMK ID:**	**LAT:** 40°50'8.0"N	**LONG:** 73°27'8.8"W

SITE DESCRIPTION

Name: Cold Spring Harbor Commuter Rail Station (MTA Station)
Address: 370 W Pulaski Rd

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: MTA

Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID:

Proposed Retrofit Location:

Storage

☐ Existing Pond
☐ Below Outfall
☐ In Road ROW
☐ Other:
☐ Above Roadway Culvert
☐ In Conveyance System
☒ Near Large Parking Lot

On-Site

☐ Hotspot Operation
☐ Small Parking Lot
☐ Individual Street
☐ Underground
☐ Individual Rooftop
☐ Small Impervious Area
☒ Landscape / Hardscape
☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes:

Drainage Area Land Use:

☐ Residential
  ☐ SFH (< 1 ac lots)
  ☐ SFH (> 1 ac lots)
  ☐ Townhouses
  ☐ Multi-Family
☐ Commercial
☐ Institutional
☐ Industrial
☐ Transport-Related
☐ Park
☐ Undeveloped
☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Large paved area with traffic islands throughout. Each catch basin recieves drainage from a relatively large area of parking lot. Along one side of the facility, a long run of several sequential catch basins is present adjacent to a grassed strip of approx 8 ft width between parking area and fence. Site is near stream headwaters

Existing Head Available and Points Where Measured:

Each basins at lower end of system are fairly deep. Practices would need to be either underground or intercept runoff prior to discharge to drainage system.

CSB-RRI-01

Retrofit Reconnaissance Investigation **RRI**

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☒ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:__________

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☒ Infiltration ☒ Swale ☐ Other:__________

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☒ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:__________
Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No
If Yes, Describe: Fence & private property along one side of site

Access:
☒ No Constraints
Constrained due to
☐ Slope ☒ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:__________

Conflicts with Existing Utilities:
☐ None
☒ Unknown

Yes	**Possible**	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☒	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:__________

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☒ Probable	☐ Not Probable

How many? varies - up to 10
Approx. DBH 18" typ

Other factors:__________

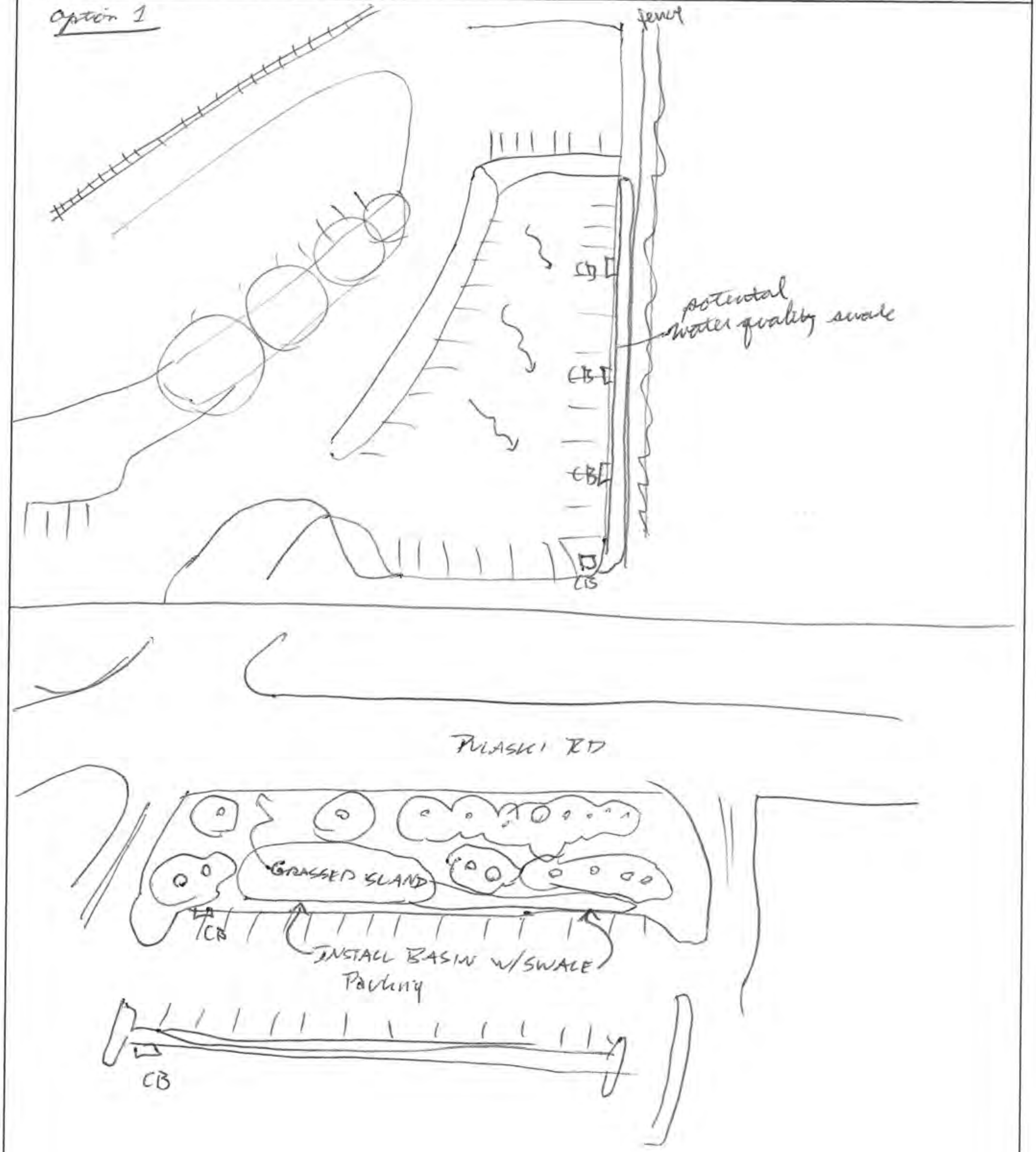
Soils:

Soil auger test holes:	☐ Yes	☐ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No
Evidence of shallow bedrock:	☐ Yes	☐ No
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No

Unique Site ID:______

CSB-RRI-01

SKETCH



CSB-RRI-01

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☐ Confirm property ownership
- ☐ Confirm drainage area
- ☐ Confirm drainage area impervious cover
- ☐ Confirm volume computations
- ☐ Complete concept sketch
- ☐ Other:______________________

- ☐ Obtain existing stormwater practice as-builts
- ☐ Obtain site as-builts
- ☐ Obtain detailed topography
- ☐ Obtain utility mapping
- ☐ Confirm storm drain invert elevations
- ☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE

IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF YES, TYPE(S):______________________

Unique Site ID:______

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: OBH		**SUBWATERSHED:**	**UNIQUE SITE ID:** OBH-RRI-01
DATE: 8/21/09	**ASSESSED BY:** DRB	**CAMERA ID:** Canon	**PICTURES:** 219-220
GPS ID:	**LMK ID:**	**LAT:** 40°52'17.4"	**LONG:** 73°31'24.5"

SITE DESCRIPTION

Name: Oyster Bay High School
Address: 150 E Main Street, Oyster Bay

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☒ Local ☐ State ☐ DOT ☐ Other:

Corresponding USSR/USA Field Sheet? ☒ Yes ☐ No If yes, Unique Site ID: OBH-HSI-02

Proposed Retrofit Location:

Storage
- ☐ Existing Pond
- ☐ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☒ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Catch Basin & piped drainage, likely to roadway drainage system.

Existing Head Available and Points Where Measured:

OBH-RRI-01

PROPOSED RETROFIT

Purpose of Retrofit:
☑ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☑ Demonstration / Education ☐ Repair ☐ Other:__________

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☒ Bioretention
☐ Filtering Practice ☒ Infiltration ☐ Swale ☐ Other:__________

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☐ Commercial ☑ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☐ Other:__________
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☒ Slope ☐ Space
☐ Utilities ☑ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:__________

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	Possible	
☐	☒	Sewer
☐	☒	Water
☐	☒	Gas
☐	☒	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☒		Overhead Wires
☐	☐	Other:__________

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☐ Probable	☒ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☒ Probable	☐ Not Probable

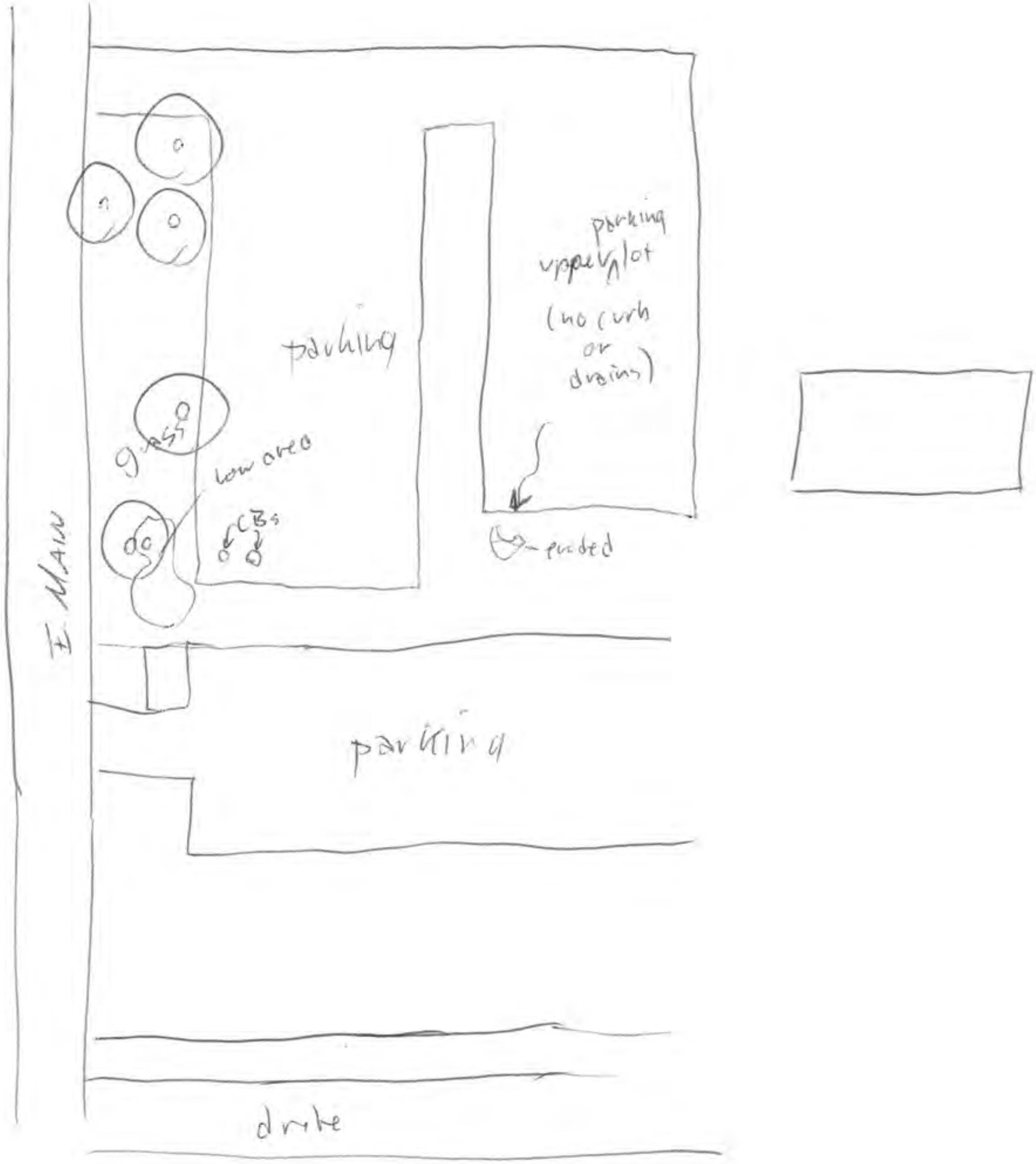
How many?__________
Approx. DBH__________

Other factors:__________

Soils:
Soil auger test holes: ☐ Yes ☐ No
Evidence of poor infiltration (clays, fines): ☐ Yes ☐ No
Evidence of shallow bedrock: ☐ Yes ☐ No
Evidence of high water table (gleying, saturation): ☐ Yes ☐ No

OBH-RRI-01

SKETCH



Unique Site ID:______

OBH-RRI-01

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership
☐ Confirm drainage area
☐ Confirm drainage area impervious cover
☐ Confirm volume computations
☐ Complete concept sketch

☐ Other: All Above

☐ Obtain existing stormwater practice as-builts
☐ Obtain site as-builts
☐ Obtain detailed topography
☐ Obtain utility mapping
☐ Confirm storm drain invert elevations
☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF YES, TYPE(S):

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: Oyster Bay	**SUBWATERSHED:** MNK	**UNIQUE SITE ID:** MNC-RRI-01

DATE: 8/26/09	**ASSESSED BY:** KMB	**CAMERA ID:**	**PICTURES:** 196-198
GPS ID:	**LMK ID:**	**LAT:** 40°54' 9.1"	**LONG:** 73°34'51.9"

SITE DESCRIPTION

Name: END of walton Avenue
Address:

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other: check possible NWR

Corresponding USSR/USA Field Sheet? ☐ Yes ☒ No If yes, Unique Site ID:

Proposed Retrofit Location:

Storage

- ☐ Existing Pond
- ☒ Below Outfall
- ☒ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site

- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☒ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈ walton Rd
Imperviousness ≈ 40 %
Impervious Area ≈

Notes:

Drainage Area Land Use:

- ☒ Residential
  - ☒ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☐ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Rooftop, lawn & driveway runoff f/ residential houses along walton Avenue conveyed in traditional catch basin & pipe system.
Discharges directly to wetland & then to OAK neck creek.

Existing Head Available and Points Where Measured: dead end @ Bayview Place

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☒ Created Wetland ☒ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:
Created wetland to treat stormwater prior to discharge to wetland area downstream of drains
Conveyance → from Walton & Bayview Place to corner and into artificial wetland – use original drainage piping

SITE CONSTRAINTS

Adjacent Land Use:
☒ Residential ☐ Commercial ☐ Institutional
☐ Industrial ☐ Transport-Related ☐ Park
☐ Undeveloped ☒ Other: Natl wildlife refuge
Possible Conflicts Due to Adjacent Land Use? ☐ Yes ☐ No
If Yes, Describe:

Access:
☐ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☒ Tree Impacts
☒ Structures ☐ Property Ownership
☐ Other: guardrail

Conflicts with Existing Utilities:
☐ None
☒ Unknown

Yes	**Possible**	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☒	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☒ Probable	☐ Not Probable
Impacts to a Stream	☒ Probable	☐ Not Probable
Floodplain Fill	☒ Probable	☐ Not Probable
Impacts to Forests	☐ Probable	☒ Not Probable
Impacts to Specimen Trees	☒ Probable	☐ Not Probable

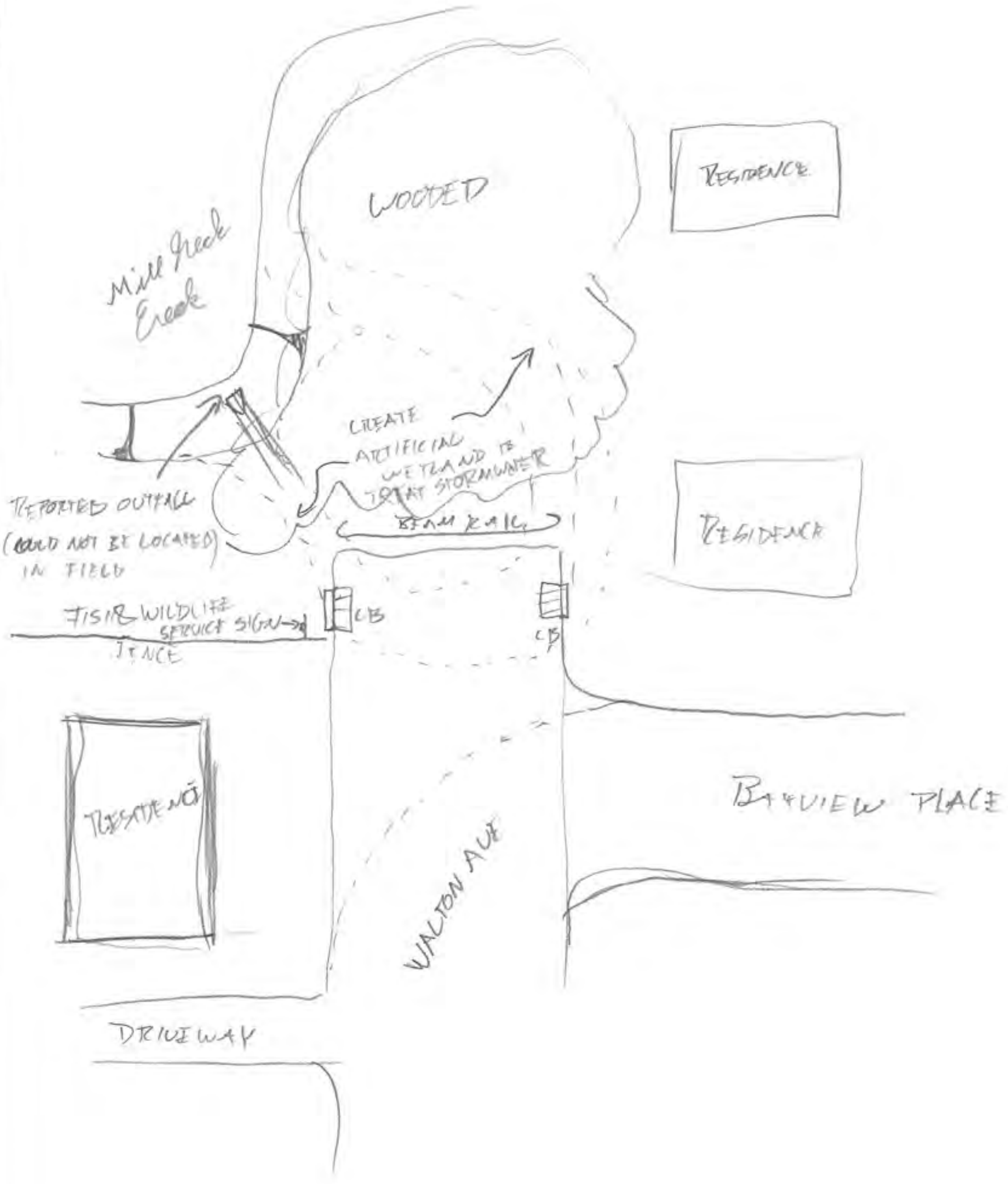
How many? 25
Approx. DBH 2 – 6 INCHES

Other factors:

Soils:

Soil auger test holes:	☐ Yes	☒ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☒ No
Evidence of shallow bedrock:	☐ Yes	☒ No
Evidence of high water table (gleying, saturation):	☒ Yes	☐ No

SKETCH


WOODED
RESIDENCE
Mill Neck Creek
CREATE ARTIFICIAL WETLAND TO TREAT STORMWATER
REPORTED OUTFALL (COULD NOT BE LOCATED) IN FIELD
BEAM RAIL
RESIDENCE
FISH & WILDLIFE SERVICE SIGN
FENCE
CB
CB
RESIDENCE
BAYVIEW PLACE
WALTON AVE
DRIVEWAY

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership
☐ Confirm drainage area
☐ Confirm drainage area impervious cover
☐ Confirm volume computations
☐ Complete concept sketch

☐ Other: ALL OF ABOVE

☐ Obtain existing stormwater practice as-builts
☐ Obtain site as-builts
☐ Obtain detailed topography
☐ Obtain utility mapping
☐ Confirm storm drain invert elevations
☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF YES, TYPE(S): ____

Unique Site ID: MNC-RRI-01

Retrofit Reconnaissance Investigation **RRI**

WATERSHED:
SUBWATERSHED:
UNIQUE SITE ID: WCR-RRI-01

DATE: 6/26/09
ASSESSED BY: KB/DB
CAMERA ID: Canon
PICTURES: 171

GPS ID:
LMK ID:
LAT: 40°51'48.8"N
LONG: 73°32'3.3"W

SITE DESCRIPTION

Name: Flow-thru (Pine Hollow Road) Recharge Basin NYSDOT #15
Address:

Ownership: ☒ Public ☐ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☒ DOT ☐ Other:

Corresponding USSR/USA Field Sheet? ☒ Yes ☐ No If yes, Unique Site ID: WCR SSD-10

Proposed Retrofit Location:

Storage
- ☒ Existing Pond
- ☒ Below Outfall
- ☐ In Road ROW
- ☐ Other:
- ☐ Above Roadway Culvert
- ☐ In Conveyance System
- ☐ Near Large Parking Lot

On-Site
- ☐ Hotspot Operation
- ☐ Small Parking Lot
- ☐ Individual Street
- ☐ Underground
- ☐ Individual Rooftop
- ☐ Small Impervious Area
- ☐ Landscape / Hardscape
- ☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Large Commercial district

Notes:

Drainage Area Land Use:
- ☐ Residential
  - ☐ SFH (< 1 ac lots)
  - ☐ SFH (> 1 ac lots)
  - ☐ Townhouses
  - ☐ Multi-Family
- ☒ Commercial
- ☐ Institutional
- ☐ Industrial
- ☐ Transport-Related
- ☐ Park
- ☐ Undeveloped
- ☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☒ Yes ☐ No ☐ Possible
If Yes, Describe:

DOT Recharge Basin w/ flow-in/ flow out

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

Storm drains in parking lots, no buffers, piped directly to basin. Basin is overgrown & contains standing water. Avail. head unknown, but likely relatively low

Existing Head Available and Points Where Measured:

Water level seems close to roadway surface elev.

PROPOSED RETROFIT

Purpose of Retrofit:
☒ Water Quality ☒ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☒ Repair ☐ Other:

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☒ Extended Detention ☒ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☒ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☒ Commercial ☐ Institutional
☐ Industrial ☒ Transport-Related ☐ Park
☒ Undeveloped ☐ Other:

Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No

If Yes, Describe: Roadway

Access:
☒ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:

Conflicts with Existing Utilities:
☐ None
☐ Unknown

Yes	**Possible**	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☒ Probable	☐ Not Probable
Impacts to a Stream	☐ Probable	☒ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☒ Probable	☐ Not Probable
Impacts to Specimen Trees	☒ Probable	☐ Not Probable

How many? 10
Approx. DBH 18

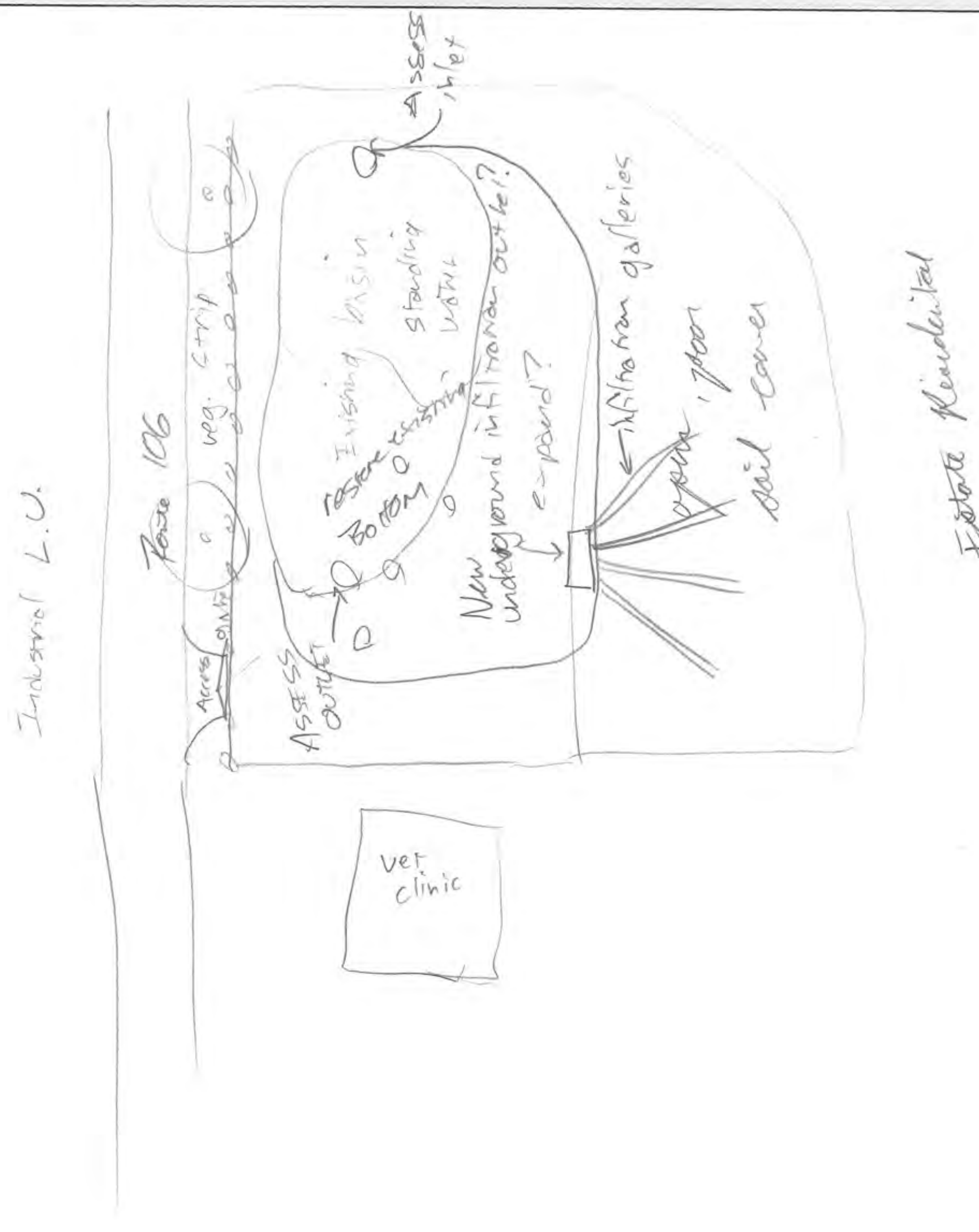
Other factors:

Soils:

Soil auger test holes:	☐ Yes	☐ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No
Evidence of shallow bedrock:	☐ Yes	☐ No
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No

Unique Site ID: WCR-RRI-01

SKETCH


Industrial L.U.
Route 106
Access
gate
veg. strip
ASSESS OUTLET
Existing basin
restore existing BOTTOM
standing water
Assess inlet
New underground infiltration outlet?
expand?
infiltration galleries
open, poor soil cover
vet clinic
Estate Residential

DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

- ☒ Confirm property ownership
- ☒ Confirm drainage area
- ☒ Confirm drainage area impervious cover
- ☒ Confirm volume computations
- ☒ Complete concept sketch
- ☐ Other:
- ☒ Obtain existing stormwater practice as-builts
- ☒ Obtain site as-builts
- ☒ Obtain detailed topography
- ☒ Obtain utility mapping
- ☒ Confirm storm drain invert elevations
- ☒ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

property ownership

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE

IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE

IF YES, TYPE(S):

Retrofit Reconnaissance Investigation **RRI**

WATERSHED: WCR	**SUBWATERSHED:** WCR	**UNIQUE SITE ID:** WCR-RRI-02

DATE: 8/26/09	**ASSESSED BY:** DRB	**CAMERA ID:** Canon	**PICTURES:** 199-204
GPS ID:	**LMK ID:**	**LAT:** 40°52'26.0" N	**LONG:** 73°31' 41.1"W

SITE DESCRIPTION

Name: White's Creek Culvert
Address: South St, Oyster Bay

Ownership: ☐ Public ☒ Private ☐ Unknown
If Public, Government Jurisdiction: ☐ Local ☐ State ☐ DOT ☐ Other:

Corresponding USSR/USA Field Sheet? ☐ Yes ☐ No If yes, Unique Site ID:

Proposed Retrofit Location:

Storage
☐ Existing Pond
☐ Below Outfall
☐ In Road ROW
☒ Other: Stream restoration
☐ Above Roadway Culvert
☐ In Conveyance System
☐ Near Large Parking Lot

On-Site
☐ Hotspot Operation
☐ Small Parking Lot
☐ Individual Street
☐ Underground
☐ Individual Rooftop
☐ Small Impervious Area
☑ Landscape / Hardscape
☐ Other:

DRAINAGE AREA TO PROPOSED RETROFIT

Drainage Area ≈
Imperviousness ≈ %
Impervious Area ≈

Notes:

Drainage Area Land Use:
☐ Residential
  ☐ SFH (< 1 ac lots)
  ☐ SFH (> 1 ac lots)
  ☐ Townhouses
  ☐ Multi-Family
☐ Commercial
☐ Institutional
☐ Industrial
☐ Transport-Related
☐ Park
☐ Undeveloped
☐ Other:

EXISTING STORMWATER MANAGEMENT

Existing Stormwater Practice: ☐ Yes ☒ No ☐ Possible
If Yes, Describe:

Stormwater from street discharges directly to Creek

Describe Existing Site Conditions, Including Existing Site Drainage and Conveyance:

White Creek flows through culvert below parking lot access.
Drainage outfall immediately upstream of culvert

Existing Head Available and Points Where Measured: N/A

PROPOSED RETROFIT

Purpose of Retrofit:
☐ Water Quality ☐ Recharge ☐ Channel Protection ☐ Flood Control
☐ Demonstration / Education ☐ Repair ☒ Other: Habitat

Retrofit Volume Computations - Target Storage:

Retrofit Volume Computations - Available Storage:

Proposed Treatment Option:
☐ Extended Detention ☐ Wet Pond ☐ Created Wetland ☐ Bioretention
☐ Filtering Practice ☐ Infiltration ☐ Swale ☐ Other:

Describe Elements of Proposed Retrofit, Including Surface Area, Maximum Depth of Treatment, and Conveyance:

Daylight White Creek attempt to restore channel to historical, natural conditions. Provide some level of stormwater treatment for received stormwater

SITE CONSTRAINTS

Adjacent Land Use:
☐ Residential ☒ Commercial ☐ Institutional
☐ Industrial ☒ Transport-Related ☐ Park
☐ Undeveloped ☒ Other: Marina storage facility
Possible Conflicts Due to Adjacent Land Use? ☒ Yes ☐ No
If Yes, Describe: Culvert runs below access drive to pier parking

Access:
☒ No Constraints
Constrained due to
☐ Slope ☐ Space
☐ Utilities ☐ Tree Impacts
☐ Structures ☐ Property Ownership
☐ Other:

Conflicts with Existing Utilities:
☐ None
☒ Unknown

Yes	**Possible**	
☐	☐	Sewer
☐	☐	Water
☐	☐	Gas
☐	☐	Cable
☐	☐	Electric
☐	☐	Electric to Streetlights
☐		Overhead Wires
☐	☐	Other:

Potential Permitting Factors:

Dam Safety Permits Necessary	☐ Probable	☒ Not Probable
Impacts to Wetlands	☒ Probable	☐ Not Probable
Impacts to a Stream	☒ Probable	☐ Not Probable
Floodplain Fill	☐ Probable	☒ Not Probable
Impacts to Forests	☒ Probable	☐ Not Probable
Impacts to Specimen Trees	☒ Probable	☒ Not Probable

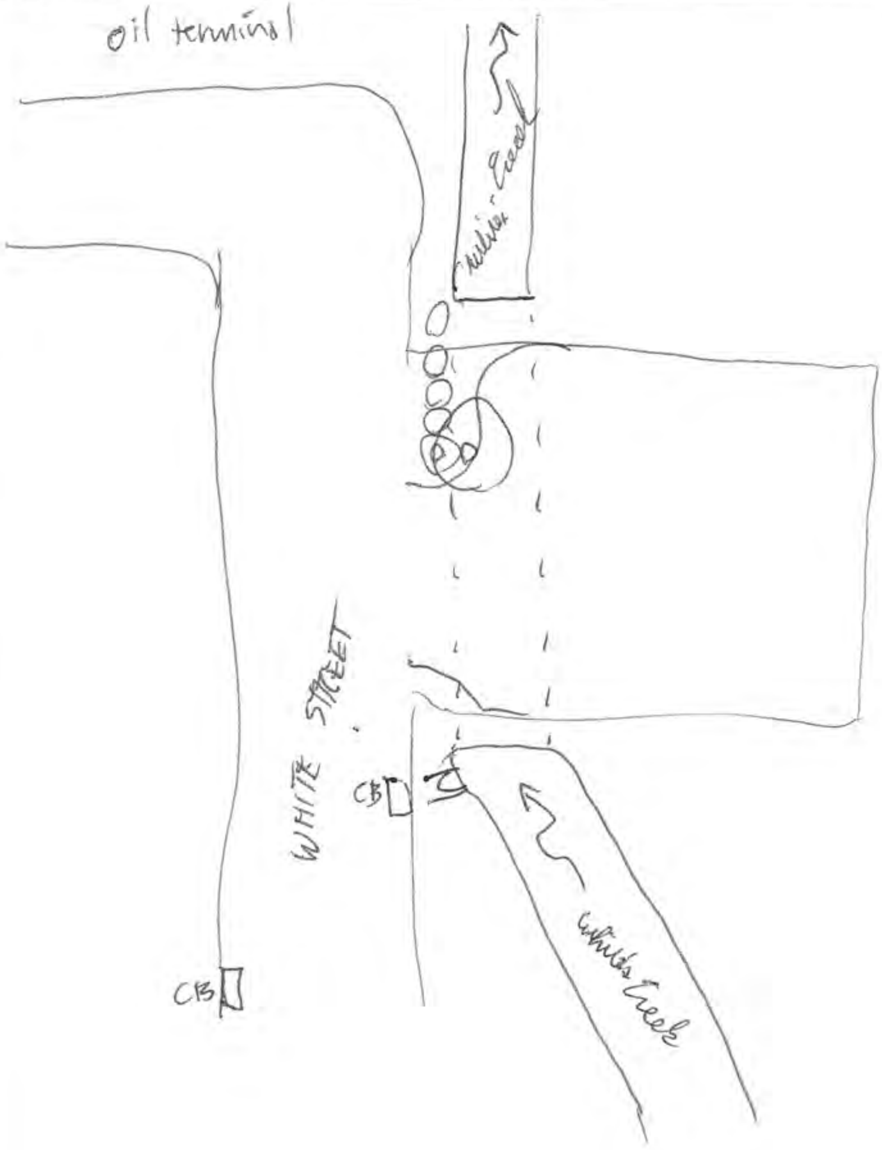
How many? 3
Approx. DBH 10"-14"

Other factors: Need to maintain access to boat yard

Soils:

Soil auger test holes:	☐ Yes	☐ No
Evidence of poor infiltration (clays, fines):	☐ Yes	☐ No
Evidence of shallow bedrock:	☐ Yes	☐ No
Evidence of high water table (gleying, saturation):	☐ Yes	☐ No

SKETCH



DESIGN OR DELIVERY NOTES

FOLLOW-UP NEEDED TO COMPLETE FIELD CONCEPT

☐ Confirm property ownership
☐ Confirm drainage area
☐ Confirm drainage area impervious cover
☐ Confirm volume computations
☐ Complete concept sketch

☐ Other:____

☐ Obtain existing stormwater practice as-builts
☐ Obtain site as-builts
☐ Obtain detailed topography
☐ Obtain utility mapping
☐ Confirm storm drain invert elevations
☐ Confirm soil types

INITIAL FEASIBILITY AND CONSTRUCTION CONSIDERATIONS

SITE CANDIDATE FOR FURTHER INVESTIGATION: ☐ YES ☐ NO ☐ MAYBE
IS SITE CANDIDATE FOR EARLY ACTION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF NO, SITE CANDIDATE FOR OTHER RESTORATION PROJECT(S): ☐ YES ☐ NO ☐ MAYBE
IF YES, TYPE(S):____

Streets and Storm Drains **SSD**

WATERSHED: oyster Bay	**SUBWATERSHED:** CSH	**UNIQUE SITE ID:** CSH-SSD-01
DATE: 8/25/09	**ASSESSED BY:** KMB	**CAMERA ID:**
MAP GRID	**RAIN IN LAST 24 HOURS** ☐ Y ☒ N	**PIC #** 68-69

A. LOCATION

A1. Street names or neighborhood surveyed: Harbor Rd – west of CSH SP & Main Street through Huntington

A2. Adjacent land use: ☒ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☒ Municipal ☒ Transport-Related Parkland

A3. Corresponding HSI or NSA field sheet? If so, circle HSI or [✓ NSA] and record its Unique Site ID here CSH-NSA-01

B. STREET CONDITIONS

B1. Road Type: ☐ Arterial ☒ Collector ☐ Local ☐ Alley ☐ Other: ________

B2. Condition of Pavement: ☐ New ☒ Good ☐ Cracked ☐ Broken

B3. Is on-street parking permitted ☐ Y ☒ N If yes, approximate number of cars per block: ________

B4. Are large cul-de-sacs present? ☐ Y ☒ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5
Organic Material	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5

C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: ☐ open ☐ enclosed ☒ mixed

C2. Percentage of inlets with catch basin storage: ________ ☒ N/A

Sample 1-2 catch basins per NSA/HSI	**C3.** Catch basin #1	**C4.** Catch basin #2
Latitude	___° ___' ___"	___° ___' ___"
Longitude	___° ___' ___"	___° ___' ___"
LMK #	Harbor Rd	terrace Place
Picture #	68	69
Current Condition	☐ Wet ☒ Dry	☐ Wet ☒ Dry
Condition of Inlet	☐ Clear ☒ Obstructed	☒ Clear ☐ Obstructed
Litter Accumulation	☒ Y ☐ N	☐ Y ☒ N
Organics Accumulation	☒ Y ☐ N	☐ Y ☒ N
Sediment Accumulation	☐ Y ☒ N	☐ Y ☒ N
Sediment Depth (in feet)	sump ft.	sump ft.
Water Depth	yes ft.	yes ft.
Evidence of oil and grease	☐ Y ☒ N	☐ Y ☒ N
Sulfur smell	☐ Y ☒ N	☐ Y ☒ N
Accessible to vacuum truck	☒ Y ☐ N	☒ Y ☐ N

D. NON-RESIDENTIAL PARKING LOT (>2 acres)

D1. Approximate size: 2 acres Municipal Lot on Main Street

D2. Lot Utilization: ☐ Full ☒ About half full ☐ Empty

D3. Overall condition of Pavement: ☐ Smooth (no cracks) ☒ Medium (few cracks) ☐ Rough (many cracks) ☐ Very Rough (numerous cracks and depressions)

D4. Is lot served by a storm water treatment practice? ☐ Y ☒ N If yes, describe: ________________

D5. On-site retrofit potential: ☐ Excellent ☒ Good ☐ Poor

CSH-SSD-01

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

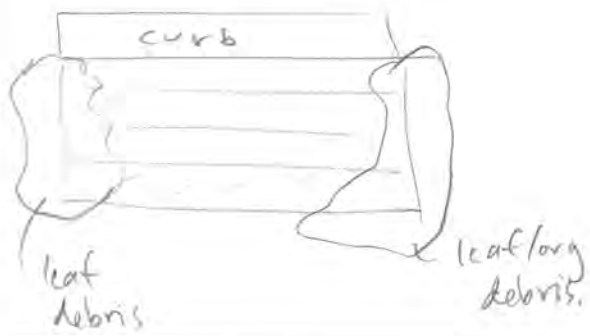
E1. Degree of pollutant accumulation in the system: ☐ High ☒ Medium ☐ Low ☐ None

E2. Rate the feasibility of the following pollution prevention strategies:

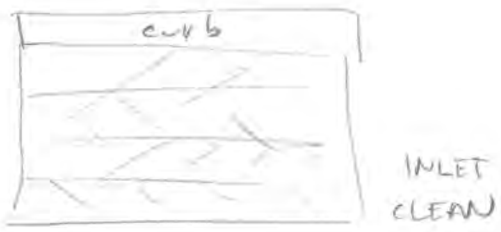
Street Sweeping: ☒ High ☐ Moderate ☐ Low
Storm Drain Stenciling: ☒ High ☐ Moderate ☐ Low
Catch Basin Clean-outs: ☒ High ☐ Moderate ☐ Low
Parking Lot Retrofit Potential: ☐ High ☒ Moderate ☐ Low

CATCH BASIN SKETCHES

#1



#2



Notes:

Streets and Storm Drains **SSD**

WATERSHED: [illegible] Oyster Bay	**SUBWATERSHED:** Mill Neck Creek	**UNIQUE SITE ID:** 001 MNC-SSD-01
DATE: 8/25/09	**ASSESSED BY:** DRB	**CAMERA ID:** Canon
MAP GRID	**RAIN IN LAST 24 HOURS** ☐ Y ☐ N	**PIC #** 142 – 146

A. LOCATION

A1. Street names or neighborhood surveyed: Ellison, Mountain, Bayview (gravel/broken)

A2. Adjacent land use: ☒ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

A3. Corresponding HSI or NSA field sheet? If so, circle HSI or NSA and record its Unique Site ID here ____________

B. STREET CONDITIONS

B1. Road Type: ☐ Arterial ☐ Collector ☒ Local ☐ Alley ☐ Other: ________

B2. Condition of Pavement: ☐ New ☐ Good ☒ Cracked ☒ Broken

B3. Is on-street parking permitted ☒ Y ☐ N If yes, approximate number of cars per block: 5

B4. Are large cul-de-sacs present? ☐ Y ☒ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5
Organic Material	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5

C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: ☐ open ☒ enclosed ☐ mixed

C2. Percentage of inlets with catch basin storage: ________ ☐ N/A

Sample 1-2 catch basins per NSA/HSI	**C3.** Catch basin #1	**C4.** Catch basin #2
Latitude	40° 54 ; 200"	40° 54 .08 "
Longitude	73° 33 ; 764"	73° 33 ; 761"
LMK #		
Picture #	142	146
Current Condition	☐ Wet ☒ Dry	☐ Wet ☒ Dry
Condition of Inlet	☒ Clear ☐ Obstructed	☐ Clear ☒ Obstructed
Litter Accumulation	☐ Y ☒ N	☒ Y ☒ N
Organics Accumulation	☒ Y ☐ N	☒ Y ☐ N
Sediment Accumulation	☐ Y ☐ N	☒ Y ☐ N
Sediment Depth (in feet)	1 ft.	1 ft.
Water Depth	0 ft.	0-5 ft.
Evidence of oil and grease	☐ Y ☒ N	☐ Y ☒ N
Sulfur smell	☐ Y ☒ N	☐ Y ☒ N
Accessible to vacuum truck	☒ Y ☐ N	☒ Y ☐ N

D. NON-RESIDENTIAL PARKING LOT (>2 acres)

D1. Approximate size: ________ acres

D2. Lot Utilization: ☐ Full ☐ About half full ☐ Empty

D3. Overall condition of Pavement: ☐ Smooth (no cracks) ☐ Medium (few cracks) ☐ Rough (many cracks) ☐ Very Rough (numerous cracks and depressions)

D4. Is lot served by a storm water treatment practice? ☐ Y ☐ N If yes, describe: ____________

D5. On-site retrofit potential: ☐ Excellent ☐ Good ☐ Poor

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

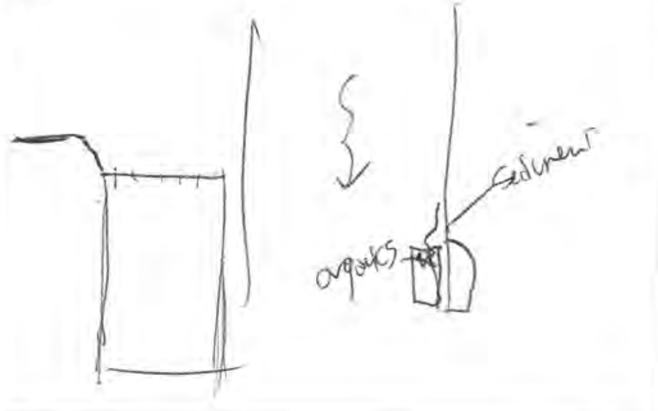
E1. Degree of pollutant accumulation in the system: ☐ High ☒ Medium ☐ Low ☐ None

E2. Rate the feasibility of the following pollution prevention strategies:

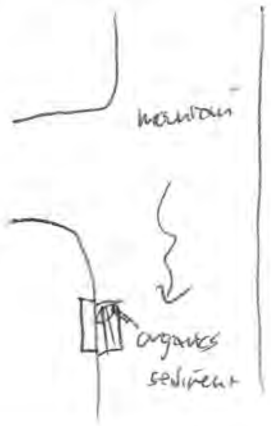
Street Sweeping:	☐ High	☒ Moderate	☐ Low	
Storm Drain Stenciling:	☐ High	☐ Moderate	☐ Low	To Paint done
Catch Basin Clean-outs:	☒ High	☐ Moderate	☐ Low	
Parking Lot Retrofit Potential:	☐ High	☐ Moderate	☒ Low	

CATCH BASIN SKETCHES

#1



#2



Notes:

Streets and Storm Drains **SSD**

WATERSHED: Oyster Bay	**SUBWATERSHED:** MNC	**UNIQUE SITE ID:** MNC-SSD-02
DATE: 6/26/09	**ASSESSED BY:** DTB	**CAMERA ID:**
MAP GRID	**RAIN IN LAST 24 HOURS** ☐ Y ☐ N	**PIC #** 155-157

A. LOCATION

A1. Street names or neighborhood surveyed: Herman Ave

A2. Adjacent land use: ☐ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

A3. Corresponding HSI or NSA field sheet? If so, circle HSI or NSA and record its Unique Site ID here ____________

B. STREET CONDITIONS

B1. Road Type: ☐ Arterial ☐ Collector ☒ Local ☐ Alley ☐ Other: ________

B2. Condition of Pavement: ☐ New ☒ Good ☐ Cracked ☐ Broken

B3. Is on-street parking permitted ☒ Y ☐ N If yes, approximate number of cars per block: ________

B4. Are large cul-de-sacs present? ☐ Y ☒ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☐ 2	☒ 3	☐ 4	☐ 5
Organic Material	☐ 1	☐ 2	☒ 3	☐ 4	☐ 5
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5

C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: ☐ open ☒ enclosed ☐ mixed

C2. Percentage of inlets with catch basin storage: ________ ☐ N/A

Sample 1-2 catch basins per NSA/HSI	**C3.** Catch basin #1	**C4.** Catch basin #2
Latitude	40° 54.078'	40° 54.081'
Longitude	73° 34.679'	73° 34.685'
LMK #		
Picture #	155	156 - 157
Current Condition	☐ Wet ☒ Dry	☐ Wet ☒ Dry
Condition of Inlet	☐ Clear ☒ Obstructed	☐ Clear ☒ Obstructed
Litter Accumulation	☒ Y ☐ N	☐ Y ☒ N
Organics Accumulation	☒ Y ☐ N	☑ Y ☐ N
Sediment Accumulation	☒ Y ☐ N	☒ Y ☐ N
Sediment Depth (in feet)	0.5 ft.	________ ft. Cannot say
Water Depth	<0.1 ft.	________ ft.
Evidence of oil and grease	☐ Y ☒ N	☐ Y ☒ N
Sulfur smell	☐ Y ☒ N	☐ Y ☒ N
Accessible to vacuum truck	☒ Y ☐ N	☒ Y ☐ N

D. NON-RESIDENTIAL PARKING LOT (>2 acres)

D1. Approximate size: ________ acres

D2. Lot Utilization: ☐ Full ☐ About half full ☐ Empty

D3. Overall condition of Pavement: ☐ Smooth (no cracks) ☐ Medium (few cracks) ☐ Rough (many cracks) ☐ Very Rough (numerous cracks and depressions)

D4. Is lot served by a storm water treatment practice? ☐ Y ☐ N If yes, describe: ____________

D5. On-site retrofit potential: ☐ Excellent ☐ Good ☐ Poor

MNC-SSD-02

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

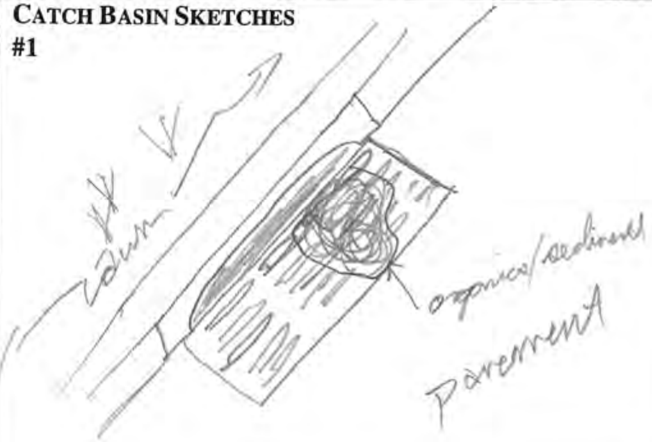
E1. Degree of pollutant accumulation in the system: ☒ High ☐ Medium ☐ Low ☐ None

E2. Rate the feasibility of the following pollution prevention strategies:

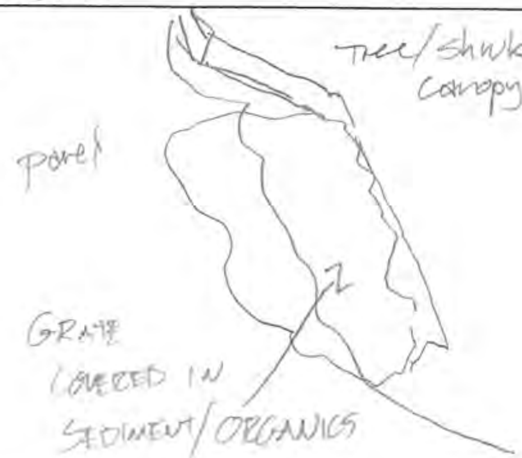
Street Sweeping:	☐ High	☒ Moderate	☐ Low
Storm Drain Stenciling:	☐ High	☒ Moderate	☐ Low
Catch Basin Clean-outs:	☒ High	☐ Moderate	☐ Low
Parking Lot Retrofit Potential:	☐ High	☐ Moderate	☒ Low

CATCH BASIN SKETCHES

#1



#2



Notes:

Brush/trees overhanging north side of road has prevented proper maintenance of storm drainage system.

Streets and Storm Drains **SSD**

WATERSHED: Oyster Bay	**SUBWATERSHED:** Oyster Bay Harbor	**UNIQUE SITE ID:** OBH-SSD-01
DATE: 8 /25/ 09	**ASSESSED BY:** KMB	**CAMERA ID:**
MAP GRID	**RAIN IN LAST 24 HOURS** ☐ Y ☐ N	**PIC #** 87, 92

A. LOCATION

A1. Street names or neighborhood surveyed:
Ships Pt Lane / Melbourne / Florence / Sidney

A2. Adjacent land use: ☒ Residential ☐ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

A3. Corresponding HSI or NSA field sheet? If so, circle HSI or [✓ NSA] and record its Unique Site ID here OBH-NSA-01

B. STREET CONDITIONS

B1. Road Type: ☐ Arterial ☐ Collector ☒ Local ☐ Alley ☐ Other: ________

B2. Condition of Pavement: ☐ New ☐ Good ☒ Cracked ☐ Broken

B3. Is on-street parking permitted ☒ Y ☐ N If yes, approximate number of cars per block: 5

B4. Are large cul-de-sacs present? ☐ Y ☒ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.

	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☒ 2	☐ 3	☐ 4	☐ 5
Organic Material	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☒ 1	☐ 2	☐ 3	☐ 4	☐ 5

C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: ☐ open ☒ enclosed ☐ mixed

C2. Percentage of inlets with catch basin storage: ________ ☐ N/A

Sample 1-2 catch basins per NSA/HSI	**C3.** Catch basin #1	**C4.** Catch basin #2
Latitude	___° ___' ___"	___° ___' ___"
Longitude	___° ___' ___"	___° ___' ___"
LMK #	Corner Ships Pt & Melbourne	Corner Ships Pt & Sidney
Picture #	87	92
Current Condition	☐ Wet ☒ Dry	☐ Wet ☒ Dry
Condition of Inlet	☒ Clear ☐ Obstructed	☒ Clear ☐ Obstructed
Litter Accumulation	☐ Y ☒ N	☐ Y ☒ N
Organics Accumulation	☐ Y ☒ N	☒ Y ☐ N
Sediment Accumulation	☐ Y ☒ N	☒ Y ☐ N little
Sediment Depth (in feet)	Curb inlet ______ ft. ?	yes ft.
Water Depth	______ ft. ?	probably ft.
Evidence of oil and grease	☐ Y ☒ N	☐ Y ☒ N
Sulfur smell	☐ Y ☒ N	☐ Y ☒ N
Accessible to vacuum truck	☒ Y ☐ N	☒ Y ☐ N

D. NON-RESIDENTIAL PARKING LOT (>2 acres) N/A

D1. Approximate size: ________ acres

D2. Lot Utilization: ☐ Full ☐ About half full ☐ Empty

D3. Overall condition of Pavement: ☐ Smooth (no cracks) ☐ Medium (few cracks) ☐ Rough (many cracks) ☐ Very Rough (numerous cracks and depressions)

D4. Is lot served by a storm water treatment practice? ☐ Y ☐ N If yes, describe: ________

D5. On-site retrofit potential: ☐ Excellent ☐ Good ☐ Poor

OBH-SSD-01

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

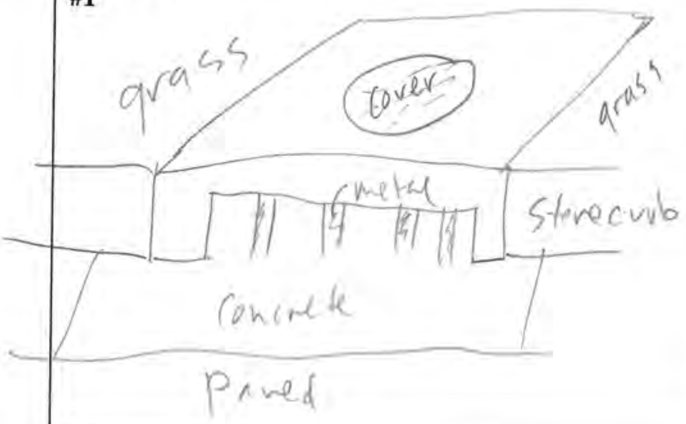
E1. Degree of pollutant accumulation in the system: ☐ High ☐ Medium ☐ Low ☐ None

E2. Rate the feasibility of the following pollution prevention strategies:

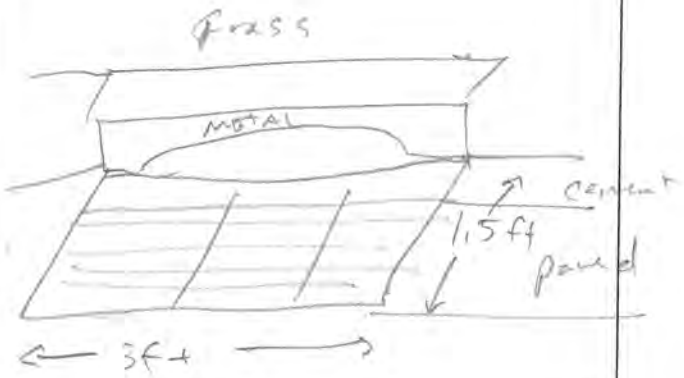
Street Sweeping:	☒ High	☐ Moderate	☐ Low
Storm Drain Stenciling:	☐ High	☐ Moderate	☒ Low done
Catch Basin Clean-outs:	☒ High	☐ Moderate	☐ Low
Parking Lot Retrofit Potential:	☐ High	☐ Moderate	☒ Low N/A

CATCH BASIN SKETCHES

#1



#2



Notes:

"Pick up dog waste" sign posted on Florence - pic

Streets and Storm Drains **SSD**

WATERSHED: Oyster Bay	**SUBWATERSHED:** White Creek	**UNIQUE SITE ID:** WCR-SSD-01
DATE: 8/26/09	**ASSESSED BY:** DRB	**CAMERA ID:**
MAP GRID	**RAIN IN LAST 24 HOURS** ☐ Y ☒ N	**PIC #** 163-166

A. LOCATION

A1. Street names or neighborhood surveyed: Commercial Parking Lot on 106

A2. Adjacent land use: ☐ Residential ☒ Commercial ☐ Industrial ☐ Institutional ☐ Municipal ☐ Transport-Related

A3. Corresponding [✓ HSI] or NSA field sheet? If so, circle [✓ HSI] or NSA and record its Unique Site ID here WCR HSI-010

B. STREET CONDITIONS

B1. Road Type: ☐ Arterial ☐ Collector ☐ Local ☐ Alley ☐ Other: ________

B2. Condition of Pavement: ☐ New ☐ Good ☐ Cracked ☐ Broken

B3. Is on-street parking permitted ☐ Y ☐ N If yes, approximate number of cars per block: ________

B4. Are large cul-de-sacs present? ☐ Y ☐ N

B5. Is trash present in curb and gutter? If so, use the index to the right to record amount.	Index Rating for Accumulation in Gutters				
	Clean				Filthy
Sediment	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Organic Material	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5
Litter	☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

C. STORM DRAIN INLETS AND CATCH BASINS

C1. Type of storm drain conveyance: ☐ open ☐ enclosed ☐ mixed

C2. Percentage of inlets with catch basin storage: ________ ☐ N/A

Sample 1-2 catch basins per NSA/HSI	**C3.** Catch basin #1	**C4.** Catch basin #2
Latitude	40° 51' 26.3"	40° 51' 31.1"
Longitude	-73° 32' 06.0"	73° 37' 06.2"
LMK #		
Picture #	163	166
Current Condition	☒ Wet ☐ Dry	☐ Wet ☒ Dry
Condition of Inlet	☒ Clear ☐ Obstructed	☒ Clear ☐ Obstructed
Litter Accumulation	☐ Y ☒ N	☐ Y ☒ N
Organics Accumulation	☐ Y ☒ N	☐ Y ☒ N
Sediment Accumulation	☒ Y ☐ N	☐ Y ☒ N
Sediment Depth (in feet)	~1 ft.	________ ft. Unknown
Water Depth	0.5 ft.	0.5 ft.
Evidence of oil and grease	☒ Y ☐ N	☒ Y ☐ N
Sulfur smell	☐ Y ☒ N	☐ Y ☒ N
Accessible to vacuum truck	☒ Y ☐ N	☑ Y ☐ N

D. NON-RESIDENTIAL PARKING LOT (>2 acres)

D1. Approximate size: 15 acres

D2. Lot Utilization: ☐ Full ☒ About half full ☐ Empty

D3. Overall condition of Pavement: ☐ Smooth (no cracks) ☒ Medium (few cracks) ☐ Rough (many cracks) ☐ Very Rough (numerous cracks and depressions)

D4. Is lot served by a storm water treatment practice? ☒ Y ☐ N If yes, describe: Recharge Basin

D5. On-site retrofit potential: ☐ Excellent ☒ Good ☐ Poor Underground separator

WCR-SSD-01

E. MUNICIPAL POLLUTANT REDUCTION STRATEGIES

E1. Degree of pollutant accumulation in the system: ☒ High ☐ Medium ☐ Low ☐ None

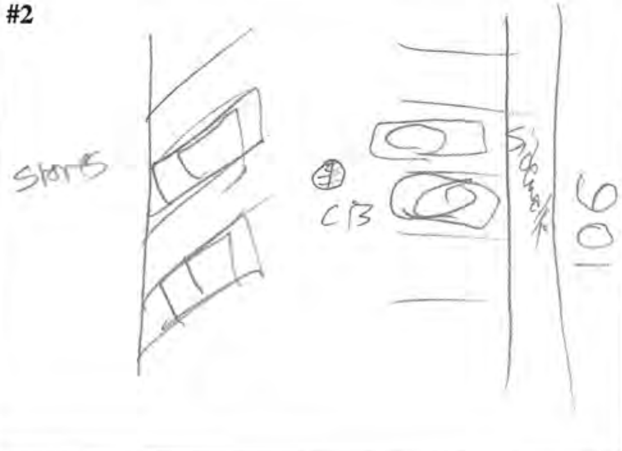
E2. Rate the feasibility of the following pollution prevention strategies:

Street Sweeping:	☐ High	☒ Moderate	☐ Low
Storm Drain Stenciling:	☐ High	☒ Moderate	☐ Low
Catch Basin Clean-outs:	☐ High	☒ Moderate	☐ Low
Parking Lot Retrofit Potential:	☐ High	☒ Moderate	☐ Low

CATCH BASIN SKETCHES

#1

#2



Notes:

Selected two rows of commercial strip mall. Stop & Shop to but not incl. McD's. Much impervious Backside v. dirty. See hotspot form. Excellent outreach target. Maybe retrofit, but little available land area.

Reach Level Assessment **RCH**

SURVEY REACH ID: CSB-01 **WTRSHD/SUBSHD:** Cold Spring Bk **DATE:** 8 / 24 / 09 **ASSESSED BY:** JHW / KMB

START **TIME:** 9 : 38 [✓ AM]/PM **LMK:** SC-01
LAT 40 ° 51 ' 25.7 " **LONG** 73 ° 27 ' 48.2 "
DESCRIPTION: Spillway from St John's Pond

END **TIME:** ___ : ___ AM/PM **LMK:** _____
LAT 40 ° 51 ' 29.8 " **LONG** 73 ° 27 ' 50.6 "
DESCRIPTION: Cold Spring Harbor

GPS ID: GPS Map60

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☒ Suburban/Res ☐ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☐ 0-25% ☐ 25-50 % ☒ 50%-75% ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick)
☐ Sand (gritty)
☒ Gravel (0.1-2.5")
☒ Cobble (2.5 –10")
☐ Boulder (>10")
☐ Bed rock

WATER CLARITY ☒ Clear ☐ Turbid *(suspended matter)* ☒ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)* iron staining

AQUATIC PLANTS IN STREAM
Attached: ☐ none ☒ some ☐ lots
Floating: ☒ none ☐ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of) ☒ Fish ☐ Beaver ☐ Deer ☐ Snails ☐ Other:

STREAM SHADING (water surface)
☐ Mostly shaded (≥75% coverage)
☐ Halfway (≥50%)
☒ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Downcutting
☐ Widening
☐ Headcutting
☐ Aggrading
☐ Sed. deposition
☐ Bed scour
☐ Bank failure
☒ Bank scour
☐ Slope failure
☐ Channelized
☐ Unknown

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 6 (ft)
RT bank 3 (ft)
Width: Bottom 8 (ft)
Top 25 (ft)

REACH ACCESSIBILITY

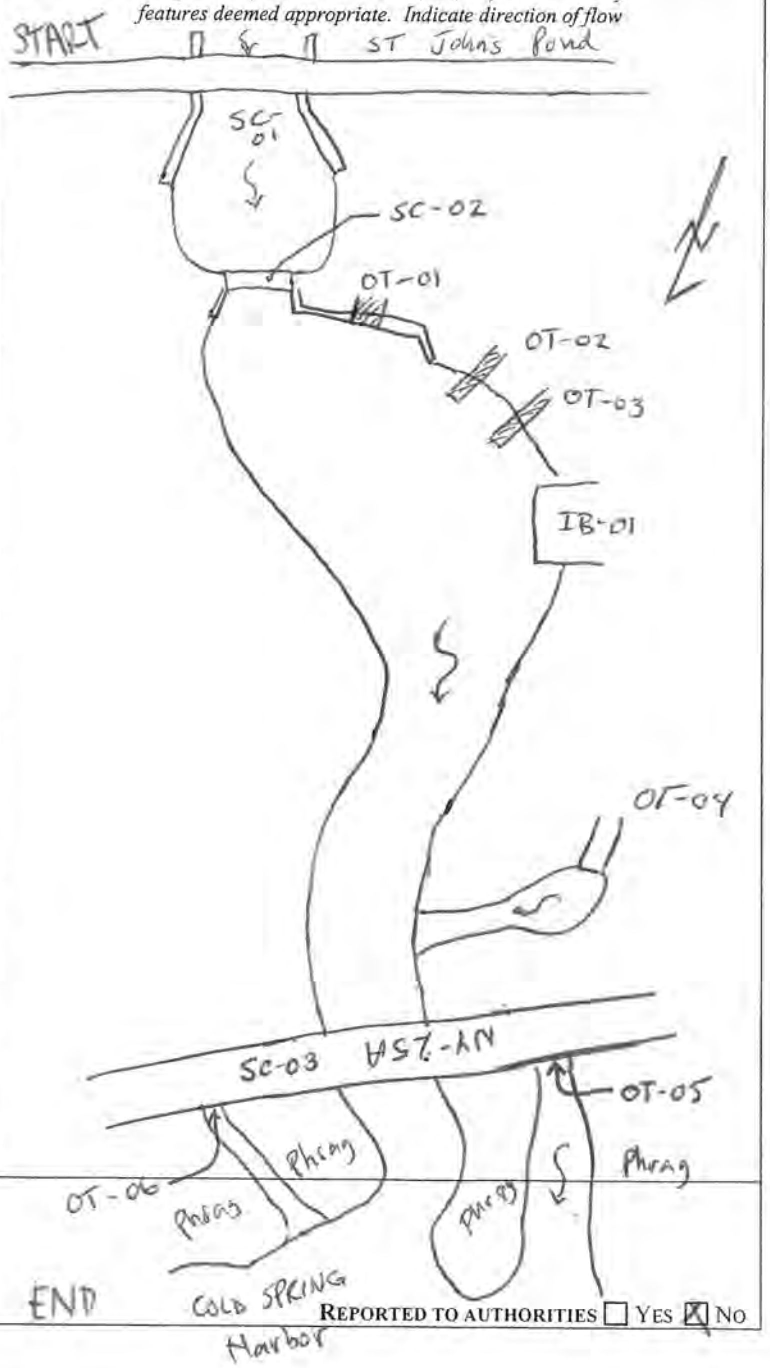
Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 3 [✓ 2] 1

NOTES: *(biggest problem you see in survey reach)*

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB, SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



REPORTED TO AUTHORITIES ☐ YES ☒ NO

OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 [✓ 13] 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	[✓ 8] 7 6	5 4 3	2 1 0
	Right Bank 10 9	[✓ 8] 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
	Right Bank 10 9	[✓ 8] 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 [✓ 11]	10 9 8 7 6	5 4 3 2 1 0

OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	[✓ 5] 4 3	2 1 0
	Right Bank 10 9	8 [✓ 7] 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	[✓ 10] 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 [✓ 9] 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 [✓ 7] 6	5 4 3 2 1 0

Sub Total In-stream: 54 **/80** + Buffer/Floodplain: 38 **/80** = **Total** Survey Reach 92 **/160**

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8 / 24 / 09
ASSESSED BY: KMB
SURVEY REACH ID: CSB-01
TIME: 9 : 43 [✓ AM]/PM
PHOTO ID: (*Camera-Pic #*) 001 /#E 003
SITE ID: (*Condition-#*) SC- 01
LAT 40 ° 51 25.8 "
LONG 73 ° 27. 48.1 "
LMK
GPS (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☒ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☒ Box ☐ Elliptical ☐ Circular ☐ Other:

 # BARRELS: ☒ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☒ Concrete ☐ Metal ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 15 (ft)
Height: 20 (ft)
Culvert length: 10 (ft)
Width: 15 (ft)
TRAIL Roadway elevation: 25 (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ no
☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

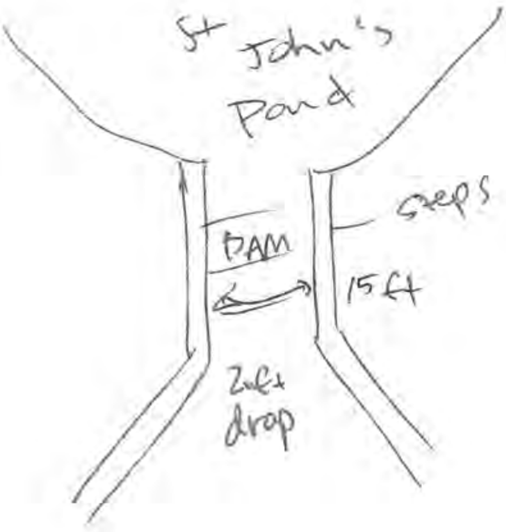
CAUSE:
☒ Drop too high Water Drop: 20ft ~~(in)~~
☐ Flow too shallow Water Depth:_____ (in)
☐ Other:

BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

[✓ 5] 4 3 2 1

NOTES/SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☒ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Bk | **DATE:** 8 / 24 / 09 | **ASSESSED BY:** KMB

SURVEY REACH ID: CSB-01 | **TIME:** 10 : 12 AM/PM | **PHOTO ID:** (*Camera-Pic #*) /# 003

SITE ID: (*Condition-#*) SC-02 | **LAT** 40° 51 ' 25.9 " **LONG** 73° 27 ' 48.5 ' **LMK**____ | **GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☒ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☒ Box ☐ Elliptical ☐ Circular ☐ Other:

 # BARRELS: ☐ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☒ Concrete ☐ Metal ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: ________(ft)
Height: ________(ft)
Broadcrested weir
Culvert length: ________(ft)
Width: 8 (ft)
Roadway elevation: ________(ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE: ☐ Total ☒ Partial ☐ Temporary ☐ Unknown

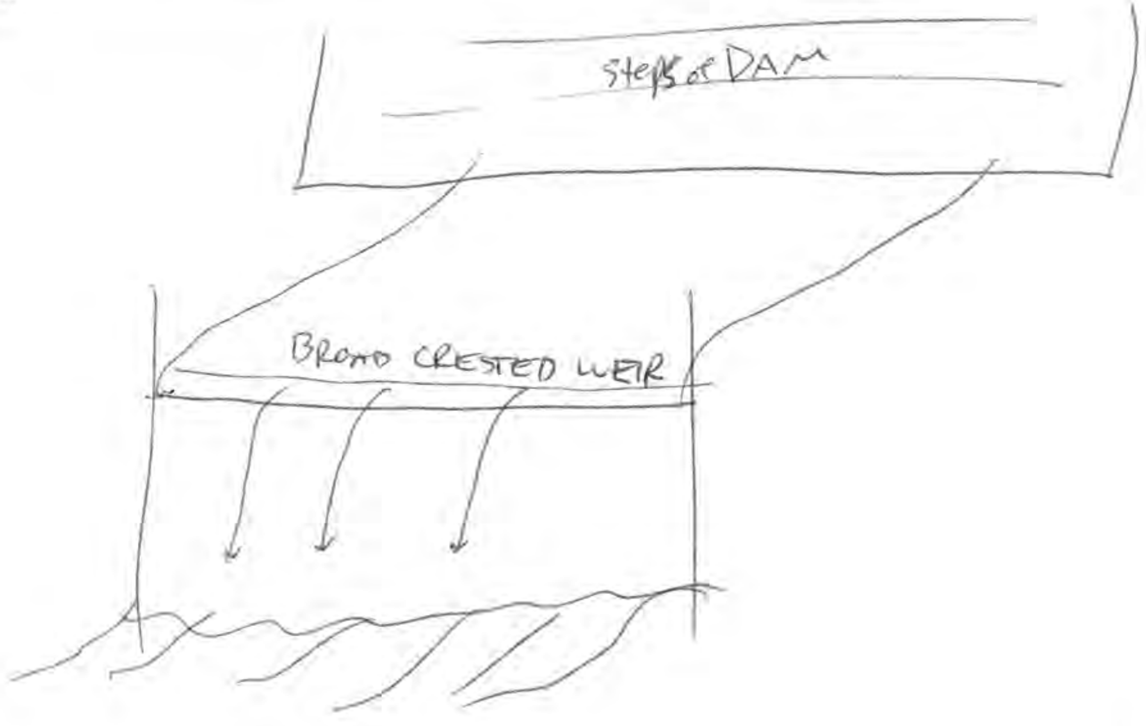
CAUSE:
☒ Drop too high Water Drop: 24 (in)
☐ Flow too shallow Water Depth:_____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 [✓ 3] 2 1

NOTES/SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☒ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8 / 24 / 09
ASSESSED BY: KMB
SURVEY REACH ID: CSB-01
TIME: 10 : 26 AM/PM
PHOTO ID: (*Camera-Pic #*) US 008 /#→ 011
SITE ID: (*Condition-#*) SC- 03
LAT 40 ° 51 ' 28.7 " **LONG** 73 ° 27 ' 49.8 " **LMK** ____
GPS (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch ☐ Bottomless
☒ Box ☐ Elliptical
☐ Circular
☐ Other:

 # BARRELS:
☐ Single
☒ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 12 (ft)
Height: 6 (ft)
Culvert length: 40 (ft)
Both barrels Width: 30 (ft)
Roadway elevation: 15 (ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE:
☐ Flat
☒ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ no
☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☒ Partial
☐ Temporary ☐ Unknown

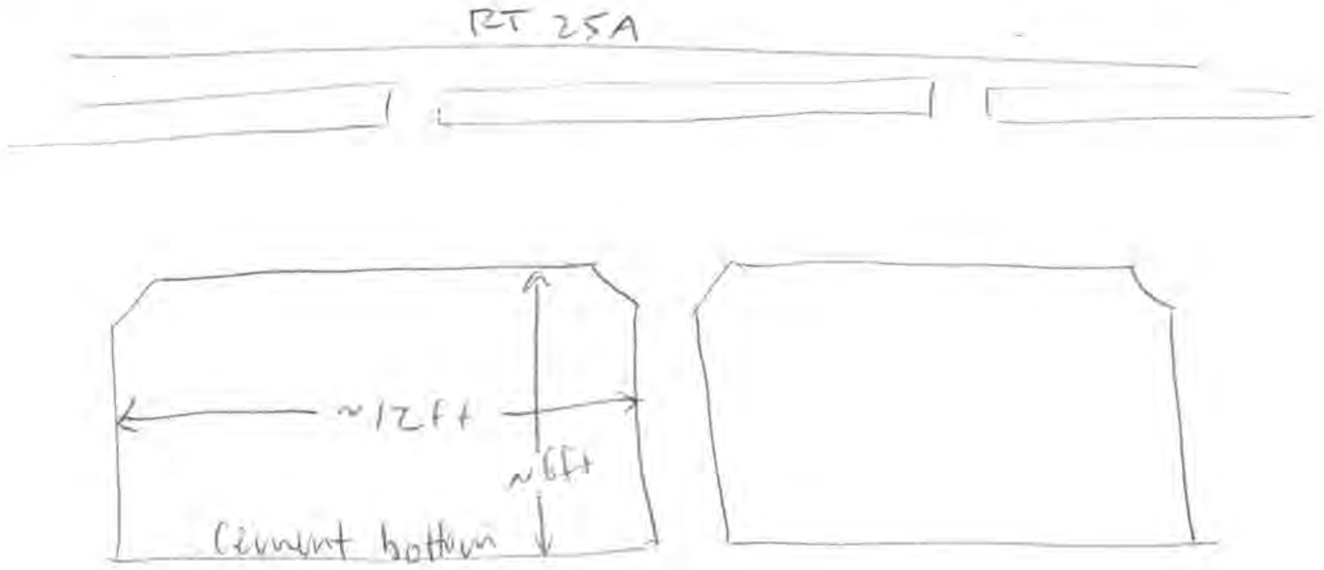
CAUSE:
☐ Drop too high Water Drop: ____ (in)
☒ Flow too shallow Water Depth: 3 (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 [✓ 3] 2 1

NOTES/SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☐ NO

Impacted Buffer **IB**

WATERSHED/SUBSHED: Coldspring Bk **DATE:** 8/24/09 **ASSESSED BY:** KMB

JRVEY REACH: CSB-01 **TIME:** 10:15 [✓ AM]/PM **PHOTO ID:** *(Camera-Pic #)* /# 004

SITE ID: (*Condition-#*) **IB-** 01

START **LAT** 40° 51' 26.4" **LONG** 73° 27' 49.1" **LMK** ____

END **LAT** ___° ___' ___" **LONG** ___° ___' ___" **LMK** ____

GPS: (*Unit ID*)

IMPACTED BANK: ☒ LT ☐ RT ☐ Both

REASON INADEQUATE: ☒ Lack of vegetation ☒ Too narrow ☐ Widespread invasive plants ☐ Recently planted ☐ Other:

LAND USE: *(Facing downstream)*	Private	Institutional	Golf Course	Park	Other Public
LT Bank	☒	☐	☐	☐	☐: Fish hatchery
RT Bank	☐	☐	☐	☐	☐:

DOMINANT LAND COVER:	Paved	Bare ground	Turf/lawn	Tall grass	Shrub/scrub	Trees	Other
LT Bank	☐	☐	☐	☐	☒	☐	☐:
RT Bank	☐	☐	☐	☐	☐	☒	☐:

INVASIVE PLANTS: ☒ None ☐ Rare ☐ Partial coverage ☐ Extensive coverage ☐ unknown

STREAM SHADE PROVIDED? ☐ None ☒ Partial ☐ Full

WETLANDS PRESENT? ☐ No ☒ Yes ☐ Unknown

POTENTIAL RESTORATION CANDIDATE ☐ Active reforestation ☐ Greenway design ☒ Natural regeneration ☐ Invasives removal ☐ no ☐ Other:

RESTORABLE AREA

	LT BANK	RT
Length (ft):	15	—
Width (ft):	10	—

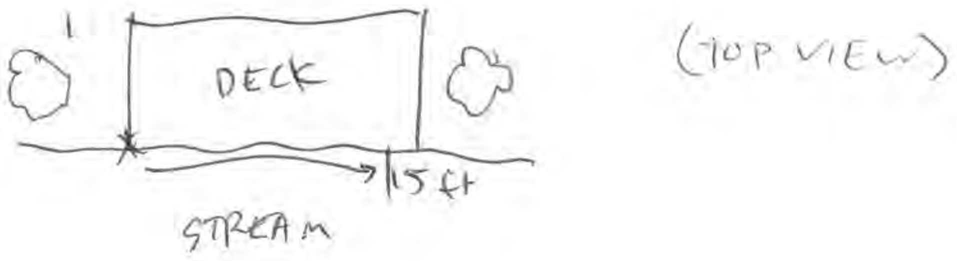
REFORESTATION POTENTIAL: (*Circle #*)

Impacted area on public land where the riparian area does not appear to be used for any specific purpose; plenty of area available for planting		Impacted area on either public or private land that is presently used for a specific purpose; available area for planting adequate		Impacted area on private land where road; building encroachment or other feature significantly limits available area for planting
5	[✓ 4]	3	2	1

POTENTIAL CONFLICTS WITH REFORESTATION ☐ Widespread invasive plants ☐ Potential contamination ☒ Lack of sun ☐ Poor/unsafe access to site ☐ Existing impervious cover ☐ Severe animal impacts (deer, beaver) ☐ Other:

NOTES:

Fish hatchery



Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Spring Bk **DATE:** 8/24/09 **ASSESSED BY:** KMB

SURVEY REACH ID: CSB-01 **TIME:** 10 : 04 [✓ AM]/PM **PHOTO ID:** (*Camera-Pic #*) /# 805

SITE ID (*Condition-#*): OT- 01 **LAT** 40 ° 51 ' 26.0 " **LONG** 73° 27' 48.7" **LMK** 5 **GPS:** (*Unit ID*)

BANK: ☒LT ☐RT ☐ Head	**TYPE:** ☒ Closed pipe	**MATERIAL:** ☒ Concrete ☐Metal ☐ PVC/Plastic ☐Brick ☐ Other:	**SHAPE:** ☐ Single ☒Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:	**DIMENSIONS:** Diameter: 24 (in)	**SUBMERGED:** ☒ No ☐ Partially ☐ Fully
FLOW: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:	☐ Open channel	■Concrete ☐ Earthen ☐ Other:	☐ Trapezoid ☐ Parabolic ☐ Other:	Depth: ____ (in) Width (Top): ____ (in) " (Bottom): ____ (in)	*NOT APPLICABLE*

CONDITION: ☐ None ☒ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:	**ODOR:** ☒ No ☐Gas ☐ Sewage ☐Rancid/Sour ☐ Sulfide ☐ Other:	**DEPOSITS/STAINS:** ☒ None ☐Oily ☐ Flow Line ☐ Paint ☐Other:	**VEGGIE DENSITY:** ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:	**PIPE BENTHIC GROWTH:** ☐ None ☐ Brown ☒ Orange ☐ Green ☐ Other: **POOL QUALITY:** ☐ No pool ☒ Good ☐Odors ☐Colors ☐Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY	**COLOR:**	☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:
	TURBIDITY:	☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque
	FLOATABLES:	☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:
OTHER CONCERNS:		☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization

☒ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ________ ft Type of existing vegetation: ____________ Slope: ______ °

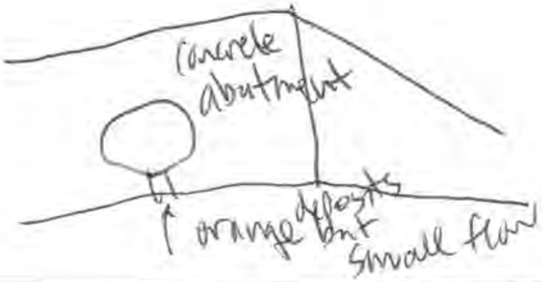
If yes for stormwater:

Is stormwater currently controlled? Land Use description: ____________

☐ Yes ☐ No ☐ Not investigated Area available:

OUTFALL SEVERITY: (*circle #*)	Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.		Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
	5	4	[✓ 3]	2	1

SKETCH/NOTES:



REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Spring Brook | **DATE:** 8/24/09 | **ASSESSED BY:** KMB

SURVEY REACH ID: CSB-01 | **TIME:** 10:08 [✓ AM]/PM | **PHOTO ID:** (*Camera-Pic #*) 006 /#

SITE ID (*Condition-#*): OT-02 / 03 | **LAT** 40° 51' 26.2" **LONG** 73° 27' 48.9" **LMK** ____ | **GPS:** (*Unit ID*)

BANK: ☒ LT ☐ RT ☐ Head

FLOW: ☐ None ☒ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe

MATERIAL: ☐ Concrete ☒ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

SHAPE: ☐ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

DIMENSIONS: Diameter: 6 (in)

SUBMERGED: ☑ No ☐ Partially ☐ Fully

☐ Open channel

☐ Concrete ☐ Earthen ☐ Other:

☐ Trapezoid ☐ Parabolic ☐ Other:

Depth: ____ (in)
Width (Top): ____ (in)
" (Bottom): ____ (in)

NOT APPLICABLE

CONDITION: ☐ None ☒ Chip/Cracked ☐ Peeling Paint ☒ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☐ None ☒ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☐ None ☐ Brown ☒ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☒ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☒ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ________ ft Type of existing vegetation: ____________ Slope: ______ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ____________

Area available:

OUTFALL SEVERITY: (*circle #*)

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

5 4 3 [✓ 2] 1

SKETCH/NOTES:

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Spring Bk | **DATE:** 8/24/07 | **ASSESSED BY:** KMB

SURVEY REACH ID: CSB-01 | **TIME:** 10:22 [✓ AM]/PM | **PHOTO ID:** (*Camera-Pic #*) /# 007

SITE ID (*Condition-#*): **OT-**04 | **LAT** 40° 51' 27.6" **LONG** 73° 27' 50.1" | **LMK** ____ | **GPS:** (*Unit ID*)

BANK: ☒ LT ☐ RT ☐ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☒ Substantial ☐ Other:

TYPE: ☒ Closed pipe

MATERIAL: ☐ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☒ Other: Clay

SHAPE: ☒ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

DIMENSIONS: Diameter: 14 (in)

SUBMERGED: ☐ No ☒ Partially ☐ Fully

TYPE: ☐ Open channel

MATERIAL: ☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS: Depth: ____ (in) Width (Top): ____ (in) " (Bottom): ____ (in)

NOT APPLICABLE

CONDITION: ☐ None ☒ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☐ None ☒ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☒ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☒ Local stream repair/outfall stabilization ☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ________ ft Type of existing vegetation: ________ Slope: ________ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

Land Use description: ________

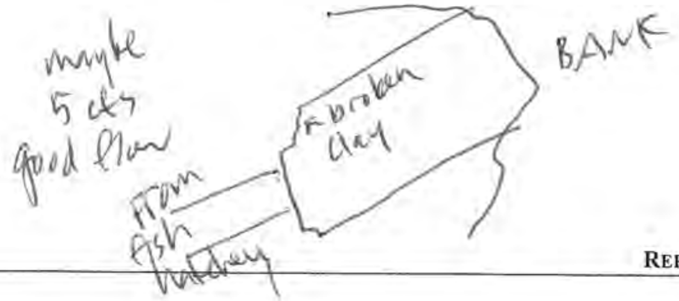
Area available:

OUTFALL SEVERITY: (*circle #*)

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

5 4 3 [✓ 2] 1

SKETCH/NOTES:



maybe 5 cfs good flow

from fish hatchery

REPORTED TO AUTHORITIES: ☐ YES ☒ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Spring Brook **DATE:** 8/24/09 **ASSESSED BY:** KMB

SURVEY REACH ID: CSB-01 **TIME:** 10:32 AM/PM **PHOTO ID:** (*Camera-Pic #*) /# 012

SITE ID (*Condition-#*): **OT-** 05 **LAT** 40° 51' 28.4" **LONG** 73° 27' 50.9" **LMK** ____ **GPS:** (*Unit ID*)

BANK: ☒ LT ☐ RT ☐ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE: ☒ Closed pipe

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

SHAPE: ☒ Single ☒ Circular ☐ Double ☐ Elliptical ☐ Triple ☐ Other:

DIMENSIONS: Diameter: 18 (in)

SUBMERGED: ☐ No ☒ Partially ☐ Fully

☐ Open channel ☐ Concrete ☐ Earthen ☐ Other: ☐ Trapezoid ☐ Parabolic ☐ Other:

Depth: ____ (in)
Width (Top): ____ (in)
" (Bottom): ____ (in)

NOT APPLICABLE

CONDITION: ☒ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☐ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY

COLOR: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:

TURBIDITY: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque

FLOATABLES: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☒ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☐ no ☐ Storm water retrofit ☐ Other:

If yes for daylighting:

Length of vegetative cover from outfall: ________ ft Type of existing vegetation: ________________ Slope: ________ °

If yes for stormwater:

Is stormwater currently controlled? ☐ Yes ☐ No ☐ Not investigated

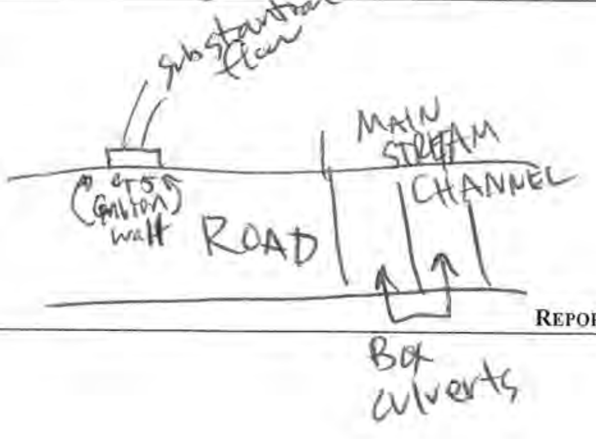
Land Use description: ____________________

Area available:

OUTFALL SEVERITY: (*circle #*)

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.
5	[✓ 4]	3	2	1

SKETCH/NOTES:



possibly a fish hatchery

REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Spring Brk
DATE: 8 / 24 / 09
ASSESSED BY: KMB
SURVEY REACH ID: CSB-01
TIME: 10 : 42 AM/PM
PHOTO ID: (*Camera-Pic #*) /# 017
SITE ID (*Condition-#*): **OT-** 06
LAT 40 ° 51 ' 29.1 " **LONG** 73 ° 27 ' 48.6 "
LMK ____
GPS: (*Unit ID*)

BANK: ☐ LT ☒ RT ☐ Head

FLOW: ☐ None ☐ Trickle ☐ Moderate ☒ Substantial ☐ Other:

TYPE: ☒ Closed pipe

MATERIAL: ☒ Concrete ☐ Metal ☐ PVC/Plastic ☐ Brick ☐ Other:

SHAPE: ☑ Single ☐ Circular ☐ Double ☒ Elliptical ☐ Triple ☐ Other: Half

DIMENSIONS: Diameter: 30 (in)

SUBMERGED: ☐ No ☒ Partially ☐ Fully

TYPE: ☐ Open channel

MATERIAL: ☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☐ Trapezoid ☐ Parabolic ☐ Other:

Depth: ____ (in)
Width (Top): ____ (in)
" (Bottom): ____ (in)

NOT APPLICABLE

CONDITION: ☐ None ☐ Chip/Cracked ☐ Peeling Paint ☒ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☐ None ☒ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☐ None ☐ Brown ☒ Orange ☐ Green ☐ Other:

POOL QUALITY: ☐ No pool ☐ Good ☐ Odors ☒ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other: orange deposits

FOR FLOWING ONLY

COLOR: ☒ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:
TURBIDITY: ☒ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque
FLOATABLES: ☒ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☐ Stream daylighting ☐ Local stream repair/outfall stabilization ☒ no ☐ Storm water retrofit ☐ Other:

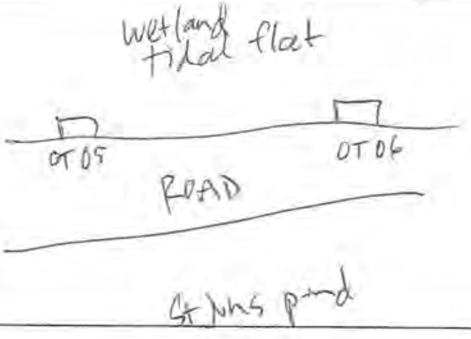
If yes for daylighting:
Length of vegetative cover from outfall: ______ ft
Type of existing vegetation: ____________
Slope: ______ °

If yes for stormwater:
Is stormwater currently controlled?
☐ Yes ☐ No ☐ Not investigated
Land Use description: ____________
Area available:

OUTFALL SEVERITY: (*circle #*)

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.	Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.	
5 [✓ 4]	3	2	1

SKETCH/NOTES:



Source unknown
~5 cfs
not just road discharge

REPORTED TO AUTHORITIES: ☐ YES ☒ NO

Reach Level Assessment **RCH**

SURVEY REACH ID: CSB-02
WTRSHD/SUBSHD: Cold Spring Bk
DATE: 8 / 24 / 09
ASSESSED BY: JHW / KMB

START **TIME:** 12 : 40 AM/[✓ PM] **LMK:** SC-01
LAT 40 ° 51 ' 08.1 " **LONG** 73 ° 27 ' 38.3 "
DESCRIPTION: Spillway of Franklin Pond

END **TIME:** 12 : 00 AM/[✓ PM] **LMK:** ____
LAT 40 ° 57 ' 11.8 " **LONG** 73 ° 27 ' 38.7 "
DESCRIPTION: Confluence of CSB w/ St J pond

GPS ID: GPS Map60

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☒ Suburban/Res ☐ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☐ 0-25% ☐ 50%-75% ☒ 25-50 % ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick) ☒ Cobble (2.5 –10")
☐ Sand (gritty) ☐ Boulder (>10")
☒ Gravel (0.1-2.5") ☐ Bed rock

WATER CLARITY ☐ Clear ☐ Turbid *(suspended matter)* ☒ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)* Iron floc

AQUATIC PLANTS IN STREAM
Attached: ☒ none ☐ some ☐ lots
Floating: ☐ none ☒ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of) ☒ Fish ☐ Beaver ☒ Deer ☐ Snails ☐ Other:

STREAM SHADING (water surface)
☑ Mostly shaded (≥75% coverage)
☐ Halfway (≥50%)
☐ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Downcutting ☐ Bed scour
☒ Widening ☐ Bank failure
☐ Headcutting ☒ Bank scour
☐ Aggrading ☐ Slope failure
☐ Sed. deposition ☐ Channelized
☐ Unknown

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 5 (ft)
RT bank 3 (ft)
Width: Bottom 10-12 (ft)
Top 15-20 (ft)

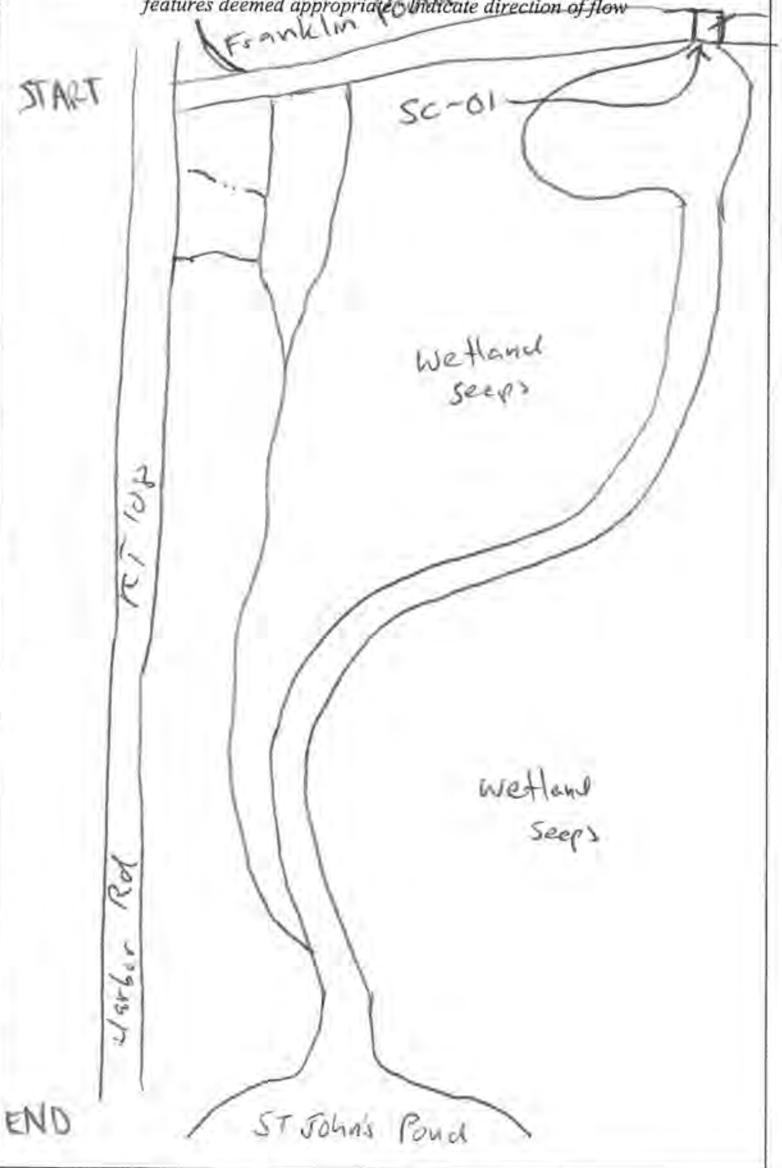
REACH ACCESSIBILITY

Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 3 [✓ 2] 1

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☐ NO

OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 [✓ 17] 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 [✓ 9]	8 7 6	5 4 3	2 1 0
	Right Bank 10 [✓ 9]	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	[✓ 8] 7 6	5 4 3	2 1 0
	Right Bank 10 [✓ 9]	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 [✓ 16]	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet; little or no riparian vegetation due to human activities.
	Left Bank 10 [✓ 9]	~~8~~ 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 [✓ 7] 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	[✓ 15] 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 [✓ 18] 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 [✓ 18] 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Sub Total In-stream: 68 /80 + Buffer/Floodplain: 67 /80 = **Total** Survey Reach 135 /160

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8 / 24 / 09
ASSESSED BY: KMB
URVEY REACH ID: CSB-02
TIME: 12 : 16 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) /# 021
SITE ID: (*Condition-#*) SC- 01
LAT 40° 51 ' 8.3 " **LONG** 73° 27 ' 38.5 " **LMK**____ **GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☒ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☒ Box ☐ Elliptical ☐ Circular ☐ Other:

 # BARRELS: ☒ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☒ Concrete ☐ Metal ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 2 (ft)
Height: 1 (ft)
Spill
Culvert length: 25 (ft)
Width: 15 (ft)
Roadway elevation: N/A (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☒ Other (*describe*): pooling downstream

CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☒ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☒ Total ☐ Partial
☐ Temporary ☐ Unknown

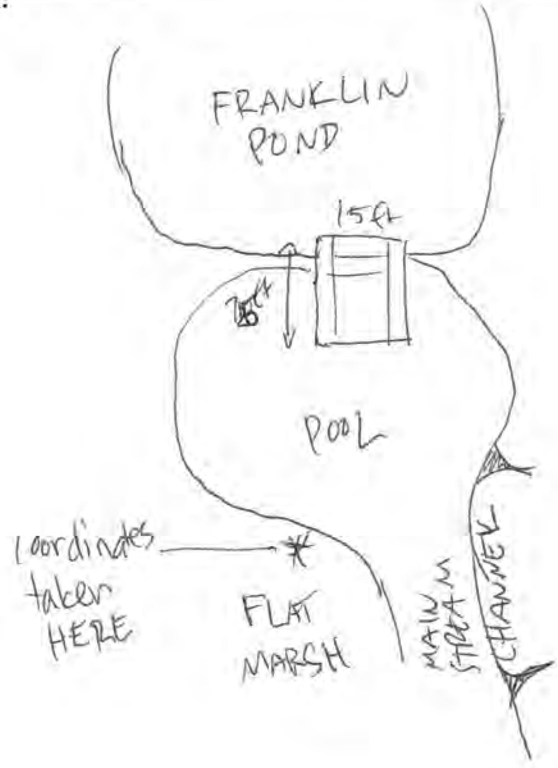
CAUSE:
☒ Drop too high Water Drop: 10 ft ~~(in)~~
☐ Flow too shallow Water Depth:____ (in)
☐ Other:

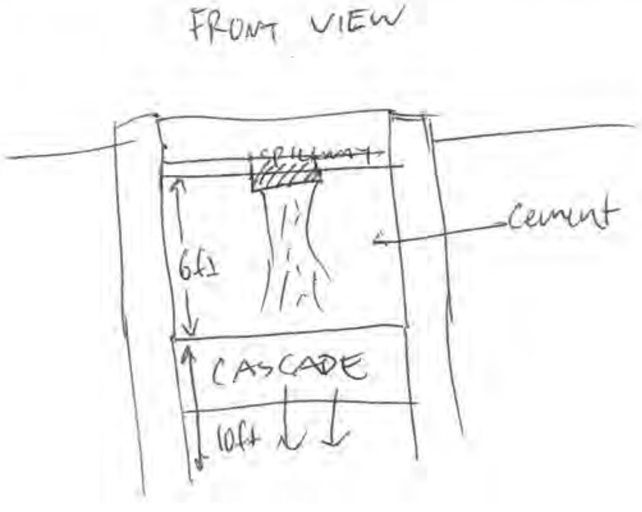
BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

[✓ 5] 4 3 2 1

NOTES/SKETCH:





REPORTED TO AUTHORITIES ☐ YES ☒ NO

Reach Level Assessment **RCH**

SURVEY REACH ID: CSB-03 **WTRSHD/SUBSHD:** Cold Spring Bh **DATE:** 8/24/09 **ASSESSED BY:** JHW/KMB

START **TIME:** 2 : 50 AM/[✓ PM] **LMK:** ____
LAT 40 ° 50 ' 40.5 " **LONG** 73 ° 27 ' 23.4 "
DESCRIPTION: Footbridge

END **TIME:** 3 : 15 AM/[✓ PM] **LMK:** ____
LAT 40 ° 50 ' 53.7 " **LONG** 73 ° 27 ' 29.4 "
DESCRIPTION: Franklin Pond Inlet

GPS ID: GPS Map60

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☒ Suburban/Res ☒ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☐ 0-25% ☒ 25-50 % ☐ 50%-75% ☐ 75-100%

DOMINANT SUBSTRATE
☒ Silt/clay (fine or slick)
☒ Sand (gritty)
☒ Gravel (0.1-2.5")
☐ Cobble (2.5 –10")
☐ Boulder (>10")
☐ Bed rock

WATER CLARITY ☒ Clear ☐ Turbid *(suspended matter)* ☐ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)*

AQUATIC PLANTS IN STREAM
Attached: ☐ none ☒ some ☐ lots
Floating: ☒ none ☐ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of) ☐ Fish ☐ Beaver ☒ Deer ☐ Snails ☒ Other: Raccoon

STREAM SHADING (water surface)
☒ Mostly shaded (≥75% coverage)
☐ Halfway (≥50%)
☐ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Unknown
☐ Downcutting
☒ Widening
☐ Headcutting
☐ Aggrading
☒ Sed. deposition
☐ Bed scour
☐ Bank failure
☐ Bank scour
☐ Slope failure
☐ Channelized

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 3-4 (ft)
RT bank 3-4 (ft)
Width: Bottom 8-10 (ft)
Top 15-20 (ft)

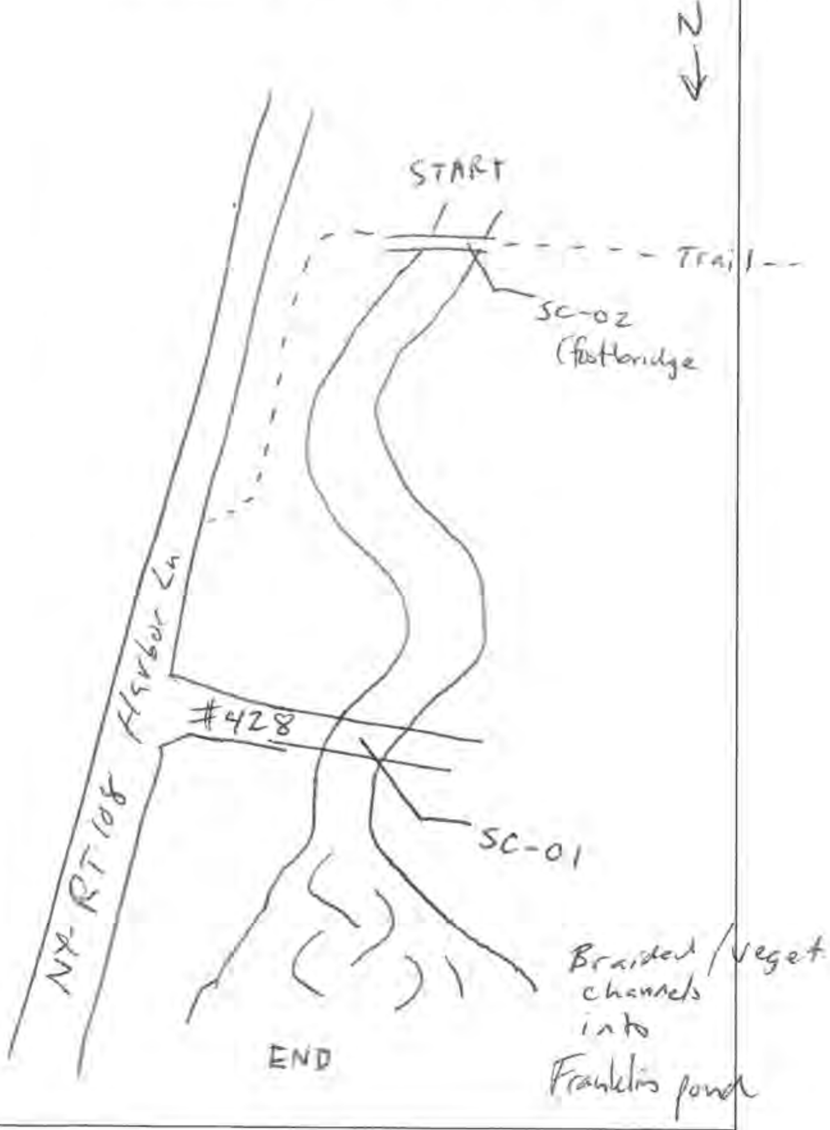
REACH ACCESSIBILITY

Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 [✓ 3] 2 1

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☒ NO

OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 [✓ 14] 13 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank [✓ 10] 9	8 7 6	5 4 3	2 1 0
	Right Bank [✓ 10] 9	8 7 6	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 [✓ 9]	8 7 6	5 4 3	2 1 0
	Right Bank 10 [✓ 9]	8 7 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 [✓ 18] 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank [✓ 10] 9	8 7 6	5 4 3	2 1 0
	Right Bank [✓ 10] 9	8 7 6	5 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 [✓ 16]	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 [✓ 18] 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 [✓ 18] 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Sub Total In-stream: 70 /80 + Buffer/Floodplain: 72 /80 = **Total** Survey Reach 142 /160

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8/24/09
ASSESSED BY: KMB
SURVEY REACH ID: CSB-03
TIME: 3:16 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) /# 26,27
SITE ID: (*Condition-#*) SC-07
LAT 40 ° 50 ' 49.9 " **LONG** 73° 27 ' 27.5 " **LMK**____
GPS (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☒ Box ☐ Elliptical ☐ Circular ☐ Other:

 # BARRELS: ☐ Single ☒ Double ☐ Triple ☐ Other:

MATERIAL: ☒ Concrete sides ☒ Metal top ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 12 (ft)
Height: 5 (ft)
Culvert length: 20 (ft)
Width: 25 (ft)
Roadway elevation: 15 (ft)

CONDITION: (*Evidence of…*)
☒ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☒ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE: ☒ Flat ☐ Slight ($2^{\circ} - 5^{0}$) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☒ no private driveway ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown NONE sand bottom

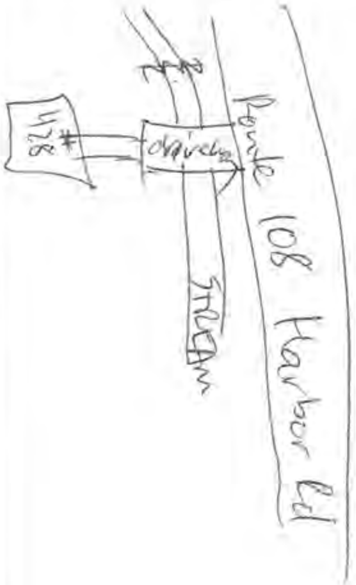
CAUSE:
☐ Drop too high Water Drop: ____ (in)
☐ Flow too shallow Water Depth: ____ (in)
☐ Other:

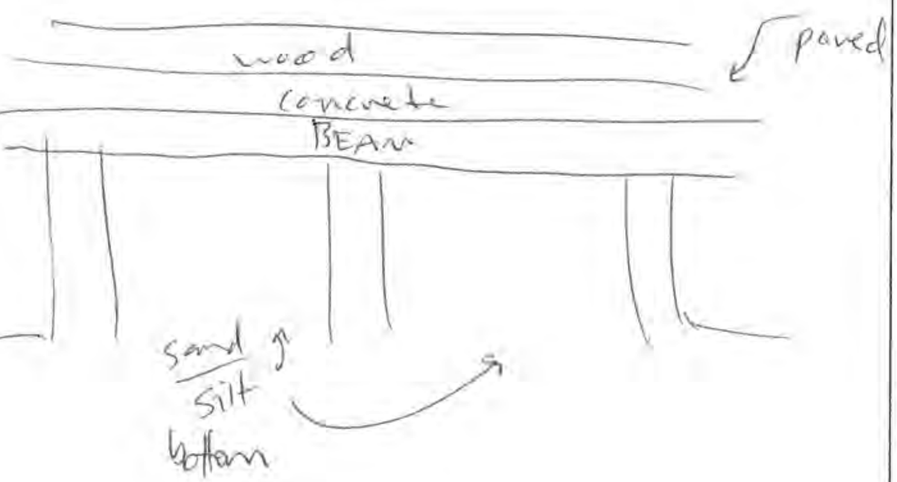
BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 3 2 [✓ 1]
NONE

NOTES/SKETCH:





REPORTED TO AUTHORITIES ☐ YES ☒ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8/24/09
ASSESSED BY: Kmb
SURVEY REACH ID: CSB-03
TIME: 3 : 38 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) /# 31
SITE ID: (*Condition-#*) SC-02
LAT 40 ° 50 ' 40.5 " **LONG** 73 ° 27 ' 23.4 " **LMK**____ **GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☒ Other: Footbridge

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Box ☐ Circular ☐ Other: ☒ Bottomless ☐ Elliptical

 # BARRELS: ☐ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☐ Concrete ☐ Metal ☒ Other: wood

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: ______(ft)
Height: ______(ft)
Culvert length: 3 (ft)
Width: 12 (ft)
Roadway elevation: ______(ft)

CONDITION: (*Evidence of...*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE: ☒ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☒ no ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown NONE

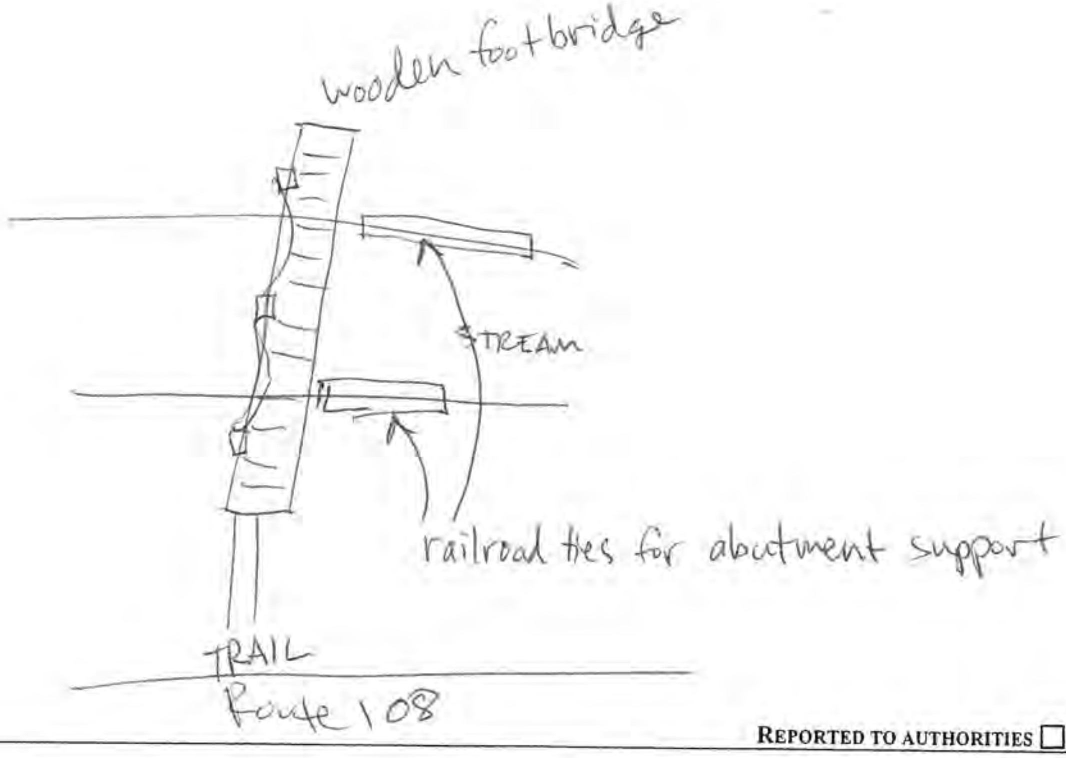
CAUSE:
☐ Drop too high Water Drop: _____ (in)
☐ Flow too shallow Water Depth: _____ (in)
☐ Other:

BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
5 4	3	2 1

NOTES/SKETCH:

(0) NONE



REPORTED TO AUTHORITIES ☐ YES ☒ NO

Trash and Debris

TR

WATERSHED/SUBSHED: Cold Spring Brook

DATE: 8 / 24 / 09

ASSESSED BY: KMB

SURVEY REACH ID: [illegible] CSB-03

TIME: 3 : 27 AM/[✓ PM]

PHOTO ID: (*Camera-Pic #*) /# 30

SITE ID: (*Condition-#*) TR- 01

LAT ___ ° ___ ' ___ " **LONG** ___ ° ___ ' ___ " **LMK** ___

GPS: (*Unit ID*)

entire reach

TYPE:
- ☐ Industrial
- ☐ Commercial
- ☒ Residential

MATERIAL:
- ☒ Plastic
- ☐ Tires
- ☐ Appliances
- ☐ Automotive
- ☐ Paper
- ☐ Construction
- ☐ Yard Waste
- ☐ Other: Cups [illegible]
- ☐ Metal
- ☐ Medical

SOURCE:
- ☐ Unknown
- ☐ Flooding
- ☒ Illegal dump
- ☐ Local outfall

LOCATION:
- ☑ Stream
- ☒ Riparian Area
  - ☐ Lt bank
  - ☐ Rt bank

LAND OWNERSHIP:
- ☐ Public
- ☐ Unknown
- ☒ Private

AMOUNT (*# Pickup truck loads*): 1 trash bag

POTENTIAL RESTORATION CANDIDATE ☒ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping ☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☐ Heavy equipment ☒ Trash bags ☐ Unknown

WHO CAN DO IT: ☒ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☐ Yes ☐ No ☒ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials
[✓ 5]	4	3	2 1

NOTES:

entire reach has bottles, cups, & various other small trash
possibly f/ road

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Reach Level Assessment **RCH**

SURVEY REACH ID: CSB-04 | **WTRSHD/SUBSHD:** Cold Spring Bk | **DATE:** 8/24/09 | **ASSESSED BY:** JHW/KMB

START **TIME:** 4:08 AM/[✓ PM] **LMK:** SC-01
LAT 40° 50' 31.1" **LONG** 73° 27' 19.7"
DESCRIPTION: Beginning of CM-gabion wall

END **TIME:** 3:50 AM/[✓ PM] **LMK:** ______
LAT 40° 50' 40.5" **LONG** 73° 27' 23.4"
DESCRIPTION: Footbridge

GPS ID: GPS Map60

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☒ Suburban/Res ☒ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☒ 0-25% ☐ 25-50 % ☐ 50%-75% ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")
☑ Sand (gritty) ☐ Boulder (>10")
☒ Gravel (0.1-2.5") ☐ Bed rock

WATER CLARITY ☒ Clear ☐ Turbid *(suspended matter)* ☐ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)*

AQUATIC PLANTS IN STREAM
Attached: ☒ none ~~☒ some~~ ☐ lots
Floating: ☐ none ☒ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of)
☒ Fish ☐ Beaver ☐ Deer
☐ Snails ☒ Other: racoon

STREAM SHADING (water surface)
~~☒ Mostly shaded~~ (≥75% coverage)
[✓ ☒ Halfway (≥50%)]
~~☐ Partially shaded~~ (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☒ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☒ Headcutting ☐ Bank scour
☐ Unknown ☐ Aggrading ☐ Slope failure
☒ Sed. deposition ☒ Channelized

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 3 (ft)
RT bank 3 (ft)
Width: Bottom 15 (ft)
Top 20 (ft)

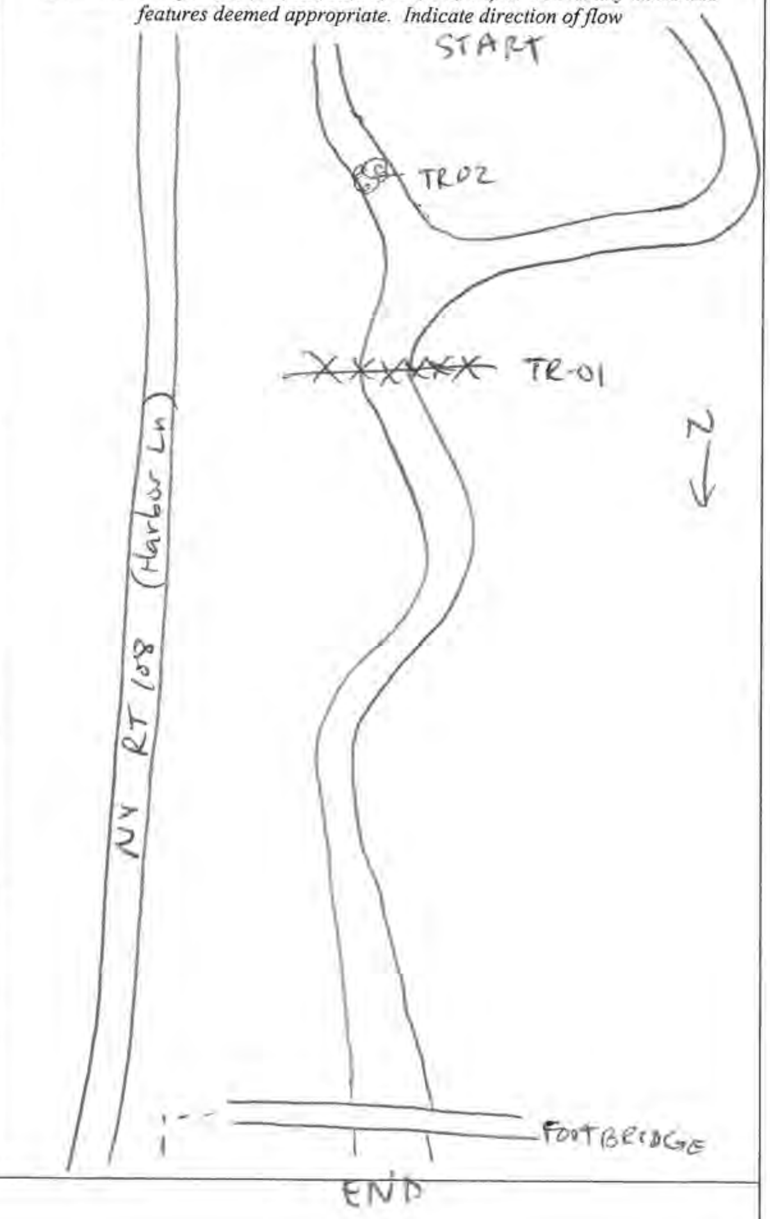
REACH ACCESSIBILITY

Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 3 [✓ 2] 1

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☐ NO

OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
IN-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 [✓ 13] 12 11	10 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
	Right Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 6	[✓ 5] 4 3	2 1 0
	Right Bank 10 9	8 7 6	[✓ 5] 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 [✓ 11]	10 9 8 7 6	5 4 3 2 1 0

OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank [✓ 10] 9	~~8~~ 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	[✓ 5] 4 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 [✓ 12] 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	[✓ 10] 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 [✓ 11]	10 9 8 7 6	5 4 3 2 1 0

Sub Total In-stream: 46 /80 + Buffer/Floodplain: 48 /80 = **Total** Survey Reach 94 /160

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brk **DATE:** 8 / 24 / 09 **ASSESSED BY:** FMB

SURVEY REACH ID: CSB - 04 **TIME:** 04:08 AM/[✓ PM] **PHOTO ID:** (*Camera-Pic #*) /# 34

SITE ID: (*Condition-#*) SC- 01 **LAT** 40° 50 ' 31.1" **LONG** 73° 27 ' 19.7" **LMK** ____ **GPS** (*Unit ID*)

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☒ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☐ Circular ☒ Other: gabion wall

 # BARRELS: ☐ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☐ Concrete ☐ Metal ☐ Other: Rock/wire

ALIGNMENT: ☐ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)

Barrel diameter: ____ (ft)

Height: 24 (ft)

Culvert length: 20 (ft)

Width: 6 (ft)

Roadway elevation: — (ft)

CONDITION: (*Evidence of…*) ☐ Cracking/chipping/corrosion ☐ Downstream scour hole ☐ Sediment deposition ☐ Failing embankment ☐ Other (*describe*):

CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit

☐ no ☒ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE: ☐ Total ☐ Partial ☒ Temporary ☐ Unknown

CAUSE:

☒ Drop too high Water Drop: 24 (in)

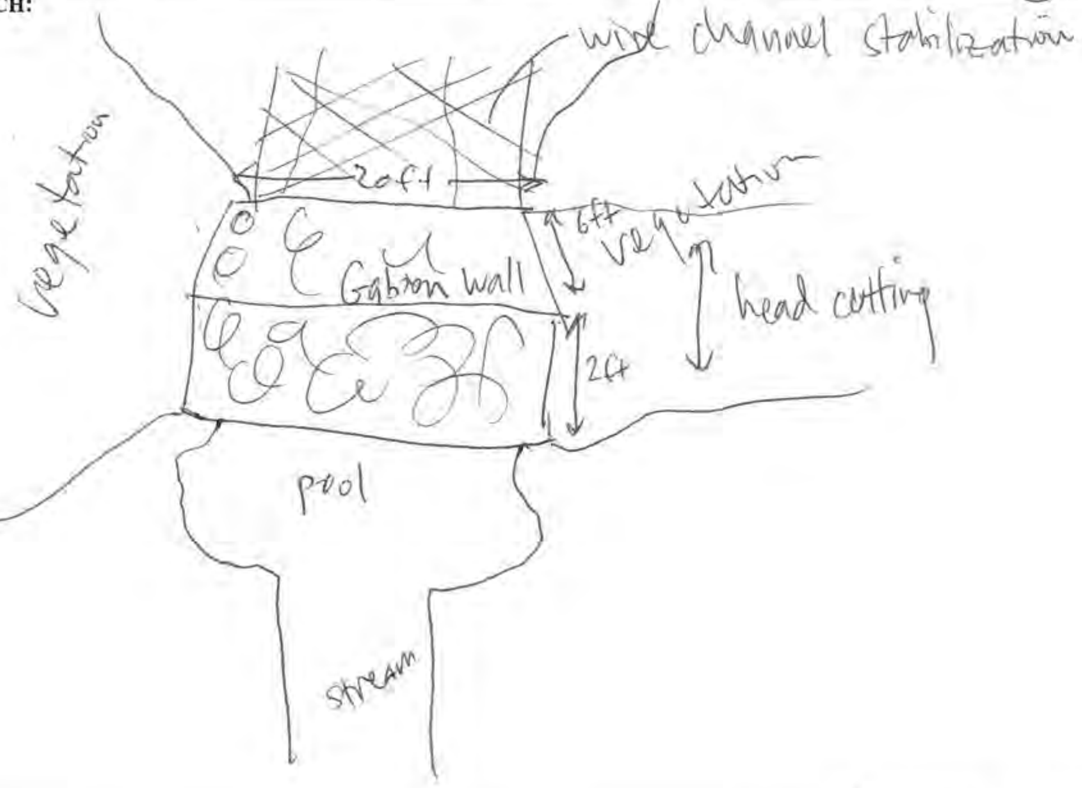
☐ Flow too shallow Water Depth: ____ (in)

☐ Other:

BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.
5 4	3	[✓ 2] 1

NOTES/SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☐ NO

Trash and Debris

TR

WATERSHED/SUBSHED: Cold SpringBk
DATE: 8/24/09
ASSESSED BY: KMB

SURVEY REACH ID: CSB-04
TIME: 3:54 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) /# 32

SITE ID: (*Condition-#*) **TR-** 01
LAT 40° 50' 34.6" **LONG** 73° 27' 20.3" **LMK** ____
GPS: (*Unit ID*)

TYPE:
☐ Industrial
☐ Commercial
☒ Residential

MATERIAL:
☐ Plastic
☐ Tires
☐ Appliances
☐ Automotive
☐ Paper
☐ Construction
☐ Yard Waste
☐ Other:
☒ Metal
☐ Medical

SOURCE:
☒ Unknown
☐ Flooding
☐ Illegal dump
☐ Local outfall

LOCATION:
☒ Stream
☐ Riparian Area
☐ Lt bank
☐ Rt bank

LAND OWNERSHIP:
☐ Public ☐ Unknown
☐ Private

AMOUNT (*# Pickup truck loads*):

POTENTIAL RESTORATION CANDIDATE ☒ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping
☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED: ☒ Heavy equipment ☐ Trash bags ☐ Unknown

WHO CAN DO IT: ☐ Volunteers ☒ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☐ Yes ☐ No ☐ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)

A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access		A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.		A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials	
[✓ 5]	4	3		2	1

NOTES:

wire fence across stream [illegible] long; 4-5 ft tall

access next to road through brush ~~very~~ long probably previous property marker

REPORTED TO AUTHORITIES ☐ YES ☑ NO

Trash and Debris

TR

WATERSHED/SUBSHED: Cold Spring Bk

DATE: 8/24/09

ASSESSED BY: KMB

SURVEY REACH ID: CSB-04

TIME: 4:02 AM [✓ PM]

PHOTO ID: (*Camera-Pic #*) /# 33

SITE ID: (*Condition-#*) TR-02

LAT 40° 50' 33.5" **LONG** 73° 27' 19.8" **LMK** ____

GPS: (*Unit ID*)

TYPE:
- ☐ Industrial
- ☐ Commercial
- ☒ Residential

MATERIAL:
- ☐ Plastic
- ☐ Tires
- ☐ Appliances
- ☐ Automotive
- ☐ Paper
- ☐ Construction
- ☐ Yard Waste
- ☐ Other: mixed house waste
- ☐ Metal
- ☐ Medical

SOURCE:
- ☐ Unknown
- ☐ Flooding
- ☒ Illegal dump
- ☐ Local outfall

LOCATION:
- ☐ Stream
- ☒ Riparian Area
  - ☐ Lt bank
  - ☒ Rt bank

LAND OWNERSHIP:
- ☐ Public
- ☒ Unknown
- ☐ Private

AMOUNT (*# Pickup truck loads*): < 1

POTENTIAL RESTORATION CANDIDATE ☒ Stream cleanup ☐ Stream adoption segment ☐ Removal/prevention of dumping ☐ no ☐ Other:

If yes for trash or debris removal

EQUIPMENT NEEDED : ☐ Heavy equipment ☒ Trash bags ☐ Unknown

WHO CAN DO IT: ☒ Volunteers ☐ Local Gov ☐ Hazmat Team ☐ Other

DUMPSTER WITHIN 100 FT: ☐ Yes ☐ No ☐ Unknown

CLEAN-UP POTENTIAL: (*Circle #*)	A small amount of trash (i.e., less than two pickup truck loads) located inside a park with easy access	A large amount of trash, or bulk items, in a small area with easy access. Trash may have been dumped over a long period of time but it could be cleaned up in a few days, possibly with a small backhoe.	A large amount of trash or debris scattered over a large area, where access is very difficult. Or presence of drums or indications of hazardous materials
	[✓ 5] 4	3	2 1

NOTES: traffic cone, planter, plastic bags, plastic cups/bottles, alum cans

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Reach Level Assessment **RCH**

SURVEY REACH ID: CSB05 **WTRSHD/SUBSHD:** Cold Spring Bk **DATE:** 8/24/05 **ASSESSED BY:** JHW / KMB

START **TIME:** 3:50 AM/[✓ PM] **LMK:** ____
LAT ~~40° 50 ' 40.5 "~~ **LONG** ~~73° 27 ' 23.4 "~~
DESCRIPTION: 40° 50' 12.1" 73° 27' 10.0"
CMP pipe

END **TIME:** 4:08 AM/[✓ PM] **LMK:** ____
LAT 40° 50 ' 31.1 " **LONG** 73° 27 ' 19.7 "
DESCRIPTION: gabion wall

GPS ID: GPS Map06

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☐ Urban/Residential ☒ Suburban/Res ☒ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☒ Other: old field

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☒ 0-25% ☐ 50%-75% ☐ 25-50 % ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick)
☐ Sand (gritty)
☒ Gravel (0.1-2.5")
Gabion
☒ Cobble (2.5 –10")
☐ Boulder (>10")
☐ Bed rock

WATER CLARITY ☒ Clear ☐ Turbid *(suspended matter)* ☐ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)*

AQUATIC PLANTS IN STREAM
Attached: ☒ none ☐ some ☐ lots
Floating: ☒ none ☐ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of)
☐ Fish ☐ Beaver ☐ Deer
☐ Snails ☒ Other: racoon

STREAM SHADING (water surface)
☐ Mostly shaded (≥75% coverage)
☒ Halfway (≥50%)
☐ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☐ Headcutting ☐ Bank scour
☐ Aggrading ☐ Slope failure
☐ Sed. deposition ☒ Channelized
☐ Unknown

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 4 (ft)
RT bank 4 (ft)
Width: Bottom 6 (ft)
Top 12 (ft)

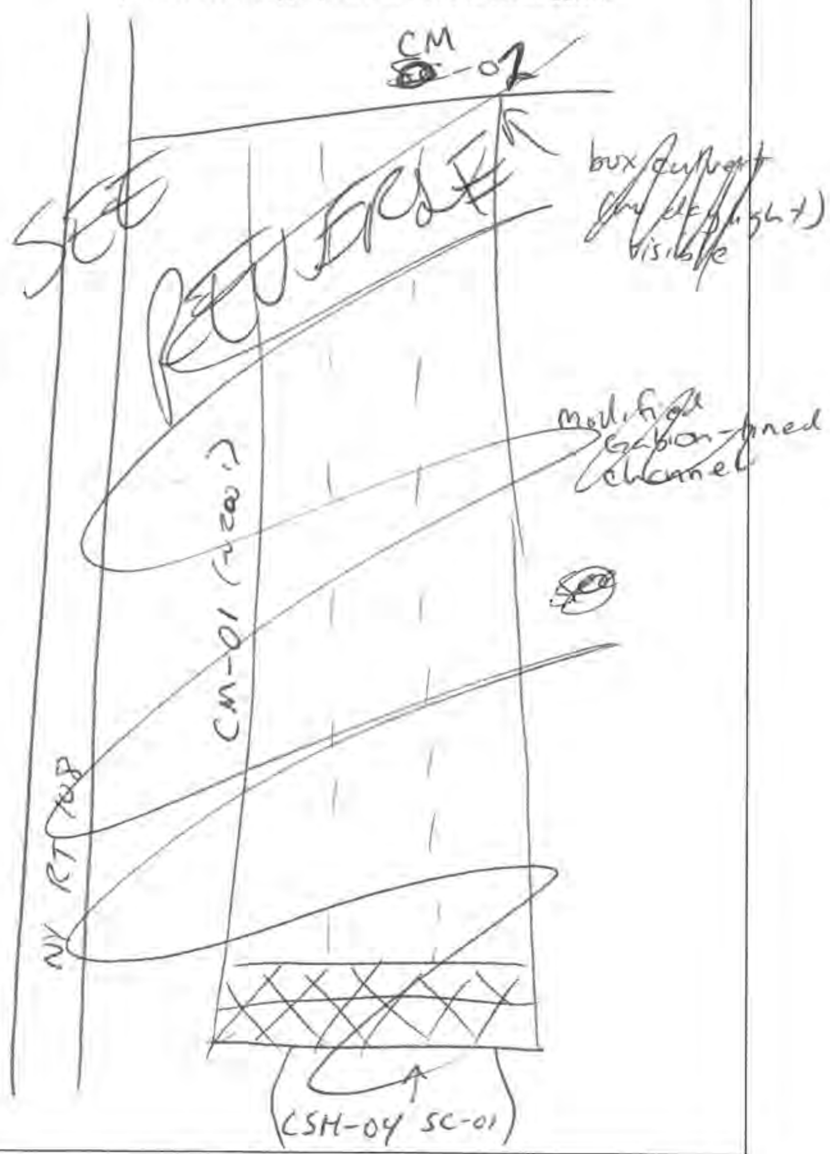
REACH ACCESSIBILITY

Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 [✓ 3] 2 1

REACH SKETCH AND SITE IMPACT TRACKING

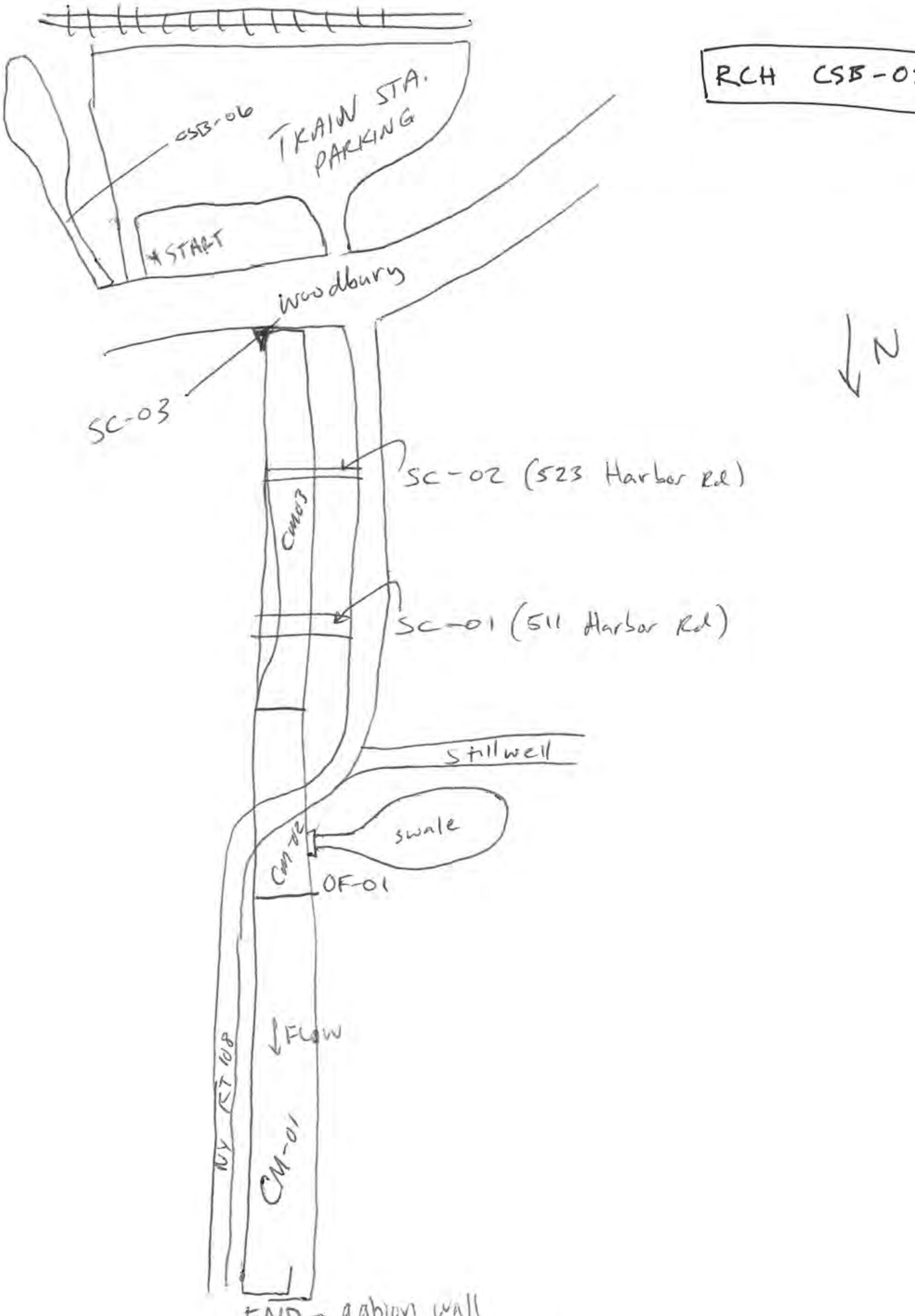
Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☐ NO

RCH CSB-05



CSB-06
TRAIN STA. PARKING
*START
woodbury
SC-03
N
SC-02 (523 Harbor Rd)
CM-03
SC-01 (511 Harbor Rd)
Stillwell
swale
CM-02
OF-01
FLOW
NY RT 108
CM-01
END - gabion wall across stream

OVERALL STREAM CONDITION				
	Optimal	**Suboptimal**	**Marginal**	**Poor**
N-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 [✓ 8] 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 [✓ 4] 3	2 1 0
	Right Bank 10 9	8 7 6	5 [✓ 4] 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use. GABLON	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 [✓ 7] 6	5 4 3	2 1 0
	Right Bank 10 9	8 [✓ 7] 6	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 [✓ 8] 7 6	5 4 3 2 1 0
OVERALL BUFFER AND FLOODPLAIN CONDITION				
	Optimal	**Suboptimal**	**Marginal**	**Poor**
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	~~5~~ 4 [✓ 3]	2 1 0
	Right Bank 10 9	8 7 6	5 4 [✓ 3]	~~2~~ 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 13 12 11	10 9 8 ~~7~~ [✓ 6]	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 [✓ 6]	5 4 3 2 1 0
FLOODPLAIN ENCROACHMENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 [✓ 2] 1 0

Sub Total In-stream: 38 /80 + Buffer/Floodplain: 20 /80 = **Total** Survey Reach 58 /160

Channel Modification

CM

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8/24/09
ASSESSED BY: KMB

SURVEY REACH ID: CSB-05
TIME: 4:22 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) # 36

SITE ID: (*Condition-#*) CM-01
START **LAT** 40° 50' 31.1" **LONG** 73° 27' 19.7 **LMK** ____
END **LAT** 40° 50' 29.2" **LONG** 73° 27' 19.2 **LMK** ____
GPS: (*Unit ID*)

TYPE: ☐ Channelization ☒ Bank armoring ☐ concrete channel ☐ Floodplain encroachment ☒ Other: channel armoring

MATERIAL:
☐ Concrete ☐ Gabion
☐ Rip Rap ☐ Earthen
☒ Metal
☐ Other:

Does channel have perennial flow? ☒ Yes ☐ No
Is there evidence of sediment deposition? ☒ Yes ☐ No
Is vegetation growing in channel? ☐ Yes ☒ No
Is channel connected to floodplain? ☒ Yes ☐ No

DIMENSIONS:
Height — (ft)
Bottom Width 6 (ft)
Top Width: — (ft)
Length: 200 (ft)

BASE FLOW CHANNEL
Depth of flow 1 – 5 (in)
Defined low flow channel? ☒ Yes ☐ No
% of channel bottom 90 %

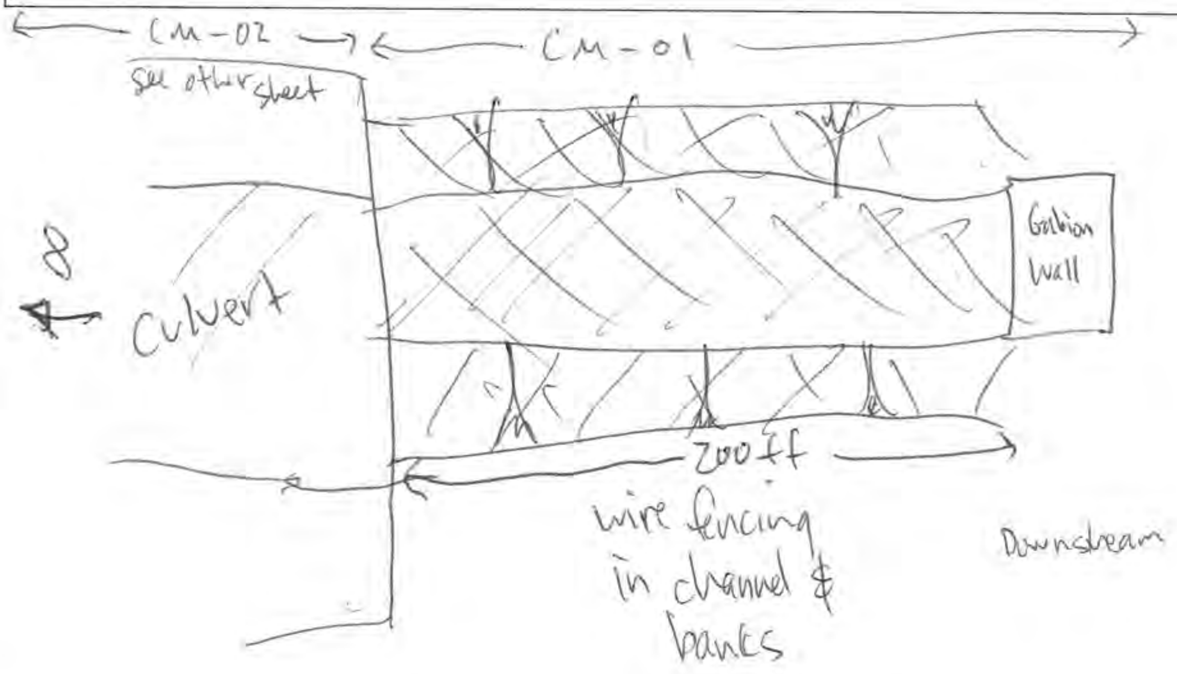
ADJACENT STREAM CORRIDOR
Available width LT ____ (ft) RT ____ (ft)
Utilities Present? ☐ Yes ☐ No
Fill in floodplain? ☐ Yes ☐ No

POTENTIAL RESTORATION CANDIDATE ☐ Structural repair ☐ Base flow channel creation ☐ Natural channel design ☐ Can't tell ☐ no ☐ De-channelization ☐ Fish barrier removal ☒ Bioengineering

CHANNEL-IZATION SEVERITY: (*Circle #*)

A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.		A moderate length (> 200') ,but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.		An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.
5	4	3	[✓ 2]	1

NOTES: wire fence across entire channel and up sides of bank



Channel Modification

CM

WATERSHED/SUBSHED: Cold Spring Brook

DATE: 8/24/09

ASSESSED BY: KMB

SURVEY REACH ID: CSB-05

TIME: 4:23 AM/[✓ PM]

PHOTO ID: (*Camera-Pic #*) /# 35

SITE ID: (*Condition-#*) CM- 02

START **LAT** 40°50'29.2" **LONG** 73°27'19.2" **LMK** ____

END **LAT** 40°50'27.0" **LONG** 73°27'18.1" **LMK** ____

GPS: (*Unit ID*)

TYPE: ☐ Channelization ☐ Bank armoring ☒ concrete channel ☐ Floodplain encroachment ☐ Other:

MATERIAL:
☒ Concrete ☐ Gabion
☐ Rip Rap ☐ Earthen
☐ Metal
☐ Other:

Does channel have perennial flow?	☒ Yes ☐ No
Is there evidence of sediment deposition?	☐ Yes ☒ No
Is vegetation growing in channel?	☐ Yes ☒ No
Is channel connected to floodplain?	☐ Yes ☒ No

DIMENSIONS:

Height	3	(ft)
Bottom Width	12	(ft)
Top Width:	12	(ft)
Length:	unk - very long	(ft)

BASE FLOW CHANNEL

Depth of flow 0.5 (in)

Defined low flow channel? ☒ Yes ☐ No

% of channel bottom 60 %

ADJACENT STREAM CORRIDOR

Available width LT 20 (ft) RT 10 (ft)

ROAD YARD

Utilities Present? ☐ Yes ☒ ~~No~~ UNK

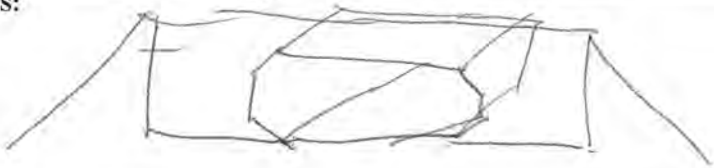
Fill in floodplain? ☒ Yes ☐ No

POTENTIAL RESTORATION CANDIDATE ☐ Structural repair ☐ Base flow channel creation ☐ Natural channel design ☐ Can't tell
☐ no ☒ De-channelization ☐ Fish barrier removal ☐ Bioengineering

CHANNELIZATION SEVERITY: (*Circle #*)

A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.	A moderate length (> 200') ,but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.	An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchanneled stream reaches above and below impacted area.
[✓ 5] 4	3	2 1

NOTES:



Channel Modification

CM

WATERSHED/SUBSHED:

DATE: 8/24/09

ASSESSED BY: KmB

SURVEY REACH ID: SB-05

TIME: 4 : 45 AM/[✓ PM]

PHOTO ID: (*Camera-Pic #*) /# 40

SITE ID: (*Condition-#*) CM-03

START **LAT** 40°50'27.0 **LONG** 73°27'18.1 **LMK** ____

END **LAT** 40°50'27.5 **LONG** 73°27'19.0 **LMK** ____

GPS: (*Unit ID*)

TYPE: ☒ Channelization ☒ Bank armoring ☐ concrete channel ☐ Floodplain encroachment ☐ Other:

MATERIAL:

☐ Concrete ☒ Gabion

☐ Rip Rap ☐ Earthen

☐ Metal

☒ Other: channel wire

Does channel have perennial flow? ☒ Yes ☐ No

Is there evidence of sediment deposition? ☐ Yes ☒ No

Is vegetation growing in channel? ☒ Yes ☐ No

Is channel connected to floodplain? ☐ Yes ☒ No

DIMENSIONS:

Height 3 (ft)

Bottom Width 8 (ft)

Top Width: 8 (ft)

Length: >500 (ft)

BASE FLOW CHANNEL

Depth of flow 0.5 (in)

Defined low flow channel? ☒ Yes ☐ No

% of channel bottom 100 %

ADJACENT STREAM CORRIDOR

Available width LT ______ (ft) RT ______ (ft)

Utilities Present? ☐ Yes ☐ No

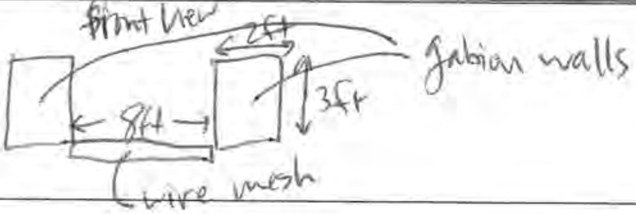
Fill in floodplain? ☐ Yes ☐ No

POTENTIAL RESTORATION CANDIDATE ☐ Structural repair ☐ Base flow channel creation ☐ Natural channel design ☐ Can't tell

☐ no ☐ De-channelization ☐ Fish barrier removal ☐ Bioengineering

CHANNELIZATION SEVERITY: (*Circle #*)	A long section of concrete stream (>500') channel where water is very shallow (<1" deep) with no natural sediments present in the channel.	A moderate length (> 200') ,but channel stabilized and beginning to function as a natural stream channel. Vegetated bars may have formed in channel.	An earthen channel less than 100 ft with good water depth, a natural sediment bottom, and size and shape similar to the unchannelized stream reaches above and below impacted area.
	[✓ 5] 4	3	2 1

NOTES:



Storm Water Outfalls **OT**

WATERSHED/SUBSHED: Cold Springbk
DATE: 8 / 24 / 09
ASSESSED BY: KMB
SURVEY REACH ID: CSB-05
TIME: 11 : 39 AM/PM
PHOTO ID: (*Camera-Pic #*) /# 37
SITE ID (*Condition-#*): **OT-** 01
LAT 40° 50 ' 27.5 " **LONG** 73° 27 ' 19.0 " **LMK** ____
GPS: (*Unit ID*)

BANK: ☐ LT ☒ RT ☐ Head

FLOW: ☒ None ☐ Trickle ☐ Moderate ☐ Substantial ☐ Other:

TYPE:
☒ Closed pipe
☐ Open channel

MATERIAL:
☒ Concrete ☐ Metal ☐ PVC/Plastic ☒ Brick ☐ Other:
☐ Concrete ☐ Earthen ☐ Other:

SHAPE: ☒ Single ☐ Double ☐ Triple
☐ Circular ☒ Elliptical ☐ Other:
☐ Trapezoid ☐ Parabolic ☐ Other:

DIMENSIONS:
Diameter: 8ft ~~(in)~~
Depth: ____ (in)
Width (Top): ____ (in)
" (Bottom): ____ (in)

SUBMERGED: ☒ No ☐ Partially ☐ Fully

NOT APPLICABLE

CONDITION: ☒ None ☐ Chip/Cracked ☐ Peeling Paint ☐ Corrosion ☐ Other:

ODOR: ☒ No ☐ Gas ☐ Sewage ☐ Rancid/Sour ☐ Sulfide ☐ Other:

DEPOSITS/STAINS: ☒ None ☐ Oily ☐ Flow Line ☐ Paint ☐ Other:

VEGGIE DENSITY: ☒ None ☐ Normal ☐ Inhibited ☐ Excessive ☐ Other:

PIPE BENTHIC GROWTH: ☒ None ☐ Brown ☐ Orange ☐ Green ☐ Other:

POOL QUALITY: ☒ No pool ☐ Good ☐ Odors ☐ Colors ☐ Oils ☐ Suds ☐ Algae ☐ Floatables ☐ Other:

FOR FLOWING ONLY
COLOR: ☐ Clear ☐ Brown ☐ Grey ☐ Yellow ☐ Green ☐ Orange ☐ Red ☐ Other:
TURBIDITY: ☐ None ☐ Slight Cloudiness ☐ Cloudy ☐ Opaque
FLOATABLES: ☐ None ☐ Sewage (toilet paper, etc.) ☐ Petroleum (oil sheen) ☐ Other:

OTHER CONCERNS: ☐ Excess Trash (paper/plastic bags) ☐ Dumping (bulk) ☐ Excessive Sedimentation ☐ Needs Regular Maintenance ☐ Bank Erosion ☐ Other:

POTENTIAL RESTORATION CANDIDATE ☐ Discharge investigation ☒ Stream daylighting ☐ Local stream repair/outfall stabilization ☒ No ☐ Storm water retrofit ☐ Other:

If yes for daylighting:
Length of vegetative cover from outfall: ______ ft Type of existing vegetation: ________ Slope: ____ °
Closed Culvert

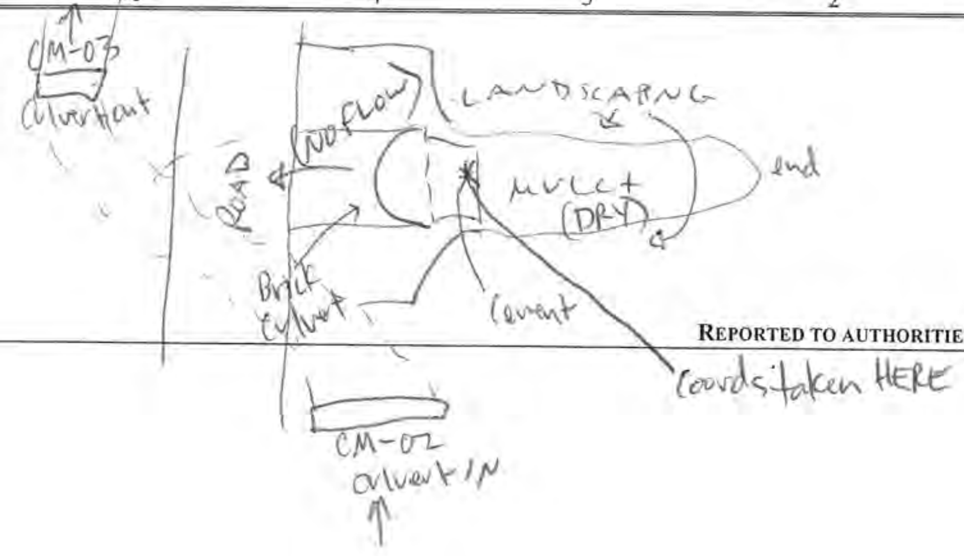
If yes for stormwater:
Is stormwater currently controlled?
☐ Yes ☐ No ☐ Not investigated
Land Use description: ________
Area available:

OUTFALL SEVERITY: (*circle #*)

Heavy discharge with a distinct color and/or a strong smell. The amount of discharge is significant compared to the amount of normal flow in receiving stream; discharge appears to be having a significant impact downstream.		Small discharge; flow mostly clear and odorless. If the discharge has a color and/or odor, the amount of discharge is very small compared to the stream's base flow and any impact appears to be minor / localized.	Outfall does not have dry weather discharge; staining; or appearance of causing any erosion problems.

5 4 3 2 [✓ 1]

SKETCH/NOTES:



REPORTED TO AUTHORITIES: ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook **DATE:** 8 / 24 / 09 **ASSESSED BY:**

URVEY REACH ID: CSB-05 **TIME:** 4 : 54 AM/[✓ PM] **PHOTO ID:** (*Camera-Pic #*) /# 39

SITE ID: (*Condition-#*) SC- 01 **LAT** 40° 50 ' 23.8" **LONG** 73° 27 ' 17.5" **LMK**____ **GPS** (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☒ Box ☐ Circular ☐ Other: ☒ Bottomless ☐ Elliptical

 # BARRELS: ☒ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☒ Concrete ☐ Metal ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 12 (ft)
Height: 3 (ft)
Culvert length: 25 (ft)
Width: ____ (ft)
Roadway elevation: 8 (ft)

CONDITION: (*Evidence of...*) ☐ Cracking/chipping/corrosion ☐ Sediment deposition ☐ Other (*describe*): ☐ Downstream scour hole ☐ Failing embankment

CULVERT SLOPE: ☐ Flat ☐ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ no ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit ☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☒ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE: ☐ Total ☐ Partial ☐ Temporary ☐ Unknown

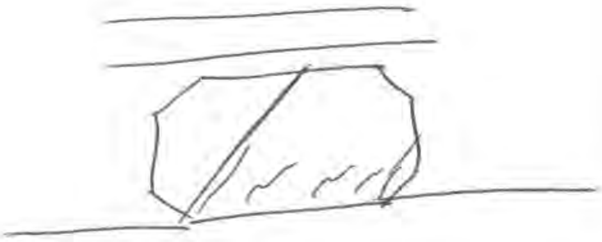
CAUSE:
☐ Drop too high Water Drop: ____ (in)
☐ Flow too shallow Water Depth: ____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 3 2 1

NOTES/SKETCH:



REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook | **DATE:** 8/24/09 | **ASSESSED BY:** KmB

URVEY REACH ID: CSB-05 | **TIME:** 5:13 AM/[✓ PM] | **PHOTO ID:** (*Camera-Pic #*) /# 41-42

SITE ID: (*Condition-#*) SC-02 | **LAT** 40° 50' 19.9" **LONG** 73° 27' 16.6" **LMK**____ | **GPS** (*Unit ID*)

TYPE: ☒ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE:
☐ Arch
☒ Box
☐ Circular
☐ Other:
☒ Bottomless
☐ Elliptical

 # BARRELS:
☒ Single
☐ Double
☐ Triple
☐ Other:

MATERIAL:
☒ Concrete
☐ Metal
☐ Other:

ALIGNMENT:
☒ Flow-aligned
☐ Not flow-aligned
☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 12 (ft)
Height: 3 (ft)
Culvert length: 25 (ft)
Width: ____ (ft)
Roadway elevation: 8 (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion
☐ Sediment deposition
☐ Other (*describe*):
☐ Downstream scour hole
☐ Failing embankment

CULVERT SLOPE:
☐ Flat
☐ Slight (2° – 5°)
☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit ☐ Local stream repair ☐ Other:
☒ no

IS SC ACTING AS GRADE CONTROL ☒ No ☐ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE:
☐ Total ☐ Partial
☐ Temporary ☐ Unknown

CAUSE:
☐ Drop too high Water Drop: ____ (in)
☐ Flow too shallow Water Depth: ____ (in)
☐ Other:

BLOCKAGE SEVERITY: *(circle #)*

A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 3 2 1

NOTES/SKETCH:

Same as SC-01 on CSB-05
driveway crossing upstream of SC-01
Address: #523 Harbor Rd.

REPORTED TO AUTHORITIES ☐ YES ☐ NO

Stream Crossing **SC**

WATERSHED/SUBSHED: Cold Spring Brook
DATE: 8 / 24 / 09
ASSESSED BY: KMB
URVEY REACH ID: CSB-05
TIME: 5 : 48 AM/[✓ PM]
PHOTO ID: (*Camera-Pic #*) /# NONE
SITE ID: (*Condition-#*) SC-03
LAT 40 ° 50 ' 10.8"
LONG 73 ° 27 ' 13.3"
LMK ____
GPS (*Unit ID*)
off corner of woodbury & pulaski – train side

TYPE: ☐ Road Crossing ☐ Railroad Crossing ☐ Manmade Dam ☐ Beaver Dam ☐ Geological Formation ☐ Other:

FOR ROAD/ RAILROAD CROSSINGS ONLY

SHAPE: ☐ Arch ☐ Bottomless ☐ Box ☐ Elliptical ☒ Circular ☐ Other:

 # BARRELS: ☒ Single ☐ Double ☐ Triple ☐ Other:

MATERIAL: ☐ Concrete ☒ Metal ☐ Other:

ALIGNMENT: ☒ Flow-aligned ☐ Not flow-aligned ☐ Do not know

DIMENSIONS: (*if variable, sketch*)
Barrel diameter: 36 (ft)
Height: ____ (ft)
Culvert length: 300 (ft)
Width: ____ (ft)
Roadway elevation: ____ (ft)

CONDITION: (*Evidence of…*)
☐ Cracking/chipping/corrosion ☐ Downstream scour hole
☐ Sediment deposition ☐ Failing embankment
☐ Other (*describe*):

CULVERT SLOPE: ☐ Flat ☒ Slight (2° – 5°) ☐ Obvious (>5°)

POTENTIAL RESTORATION CANDIDATE ☒ no
☐ Fish barrier removal ☐ Culvert repair/replacement ☐ Upstream storage retrofit
☐ Local stream repair ☐ Other:

IS SC ACTING AS GRADE CONTROL ☐ No ☒ Yes ☐ Unknown

If yes for fish barrier

EXTENT OF PHYSICAL BLOCKAGE: ☒ Total ☐ Partial ☐ Temporary ☐ Unknown

CAUSE:
☒ Drop too high Water Drop: 24 (in)
☐ Flow too shallow Water Depth: ____ (in)
☐ Other:

BLOCKAGE SEVERITY: (*circle #*)

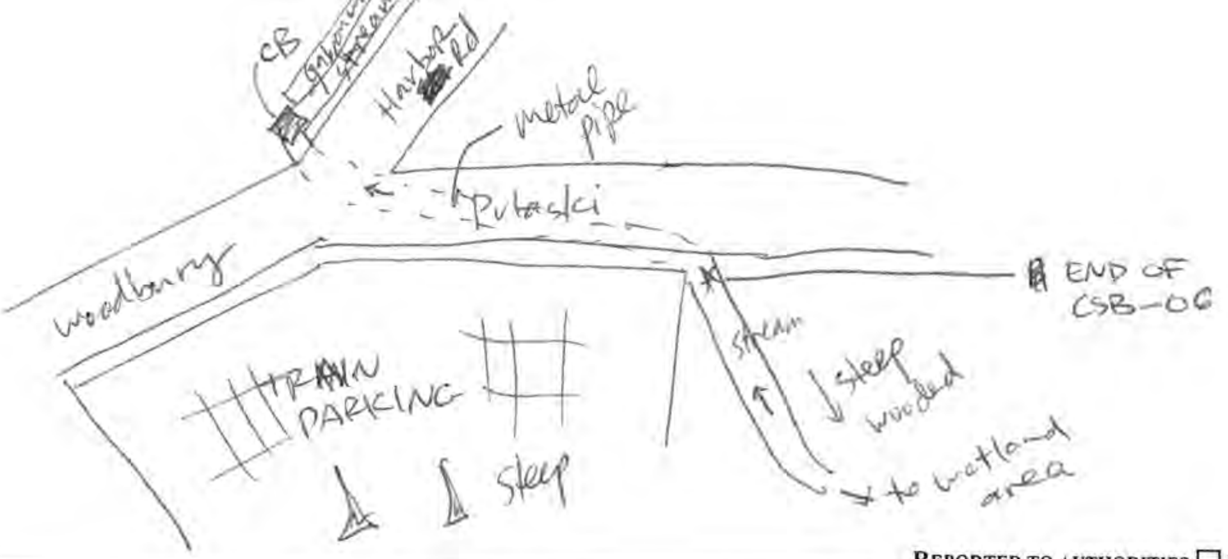
A structure such as a dam or road culvert on a 3rd order or greater stream blocking the upstream movement of anadromous fish; no fish passage device present.	A total fish blockage on a tributary that would isolate a significant reach of stream, or partial blockage that may interfere with the migration of anadromous fish.	A temporary barrier such as a beaver dam or a blockage at the very head of a stream with very little viable fish habitat above it; natural barriers such as waterfalls.

5 4 [✓ 3] 2 1

NOTES/SKETCH:

probably no anadromous fish (shallow flow)

Road crossing from Harbor under Woodbury/Pulaski toward train station



REPORTED TO AUTHORITIES ☐ YES ☐ NO

Reach Level Assessment **RCH**

SURVEY REACH ID: ~~CSB~~ CSB-06 **WTRSHD/SUBSHD:** Cold Spring Bh **DATE:** 8 / 24 / 09 **ASSESSED BY:** JHW / KMB

START **TIME:** 9 : 08 AM/PM **LMK:** ____
LAT ~~40° 50' 31.1"~~ **LONG** ~~73° 27' 19.7"~~
DESCRIPTION: wetland area (headwaters)
40° 50' 13.7" 73° 27' 3.4"

END **TIME:** 5 : 45 AM/[✓ PM] **LMK:** SC-03 CSB 05
LAT 40 ° 50 ' 12.1 " **LONG** 73 ° 27 ' 10.0 "
DESCRIPTION: Pipe CMP &

GPS ID: GPS MapGo

RAIN IN LAST 24 HOURS ☐ Heavy rain ☐ Steady rain ☒ None ☐ Intermittent ☐ Trace

PRESENT CONDITIONS ☐ Heavy rain ☐ Steady rain ☐ Intermittent ☒ Clear ☐ Trace ☐ Overcast ☐ Partly cloudy

SURROUNDING LAND USE: ☐ Industrial ☐ Commercial ☒ Urban/Residential ☒ Suburban/Res ☐ Forested ☐ Institutional ☐ Golf course ☐ Park ☐ Crop ☐ Pasture ☐ Other:

AVERAGE CONDITIONS *(check applicable)*

BASE FLOW AS % CHANNEL WIDTH ☒ 0-25% ☐ 50%-75% ☐ 25-50 % ☐ 75-100%

DOMINANT SUBSTRATE
☐ Silt/clay (fine or slick) ☐ Cobble (2.5 –10")
☒ Sand (gritty) ☐ Boulder (>10")
☐ Gravel (0.1-2.5") ☐ Bed rock

WATER CLARITY ☒ Clear ☐ Turbid *(suspended matter)* ☐ Stained *(clear, naturally colored)* ☐ Opaque *(milky)* ☐ Other *(chemicals, dyes)*

AQUATIC PLANTS IN STREAM
Attached: ☒ none ☐ some ☐ lots
Floating: ☒ none ☐ some ☐ lots

WILDLIFE IN OR AROUND STREAM (Evidence of) ☐ Fish ☐ Beaver ☐ Deer ☐ Snails ☐ Other:

STREAM SHADING (water surface)
☐ Mostly shaded (≥75% coverage)
☒ Halfway (≥50%)
☐ Partially shaded (≥25%)
☐ Unshaded (< 25%)

CHANNEL DYNAMICS
☐ Downcutting ☐ Bed scour
☐ Widening ☐ Bank failure
☐ Headcutting ☐ Bank scour
☐ Aggrading ☐ Slope failure
☐ Unknown ☒ Sed. deposition ☐ Channelized

CHANNEL DIMENSIONS *(FACING DOWNSTREAM)*
Height: LT bank 3 (ft)
RT bank 4 (ft)
Width: Bottom 8 (ft)
Top 18 (ft)

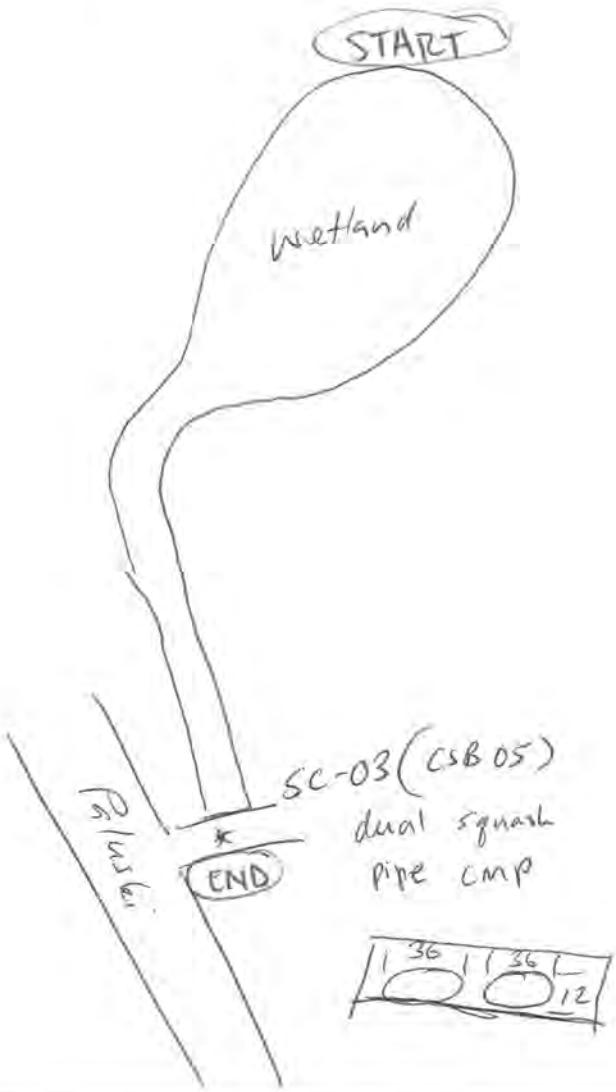
REACH ACCESSIBILITY

Good: Open area in public ownership, sufficient room to stockpile materials, easy stream channel access for heavy equipment using existing roads or trails.	**Fair:** Forested or developed area adjacent to stream. Access requires tree removal or impact to landscaped areas. Stockpile areas small or distant from stream.	**Difficult.** Must cross wetland, steep slope, or sensitive areas to get to stream. Few areas to stockpile available and/or located a great distance from stream. Specialized heavy equipment required.

5 4 3 [✓ 2] 1

REACH SKETCH AND SITE IMPACT TRACKING

Simple planar sketch of survey reach. Track locations and IDs for all site impacts within the survey reach (OT, ER, IB,SC, UT, TR, MI) as well as any additional features deemed appropriate. Indicate direction of flow



NOTES: *(biggest problem you see in survey reach)*

REPORTED TO AUTHORITIES ☐ YES ☒ NO

OVERALL STREAM CONDITION

	Optimal	Suboptimal	Marginal	Poor
N-STREAM HABITAT *(May modify criteria based on appropriate habitat regime)*	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	[✓ 10] 9 8 7 6	5 4 3 2 1 0
VEGETATIVE PROTECTION *(score each bank, determine sides by facing downstream)*	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
	Right Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
BANK EROSION (facing downstream)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Grade and width stable; isolated areas of bank failure/erosion; likely caused by a pipe outfall, local scour, impaired riparian vegetation or adjacent use.	Past downcutting evident, active stream widening, banks actively eroding at a moderate rate; no threat to property or infrastructure	Active downcutting; tall banks on both sides of the stream eroding at a fast rate; erosion contributing significant amount of sediment to stream; obvious threat to property or infrastructure.
	Left Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
	Right Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
FLOODPLAIN CONNECTION	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) able to enter floodplain. Stream not deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.	High flows (greater than bankfull) **not** able to enter floodplain. Stream deeply entrenched.
	20 19 18 17 16	15 14 13 12 11	10 9 [✓ 8] 7 6	5 4 3 2 1 0

OVERALL BUFFER AND FLOODPLAIN CONDITION

	Optimal	Suboptimal	Marginal	Poor
VEGETATED BUFFER WIDTH	Width of buffer zone >50 feet; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, crops) have not impacted zone.	Width of buffer zone 25-50 feet; human activities have impacted zone only minimally.	Width of buffer zone 10-25 feet; human activities have impacted zone a great deal.	Width of buffer zone <10 feet: little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 [✓ 6]	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 [✓ 4] 3	2 1 0
FLOODPLAIN VEGETATION	Predominant floodplain vegetation type is mature forest	Predominant floodplain vegetation type is young forest	Predominant floodplain vegetation type is shrub or old field	Predominant floodplain vegetation type is turf or crop land
	20 19 18 17 16	15 14 [✓ 13] 12 11	10 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN HABITAT	Even mix of wetland and non-wetland habitats, evidence of standing/ponded water	Even mix of wetland and non-wetland habitats, no evidence of standing/ponded water	Either all wetland or all non-wetland habitat, evidence of standing/ponded water	Either all wetland or all non-wetland habitat, no evidence of standing/ponded water
	20 19 18 17 16	15 14 13 12 11	[✓ 10] 9 8 7 6	5 4 3 2 1 0
FLOODPLAIN ENCROACH-MENT	No evidence of floodplain encroachment in the form of fill material, land development, or manmade structures	Minor floodplain encroachment in the form of fill material, land development, or manmade structures, but not effecting floodplain function	Moderate floodplain encroachment in the form of filling, land development, or manmade structures, some effect on floodplain function	Significant floodplain encroachment (i.e. fill material, land development, or man-made structures). Significant effect on floodplain function
	20 19 18 17 16	15 14 13 12 11	[✓ 10] 9 8 7 6	5 4 3 2 1 0

Sub Total In-stream: 42 /80 + Buffer/Floodplain: 43 /80 = **Total** Survey Reach 85 /160

Photo Inventory

(By Camera)

STREAM ASSESSMENTS

Project: OB/CSH

Group: JHW/KMB

Camera: Cannon A580

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
8/24/09	CSB-01	SC-01	100-001	spillway (U/S)
		SC-01	100-002	scour hole (D/S)
		SC-02	003	2° spillway (fore) (U/S) + 1° spillway (back)
		IB-01	004	stream reach (D/S) + IB-01
		OT-01	005	OT-01
		OT-02/03	006	OT-02/03 = 2 × 6" drain pipes
		OT-04	007	OT-04 = 12" clay pipe from hatchery
		SC-03	008	D/S Left } dual box culvert under
		SC-03	009	D/S Right } NY-25A Bridge # 0183-0
		SC-03	010	U/S Right } Ibid
		SC-03	011	U/S Left }
		OT-05	012	U/S look @ OT-05
		OT-05	013	D/S from OT-05 look @ CSH
			100-014 to 016	Panoramic of CSH
		OT-06	017	U/S look @ OT-06

OT-06 018 D/S look from OT-06

(BACK)

PAGE 1 OF 3

Photo Inventory

(By Camera)

Project: CSH/OBH
Group: JHW/KMB
Camera: Canon A580

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
8/24/09	CSB-02		100-019	U/S end of reach
↓	↓		020	D/S end of reach toward St John's Pond
↓	↓	SC-01	021	U/S start of reach @ SC-01
↓	↓		022	D/S from start of reach
↓	↓		023	U/S mid-reach
↓	↓		024	D/S mid-reach
↓	↓		025	Typical iron staining no source other than ground water
↓	CSB-03	SC-01	026	U/S Left } facing 428 Harbor Ln x-ing
↓	↓	SC-01	027	U/S Right }
↓	↓		028	U/S from end of reach
↓	↓		029	D/S from end of reach
↓	↓	TR-01	030	Typ. trash in stream reach
↓	↓	SC-02	031	Footbridge w/ timber abutments
↓	CSB 04	TR-01	032	wire fence
↓	↓	TR-02	033	misc. debris

(BACK)

Photo Inventory

(By Camera)

Project: CSH/OBH

Group: JHW/KMB

Camera: Canon A580

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
8/24/09	CSB-04	SC-01	100-034	gabion wall preventing headcut
	CSB-05	CM ~~SC~~-02	035	U/S facing SC-01
	CSB05	CM ~~S~~-01	036	D/S facing modified stream channel
		OF-01	037	facing OF01
			038	facing rention swale connected to OF01
		SC-01	039	U/S facing SC-01 (511 Harbor Ln)
		CM-03	040	Gabion lined channel (CM-03) facing D/S @ SC-01
			41	U/S of SC02
			42	D/S of SC02
		SC-02	43	U/S facing SC02
	CSB-06		44	U/S from CSB-05 "SC-03"

(BACK)

PAGE 3 OF 3

Photo Inventory

(By Camera)

UPLAND ASSESSMENTS

Project: Friends of the Bay
Group: KNB/DRB
Camera: Canon

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
8/25	Main St Huntington		100-0046	looking east on Main St
			0047	Storefront on Main St.
			0048	Garden & adjacent storm drain
			-0052 -0053	sidewalks, downspouts Storm drain in front of fire station
	Harbor Road	CSH-NSI-01	-0054	Cold Spring Harbor Fire Dept.
		CSH-NSI-01	0055-0061	State park parking area - sandy, opportunity for retrofit
			0062 -0067	Harbor Rd neighborhood
		CSH-SSD-01 CSH-SSD-02	-0068 -0069	streets & storm drains terrace place stormdrain & paved ditch
			-0070 -0071	Park & Main St / Harbor Rd Photo behind ~~Downtown~~ Huntington
	Main St Huntington	HSI-01 (CSH)	-0072 -0078	Huntington Downtown Muni Parking Lot (next to post office)
	Florence/ Ship's Pt Neighborhood	OBH-NSA-01	-0079 -0082	Florence Road
		[illegible] WCR HSI-01	0083 0085	Commander Oil Terminal
		OBH-NSA-01 OBH-~~NSA~~ SSD-01	0086 0087	Dog waste sign Melbourne St Storm drain w/ marker CB-1
			0088 -0090	Ships point Outfall
		OBHSSD-01 OBH-NSA-01	-0092 -0093	CB#2 (Sidney & Ships Pt) Ship's Point Cove along length

(BACK)

PAGE 1 OF 4

Photo Inventory

(By Camera)

Project: FRIENDS OF THE BAY

Group: KMB/DRB

Camera: Conor

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Date	Stream/ Reach	Location ID	Photo #	Description
8/25	OBH-HSI-02 →		100-0094 -0103	Oyster Bay High School
			0104- 0106	Town Offices
		OBH-HSI-01	0109 0119 0120	L.I. Railway Yard
			0124 0125 0133	Fireman Field Jacobsen
			0134 0138	Recharge Basin
		MNC-NSA-01 MNR-SSD-01	0142	CB-1
8/26/09			0147	Oak Hill Drive Basin
		WCR-NSA-01	0148	Singworth ST Neighborhood
			0149 0150	STORM BASIN 600
	Bailey Arboretum	BAI-NSA-01	151- 153	Matinecock Lane
	Mill Neck Creek	MNC-NSA-01	154	Hernan Ave dead end outfall to OAK Neck Creek (Mill Neck Cr)
	Mill Neck Creek	MNC-SSD-02	155	Hernan Ave CB-01
	↓	↓	156 157	Hernan Ave CB-02
	↓	↓	158- 159	outlet to wetland area - Hernan Ave
	CTR	CTR-NSA-01	160	House on Centre Island Rd
	↓	CTR-HSI-01	161- 162	Seawanhaka Yacht Club

(BACK)

PAGE 2 OF 4

Photo Inventory

(By Camera)

Project: Oyster Bay

Group: KMB / DRB

Camera: ____________

This field sheet is to be completed AS photos are taken in the field. The intent is to force us to organize pictures taken on a camera basis. Fill out one sheet per camera (add sheets as needed). Only fill in Date/Reach/Location ID when you start in a new spatial or temporal location.

Date	Stream/ Reach	Location ID	Photo #	Description
8/26/09	WCR	WCR-SSD -01	163-166	Catch basin#1 in stop & shop lot (163?); plaza; 166 - CB#2
			167-168	Pine Hollow possible sidewalk retrofit
		WCR-HSI-02	169-170 171-173	rite aid - behind Stop shop - behind
			174 176	Construction - DeBellis & Sons Contractors Collision unlimited
	WCR	WCR-RRI-01	177	NYS Recharge Basin #15
			178 181	Boys & Girls Club Back " " Front
	BAI	BAI-HSI-01	182-184	Locust Valley Int. School Bus maintenance facility
		BAI-HSI-01	185 186	roof leaders fueling - outdoors
		BAI-RRI-01	187-192	Retrofit at Int. School - Locust Valley
		BAI-RRI-02	193-194	Ann M. MacArthur Primary school potential retrofit
	MNC	MNC-RRI-01	195-198	END OF WALTON AVE - MNC potential restoration spot
	WCR	WCR-RRI-02	199-204	White's Creek on White st for retrofit → daylighting stream
	OBH	OBH-NSA-02	205-210	Maxwell St NSA
	CSB	CSB-RRI-01	211-212 213-214	MTA station drainage swale far south of site → 40°50'7.5" 73°27' 13.1" evidence of erosion → 40'50' 8.4" 73° 27' 10.7"
			215-216 217-218	same loc ↑ possible bioret/garden - 5 manholes front grass island

(BACK)

PAGE 3 OF 4

Photo Inventory

(By Camera)

upper francis pond = "smithes" Bk. Nassau Co.

Project: ______________

Group: ______________

Camera: ______________

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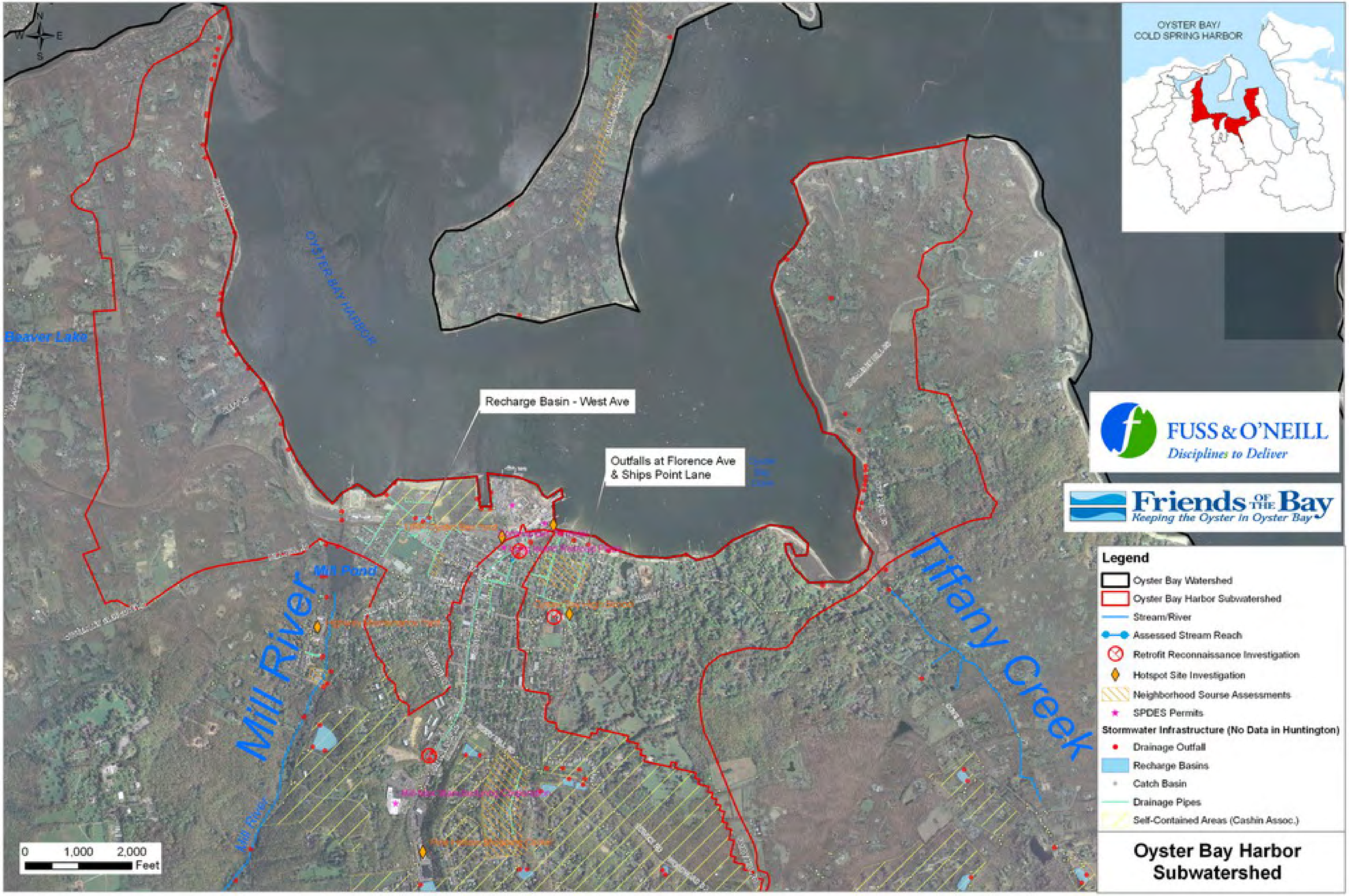
Date	Stream/ Reach	Location ID	Photo #	Description
8/27/09	OBH	OBH-RR-01	219-220	High school admin Bldg - E main St. lower lot drainage - no curb/gutter
			221	Beakman's Creek drainage outlet to stream conveys sediment
			222-226	The Birches - Meleray & surrounding Streets - Davis, etc.
			227-228	Pond draining to Beakman Creek 1050 Shore Rd.
8/27	Mill River	MRV-NSA-01	229-233	50 Glen Cove Road - OB Housing Apartments Authority
		MRV-HSI-01	234-243	OB Town Highway Garage
			244-245	Tiffany Creek Accommodation Cove Rd & Shutter Lane
			246-248	Factory Pond Road [illegible] Recommendation
			249 250-251	Shu swamp & Dogwood Lane erosion Valley ~~Road~~ Ave large curb inlets & concrete gutter -
			252-257	Mill River Road - Cooling retrofit
			258-259	Locust Ave Mill River headwaters filthy standing water in outlet stream

(BACK)

PAGE 4 OF 4

Tiffany Creek Subwatershed


OYSTER BAY/
COLD SPRING HARBOR
N
S
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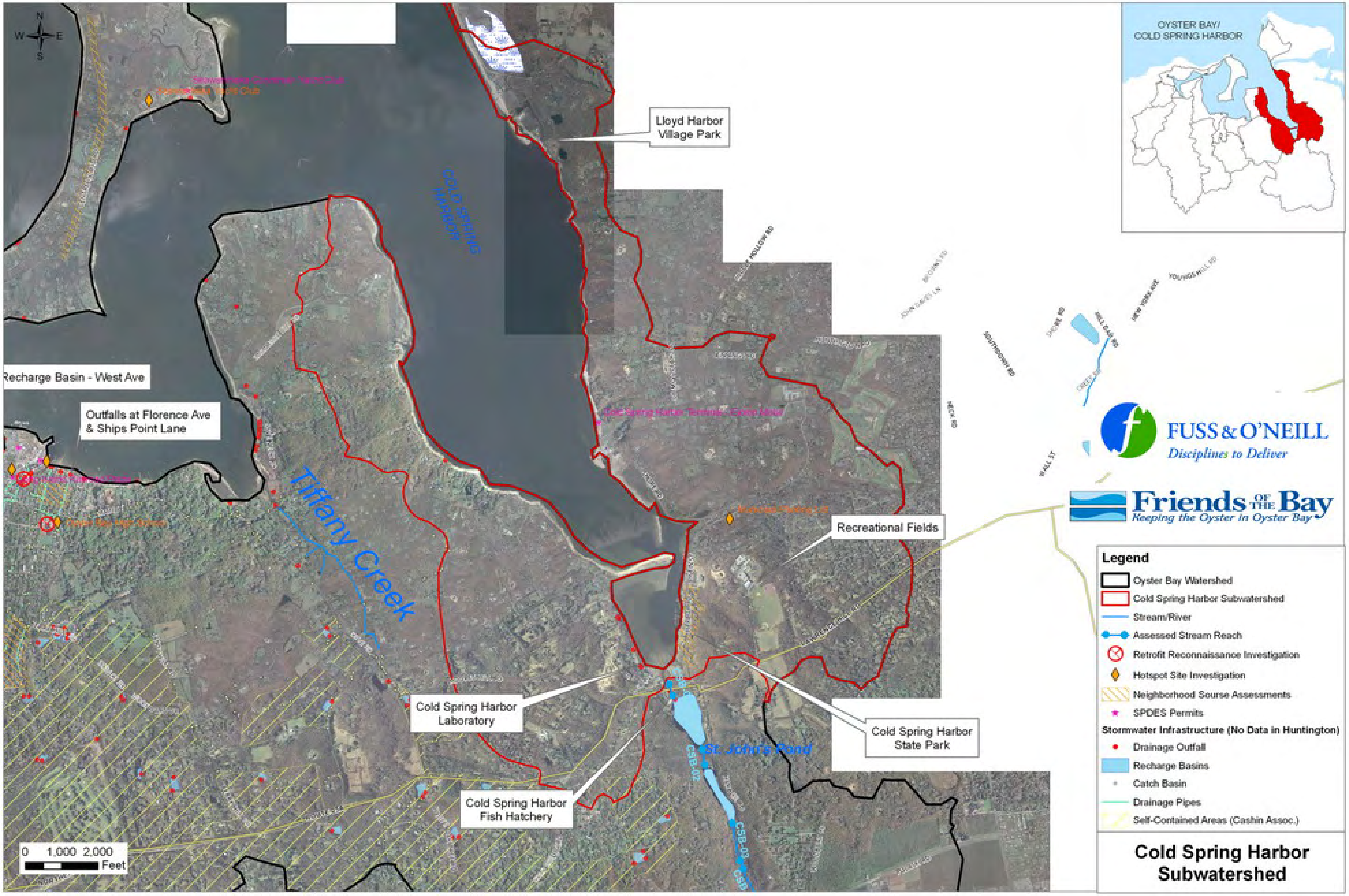
W
Beaver Lake
OYSTER BAY HARBOR
Recharge Basin - West Ave
Outfalls at Florence Ave
& Ships Point Lane
Mill Pond
Mill River
Tiffany Creek
0
1,000
2,000
Feet
FUSS & O'NEILL
Disciplines to Deliver
Friends of the Bay
Keeping the Oyster in Oyster Bay
Legend
Oyster Bay Watershed
Oyster Bay Harbor Subwatershed
Stream/River
Assessed Stream Reach
Retrofit Reconnaissance Investigation
Hotspot Site Investigation
Neighborhood Sourse Assessments
SPDES Permits
Stormwater Infrastructure (No Data in Huntington)
Drainage Outfall
Recharge Basins
Catch Basin
Drainage Pipes
Self-Contained Areas (Cashin Assoc.)
Oyster Bay Harbor
Subwatershed

Mill River Subwatershed

Mill Neck Creek Subwatershed

Lloyd Neck Subwatershed

Kentuck Brook Subwatershed



Cold Spring Harbor Subwatershed

Cold Spring Brook Subwatershed

FUSS & O'NEILL
Disciplines to Deliver

Friends OF THE Bay
Keeping the Oyster in Oyster Bay

Beaver Brook Subwatershed

White's Creek Subwatershed


JAMAICA
ASH
333-2211

LOST PHO


NO
PARKING
8AM–11PM
MAY 1ST TO
SEPT. 30
DOG WASTE
TRANSMITS DISEASE POLLUTES
OUR HARBORS CONTAMINATES
OUR DRINKING WATER
CLEAN UP
AFTER YOUR
DOG
IT'S REQUIRED BY LAW!
$25. FINE OR IMPRISONMENT
ORD. 10[illegible]5A & B


DEAD
END


STOP


DO
30
UNITED STATES POSTAL SERVICE


DO NOT
ENTER


LEE
CONSTRUCTION
Cold Spring Harbor, N.Y.


Gulf
2.99
ANY TIME
NO STOPPING ANY TIME


DEAD END


141


150
PRIVATE
MEMBERS & GUESTS ONLY
NO


150


91899-JV


to...
COLD SPRING HARBOR
STATE PARK
DAVID PATERSON
CAROL ASH
LONG ISLAND
the Long Island Greenbelt Trail Conference
STOPPING
ANY
TIME


ELM PL
STOP HERE ON RED


SPEED LIMIT 30
Orpheus


IRELAND-GANNON
ASSOCIATES
Designers and builders
of fine landscapes


Faded Rose
"Vintage designs & elegance for the home"
153
FADED ROSE


OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE
NYS Environmental
Protection Fund
Methodist Church Investigation & Stabilization
The Society for the Preservation of Long Island Antiquities (SPLIA)
George E. Pataki, Governor
[illegible] Castro, Commissioner


35
MPH


3 0-


TOWN of OYSTER BAY TOWN HALL
VISITOR PARKING 20 MINUTES


Do Not Block Driveway
Do Not Block Driveway
Future Site of
OYSTER BAY RAIL ROAD MUSEUM
In Conjunction with Town of Oyster Bay
☑ Phase One: LEASE LAND COMPLETE
☑ Phase Two: AQUIRE HISTORIC OYSTER BAY RAIL ROAD STATION
☐ Phase Three: RESTORE TURNTABLE, ROLLING STOCK & LOCOMOTIVE 35
☐ Phase Four: OPEN FOR BUSINESS
"Get On Board" - Volunteers / Members Welcome
558-7036


C-50
Do Not Block Driveway
Do Not Block Driveway

TOYOTA


CLOTHING & SHOE DROP


SPEED
LIMIT
10


Oyster Bay Western Waterfront
Former Jakobson Ship Yard
State of New York
Department of Environmental Conservation
In Partnership with
Town of Oyster Bay


SCOOPY DOO
DOG & GOOSE WASTE REMOVAL
516 676-0083
Office Space
FOR
RENT
516 484-6068
Mathew A. Ziccardi Esq.
Attorney at Law
516-330-8051
WILLIAM A. DiCONZA
ATTORNEY AT LAW


BAYVIEW AVE


5
HONDA
VENTURE


HOLDEN


NASSAU COUNTY
STORM BASIN 600
NO TRESPASSING


MATINECOCK LA.
Daniel Gale
Sotheby's
516 759 4800


STOP&SHOP


Pine Hollow Center
RITE AID
PHARMACY
1-HR PHOTO
GNC
Marty's Party


WINE FACTORY OUTLET
CLEANERS & TAILORS
4 NAIL U SPA
NAIL & S
OPEN
NAIL
MANICURE
PEDICURE
WAXING
4 NAIL U SPA
EUROPEAN TAILORS


NO


CARDBOARD
ONLY


WINTERS
BROS
491-4923
937-0900
CARDBOARD
ONLY


MIDORI


CANDY BRAND


COLLISION Unlimited
922-2332
Body Repair


106

BOYS & GIRLS CLUB


RAMP
120
STOP
LOCUST
SCHOOL DISTRICT
DIESEL


SCHOOL BUS
SCHOOL BUS
SCHOOL BUS
SCHOOL BUS

SCHOOL BUS
EMERGENCY DOOR
OPERATOR
112
516-674-6340
W-23856
FUTURA
WINTERS BROS.

RTHUR


NO PARKING
FIRE
ZONE
BUS
ONLY


DEAD
END


DEAD
END


DEAD
END


OAK CLIFF
BOAT YARD
STOP


NO PARKING ANY TIME


STOP


CATERPILLAR


Nassau County/Town of Oyster Bay
Capital Improvement Project
Thomas R. Suozzi
County Executive
John Venditto
Town Supervisor
Diane Yatauro
Presiding Officer
Nassau County Legislator
Elizabeth A. Faughnan
Councilwoman
Oyster Bay Town Board
Project : Locust Valley (AKA Birches)
Sanitary Sewer, Storm Water
and Roadway Improvements


CHEVROLET


THIS ROAD
WILL BE
CLOSED
SUNDAY
AUG. 30TH
7:30AM TO 12PM


NO STOPPING ANY TIME


CHEVROLET


YARD SPEED
5
H.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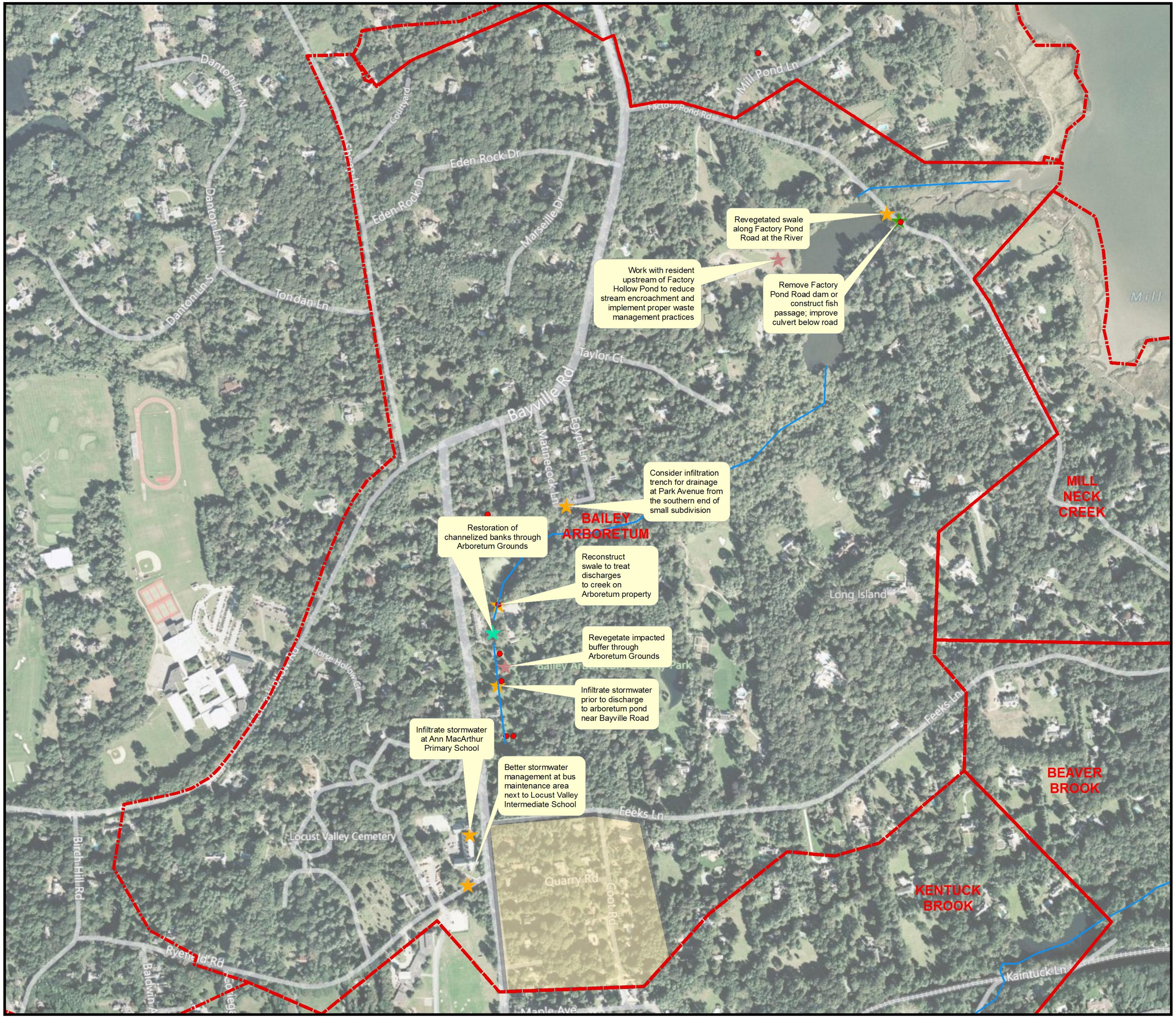
META
ONL

PLANTIN
ARBOR

Appendix B

Maps of Subwatershed Recommendations



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore
Keeping the Oyster Bay
Est. 1987

FUSS & O'NEILL

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▭ Self-contained Drainage Areas

N
W E
S

0 550 1,100
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
bing Maps Hybrid (c) 2010 Microsoft Corporation and its data suppliers
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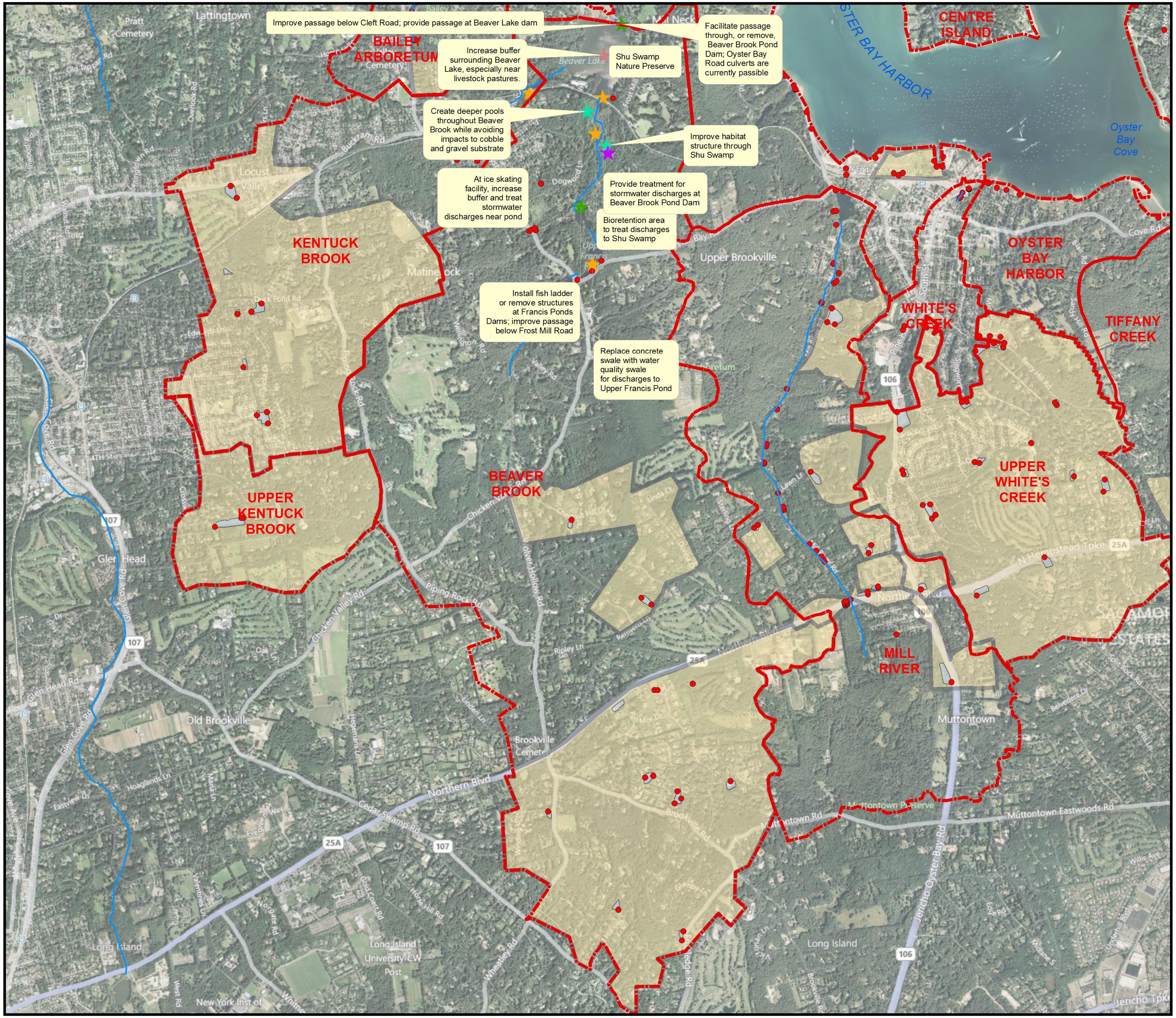
Subwatershed Recommendations
Bailey Arboretum Subwatershed



Improve passage below Cleft Road; provide passage at Beaver Lake dam

Increase buffer surrounding Beaver Lake, especially near livestock pastures.

Shu Swamp Nature Preserve

Facilitate passage through, or remove, Beaver Brook Pond Dam; Oyster Bay Road culverts are currently passible

Create deeper pools throughout Beaver Brook while avoiding impacts to cobble and gravel substrate

Improve habitat structure through Shu Swamp

At ice skating facility, increase buffer and treat stormwater discharges near pond

Provide treatment for stormwater discharges at Beaver Brook Pond Dam

Bioretention area to treat discharges to Shu Swamp

Install fish ladder or remove structures at Francis Ponds Dams; improve passage below Frost Mill Road

Replace concrete swale with water quality swale for discharges to Upper Francis Pond

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

- ▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▭ Self-contained Drainage Areas

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Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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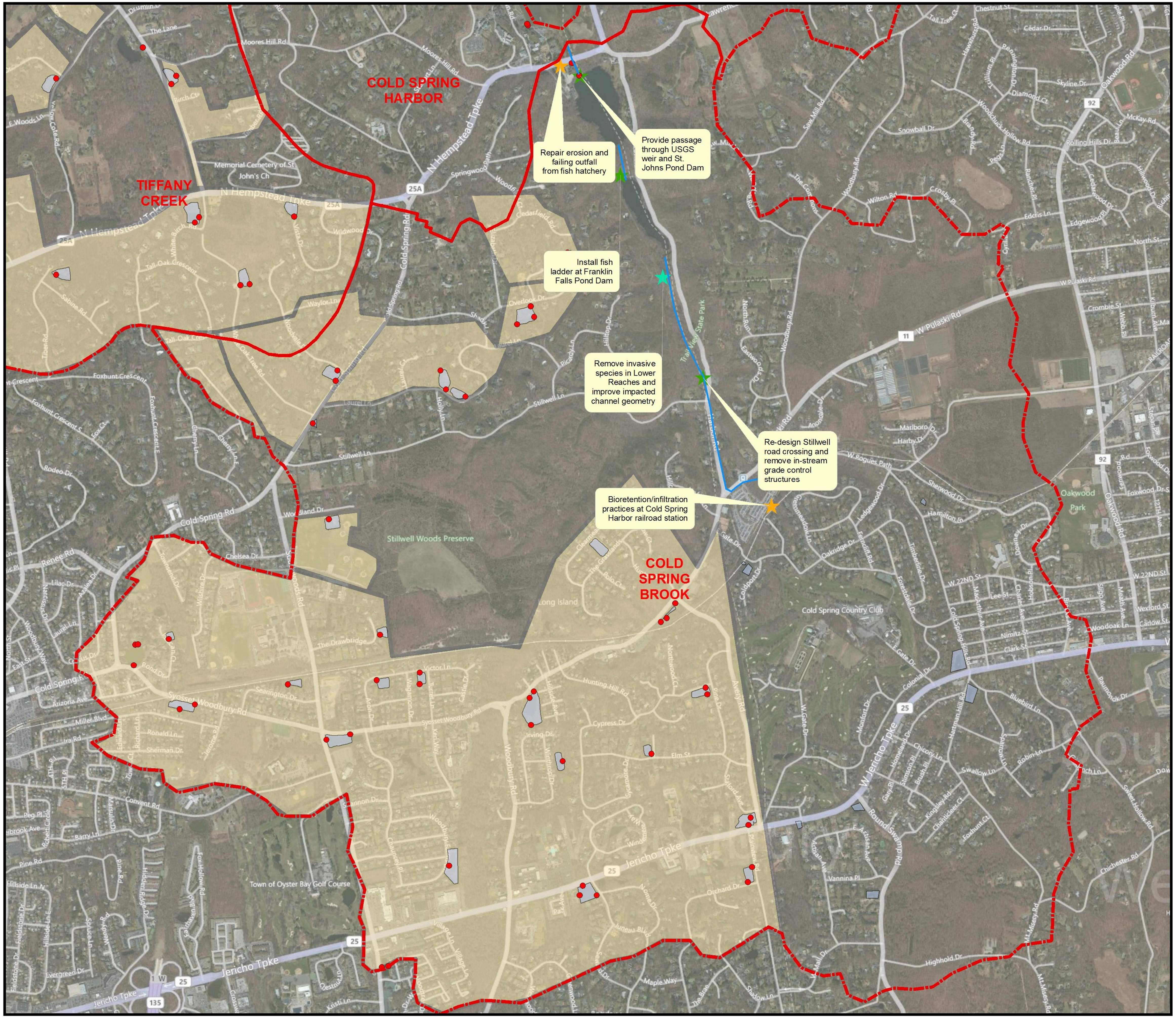
Subwatershed Recommendations
Beaver Brook Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore
Keeping the Oyster Bay
Est. 1987

FUSS & O'NEILL



Repair erosion and failing outfall from fish hatchery

Provide passage through USGS weir and St. Johns Pond Dam

Install fish ladder at Franklin Falls Pond Dam

Remove invasive species in Lower Reaches and improve impacted channel geometry

Re-design Stillwell road crossing and remove in-stream grade control structures

Bioretention/infiltration practices at Cold Spring Harbor railroad station

Legend

🟥 Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▨ Self-contained Drainage Areas (Suffolk County Data Unavailable)

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0 1,500 3,000
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
bing Maps Hybrid (c) 2010 Microsoft Corporation and its data suppliers
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Subwatershed Recommendations
Cold Spring Brook Subwatershed

Green Street retrofit of Main Street through Cold Spring Harbor hamlet

Provide treatment for Route 25A outfalls

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▭ Self-contained Drainage Areas (Suffolk County Data Unavailable)

N W E S

0 1,900 3,800
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Subwatershed Recommendations
Cold Spring Harbor Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Restoration of the Spartina intertidal zone between Centre Island Beach and Mill RiverRoad and Gun Club to create nesting and hatchling habitat for diamondback terrapins

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★ Potential Fish Passage Restoration Projects
★ Potential Buffer Restoration Projects
★ Recommended Stormwater Retrofits
★ Potential Stream Restoration Projects
★ Potential Wetland & Shoreline Restoration Projects
▭ Recharge Basins
● Storm Drainage Outfall
▭ Self-contained Drainage Areas

N
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Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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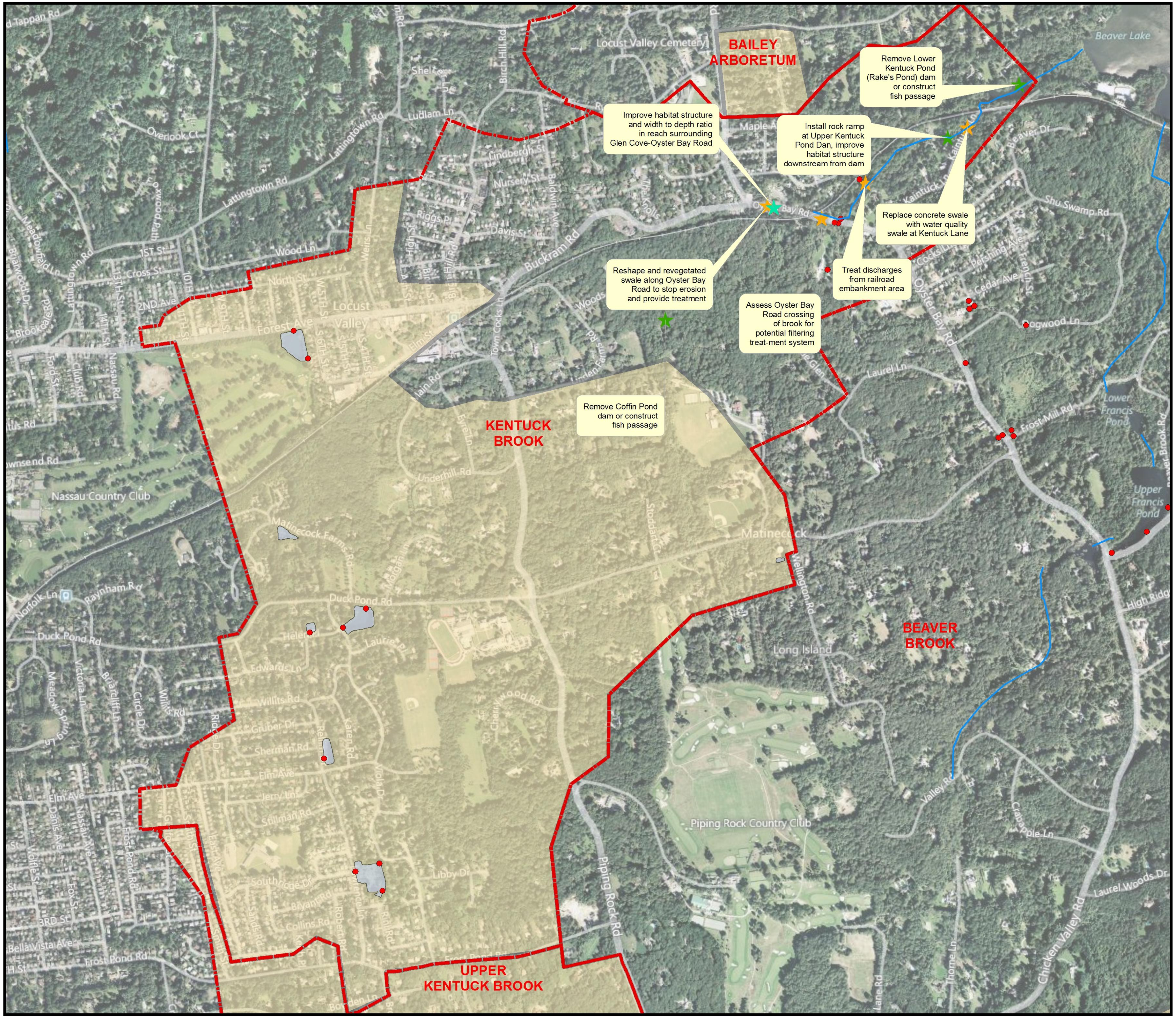
Subwatershed Recommendations
Centre Island Subwatershed



Remove Lower Kentuck Pond (Rake's Pond) dam or construct fish passage

Improve habitat structure and width to depth ratio in reach surrounding Glen Cove-Oyster Bay Road

Install rock ramp at Upper Kentuck Pond Dan, improve habitat structure downstream from dam

Replace concrete swale with water quality swale at Kentuck Lane

Reshape and revegetated swale along Oyster Bay Road to stop erosion and provide treatment

Treat discharges from railroad embankment area

Assess Oyster Bay Road crossing of brook for potential filtering treat-ment system

Remove Coffin Pond dam or construct fish passage

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▨ Self-contained Drainage Areas

N S E W

0 1,000 2,000
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Subwatershed Recommendations
Kentuck Brook Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

🟥 Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★ Potential Fish Passage Restoration Projects

★ Potential Buffer Restoration Projects

★ Recommended Stormwater Retrofits

★ Potential Stream Restoration Projects

★ Potential Wetland & Shoreline Restoration Projects

▭ Recharge Basins

● Storm Drainage Outfall

▭ Self-contained Drainage Areas

(Suffolk County Data Unavailable)

N
W E
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0 950 1,900
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Subwatershed Recommendations
Lloyd Neck Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▨ Self-contained Drainage Areas

N
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0 950 1,900
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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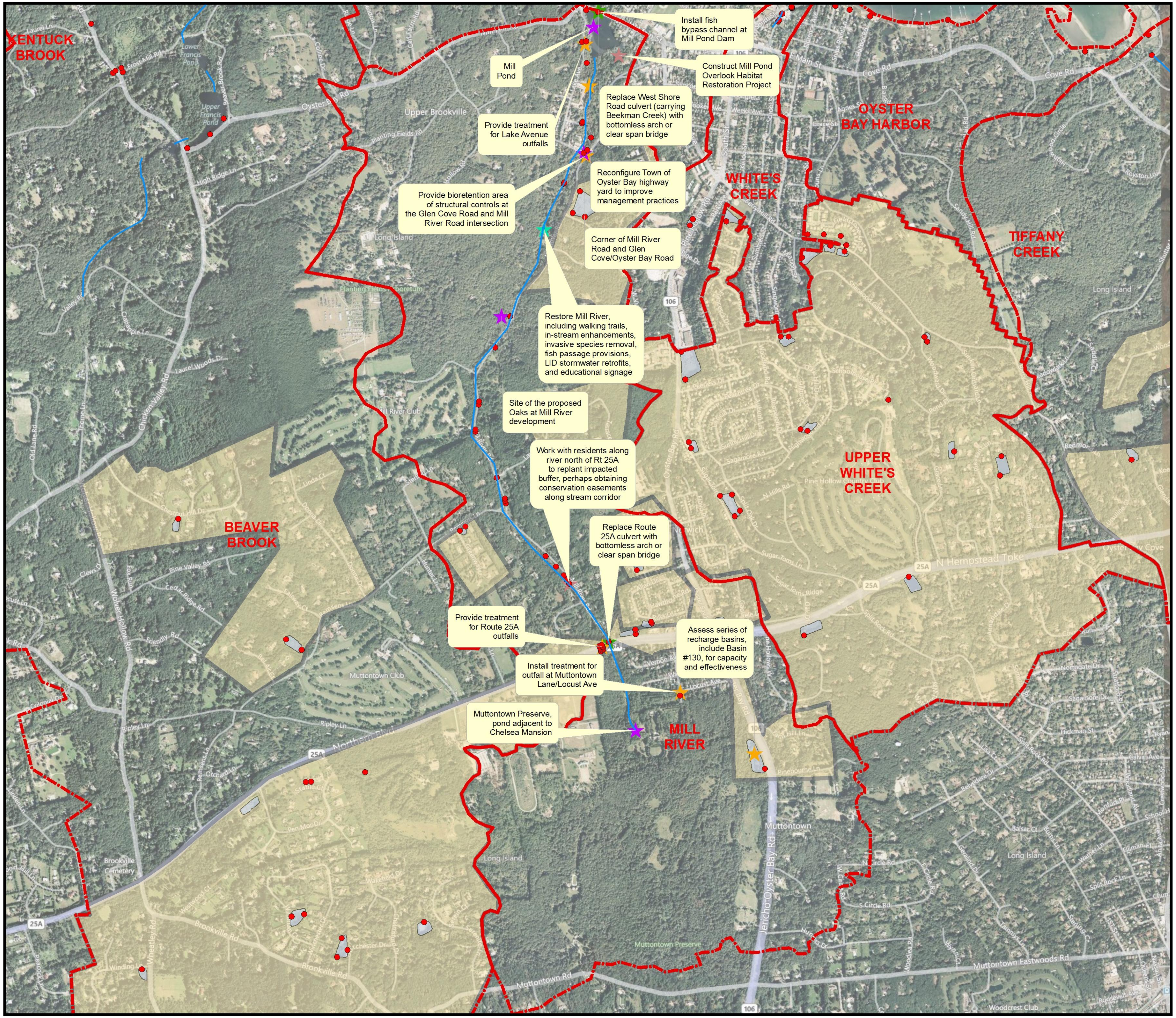
Subwatershed Recommendations
Mill Neck Creek Subwatershed



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★ Potential Fish Passage Restoration Projects

★ Potential Buffer Restoration Projects

★ Recommended Stormwater Retrofits

★ Potential Stream Restoration Projects

★ Potential Wetland & Shoreline Restoration Projects

▭ Recharge Basins

● Storm Drainage Outfall

▨ Self-contained Drainage Areas

N
W E
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0 1,600 3,200
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
bing Maps Hybrid (c) 2010 Microsoft Corporation and its data suppliers
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Subwatershed Recommendations
Mill River Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Improve stewardship with homeowners along Harborview Drive

Capture and treat Cleft Road stormwater at West Shore Road prior to discharge

Replace culvert at West Shore Road

Remove berm between wetlands upstream from Spring Lake Creek Mill Pond Dam

Remove dam at first pond south of Cleft Road, install passage at second pond

Mill River/Beekman Creek

Implement LID principles as part of Beekman Creek restoration project

West Shore Road seawall reconstruction

Daylight creek to restore passage and habitat

LID improvements at Oyster Bay High School

Improve habitat structure upstream from section to be daylighted and restored and ensure that brook trout are not impacted

Western Waterfront Redevelopment

LID improvements at Town Hall

Legend

- ▭ Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

- ★ Potential Fish Passage Restoration Projects
- ★ Potential Buffer Restoration Projects
- ★ Recommended Stormwater Retrofits
- ★ Potential Stream Restoration Projects
- ★ Potential Wetland & Shoreline Restoration Projects
- ▭ Recharge Basins
- ● Storm Drainage Outfall
- ▭ Self-contained Drainage Areas

N
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0 1,400 2,800
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Subwatershed Recommendations
Oyster Bay Harbor Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Legend

▭	Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★	Potential Fish Passage Restoration Projects
★	Potential Buffer Restoration Projects
★	Recommended Stormwater Retrofits
★	Potential Stream Restoration Projects
★	Potential Wetland & Shoreline Restoration Projects
▭	Recharge Basins
●	Storm Drainage Outfall
▭	Self-contained Drainage Areas

N
W E
S

0 1,000 2,000
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
bing Maps Hybrid (c) 2010 Microsoft Corporation and its data suppliers
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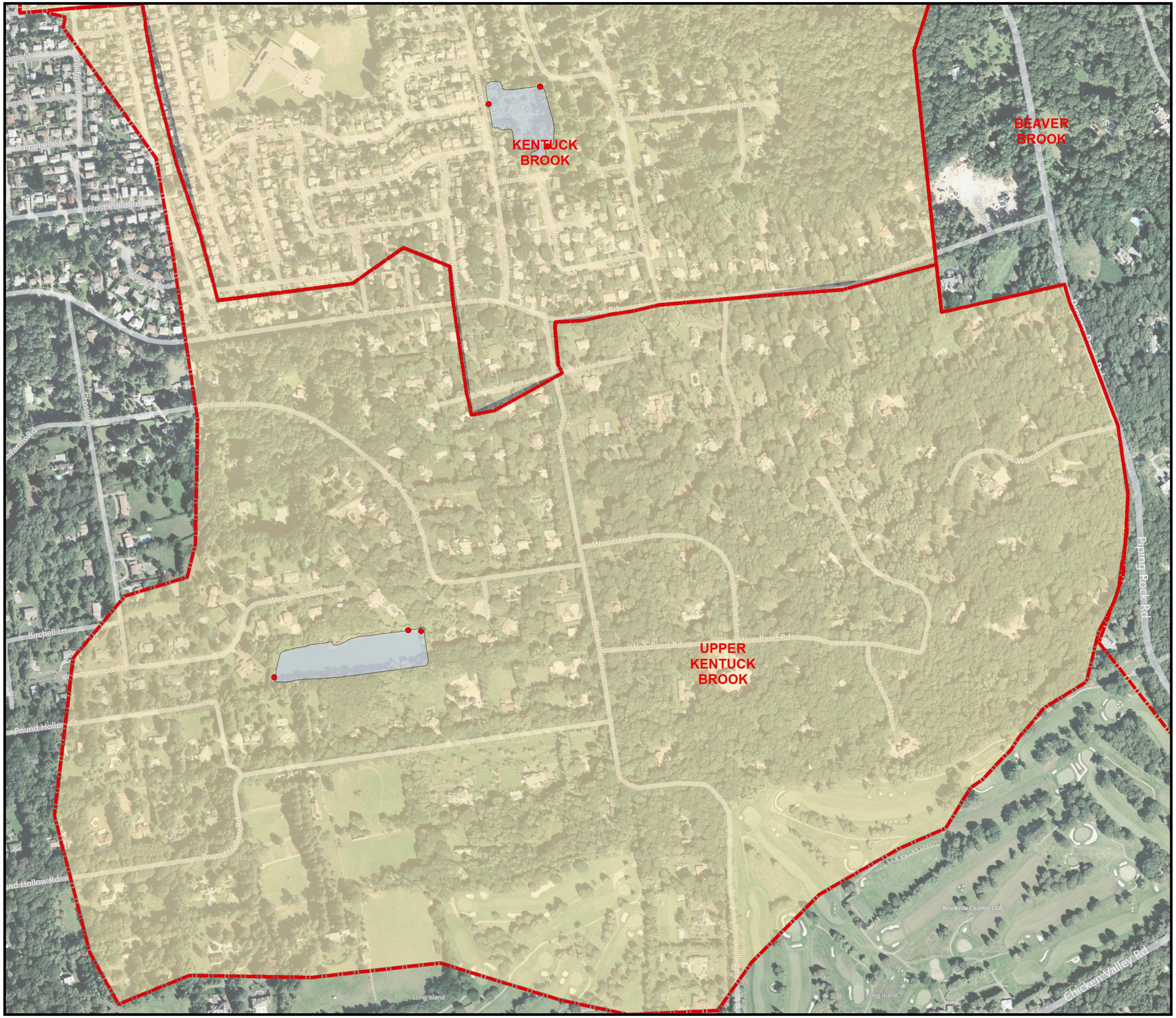
Subwatershed Recommendations
Tiffany Creek Subwatershed



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

▭	Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

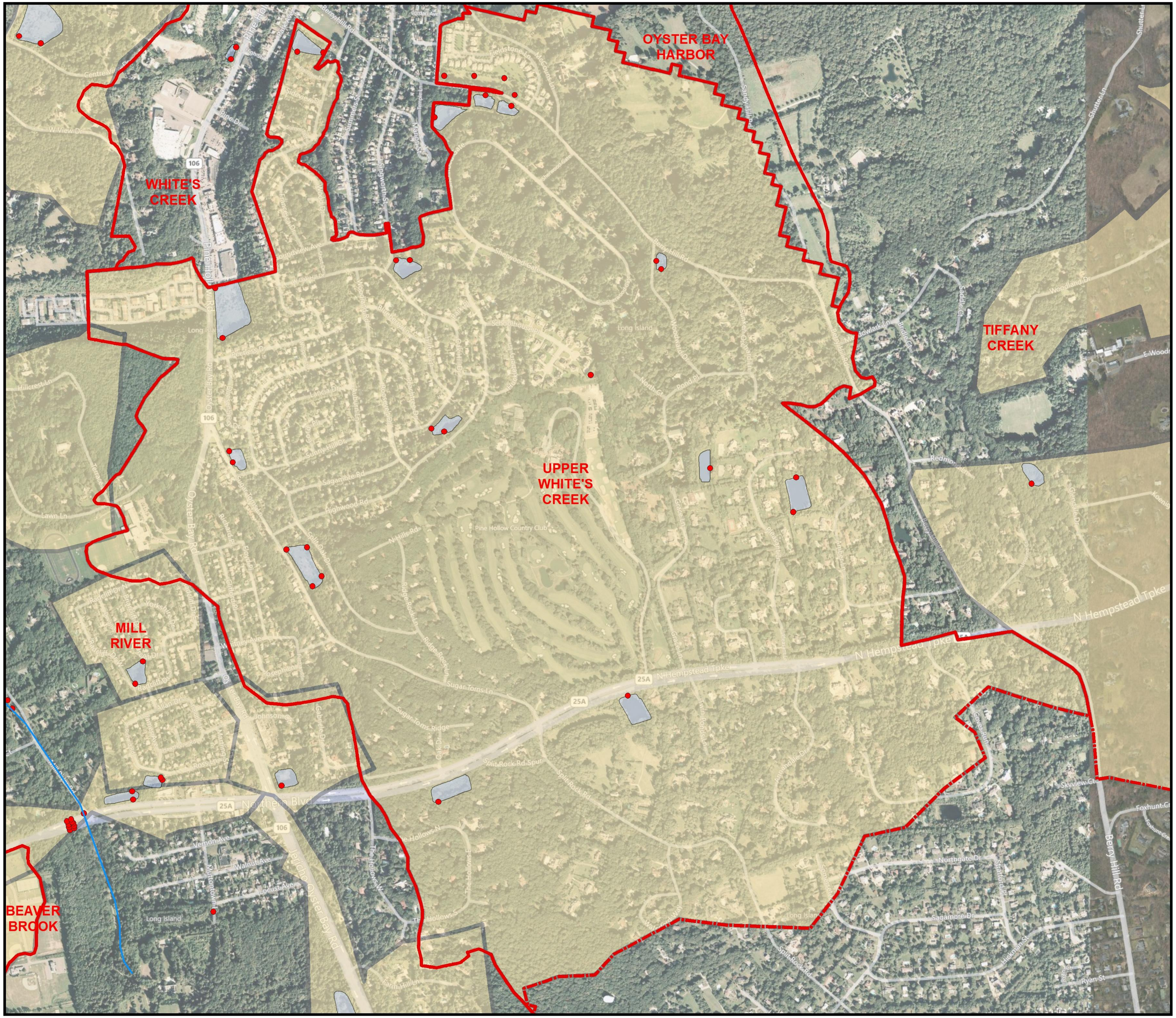
★	Potential Fish Passage Restoration Projects
★	Potential Buffer Restoration Projects
★	Recommended Stormwater Retrofits
★	Potential Stream Restoration Projects
★	Potential Wetland & Shoreline Restoration Projects
▭	Recharge Basins
●	Storm Drainage Outfall
▭	Self-contained Drainage Areas

N
W E
S

0 490 980
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
bing Maps Hybrid (c) 2010 Microsoft Corporation and its data suppliers
J:\GIS\P2005\1349\A31\Subwatershed Recommendations.mxd

Subwatershed Recommendations
Upper Kentuck Brook Subwatershed



Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL

Legend

▭	Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★	Potential Fish Passage Restoration Projects
★	Potential Buffer Restoration Projects
★	Recommended Stormwater Retrofits
★	Potential Stream Restoration Projects
★	Potential Wetland & Shoreline Restoration Projects
▭	Recharge Basins
●	Storm Drainage Outfall
▭	Self-contained Drainage Areas

N
W E
S

0 890 1,780
Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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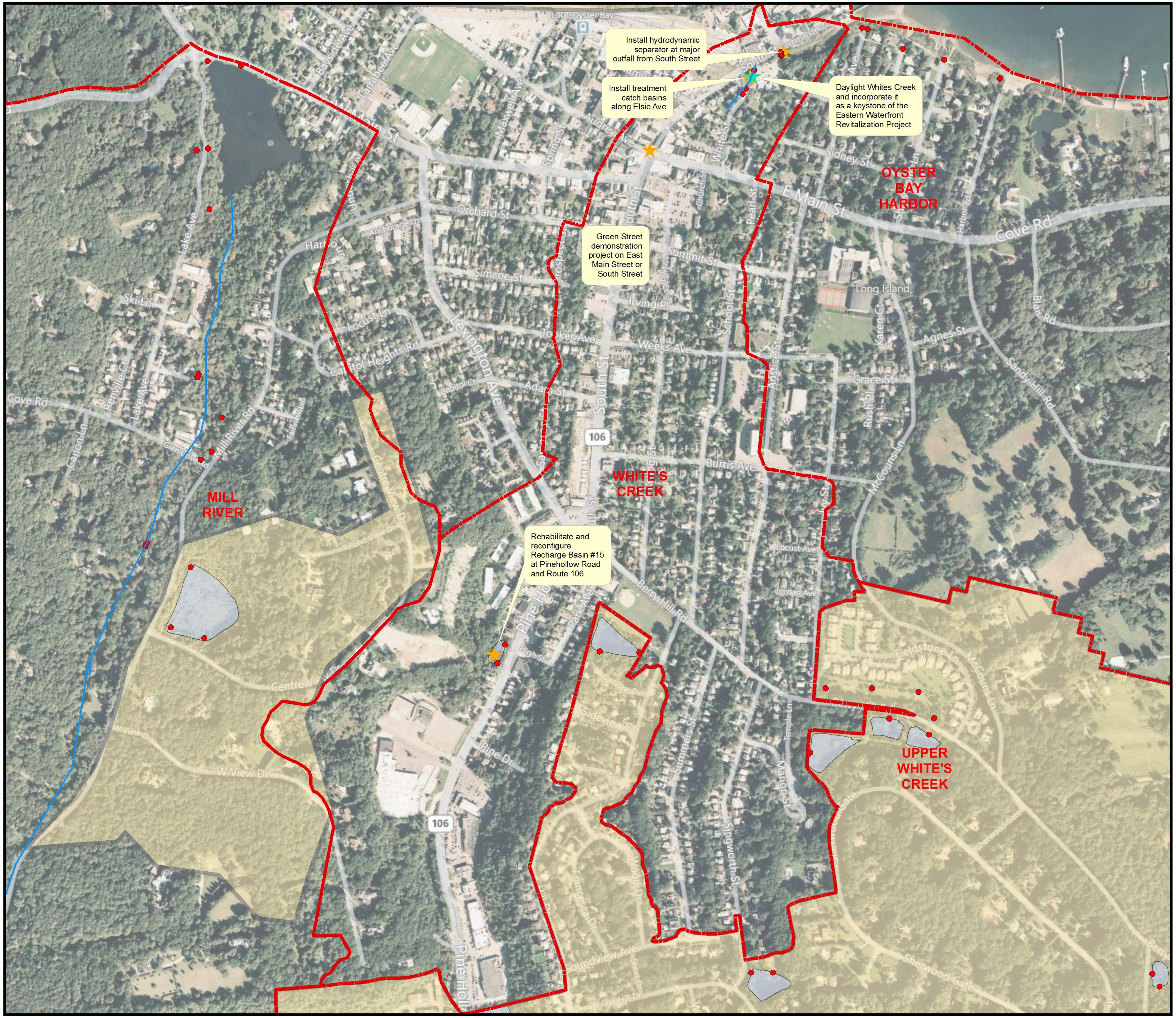
Subwatershed Recommendations
Upper White's Creek Subwatershed

Watershed Action Plan
Oyster Bay/Cold Spring Harbor

Friends of the Bay
protect - preserve - restore

FUSS & O'NEILL



Install hydrodynamic separator at major outfall from South Street

Install treatment catch basins along Elsie Ave

Daylight Whites Creek and incorporate it as a keystone of the Eastern Waterfront Revitalization Project

Green Street demonstration project on East Main Street or South Street

Rehabilitate and reconfigure Recharge Basin #15 at Pinehollow Road and Route 106

Legend

▭	Oyster Bay/Cold Spring Harbor Subwatersheds

Recommendation

★	Potential Fish Passage Restoration Projects
★	Potential Buffer Restoration Projects
★	Recommended Stormwater Retrofits
★	Potential Stream Restoration Projects
★	Potential Wetland & Shoreline Restoration Projects
▭	Recharge Basins
●	Storm Drainage Outfall
▭	Self-contained Drainage Areas

N S E W

0 580 1,160

Feet

Data Sources:
Town of Oyster Bay and Huntington GIS
Nassau and Suffolk County GIS
USGS/EPA National Hydrology Dataset Plus
US Census 2000
New York State Department of Environmental Conservation
US Fish and Wildlife Service
Center for Land Use Education and Research (CLEAR)
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Subwatershed Recommendations
White's Creek Subwatershed

Appendix C

Site-Specific Project Cost Estimates

Recommendation	Planning Level Cost (2011$)	Typical Range		Source
Invasive Species Management Plan (Watershed-Wide)	$35,100	$21,000	$49,000	Professional engineering experience
Targeted Stormwater Retrofits				Center for Watershed Protection Urban Stormwater Retrofit Practices (2007)
Constructed Wetlands - per acre treated	$4,700	$3,400	$15,600	
Extended Detention - per acre treated	$6,200	$3,700	$12,200	
Wet Ponds - per acre treated	$14,000	$5,100	$4,600	
Water Quality Swale - per acre treated	$29,300	$17,500	$59,000	
Bioretention/infiltration - per acre treated	$41,000	$32,000	$67,000	
Stormwater Curb Extensions - per 4,500 sf IC treated	$27,000	$19,500	$40,000	City of Portland (2005)
Pervious Pavement - per square foot	$14	$7	$21	R.S. Means - includes limited subgrade modifications
Illicit Discharge Investigation	Varies significantly based on methods used			NEIWPCC IDDE Manual (2003), CWP IDDE Manual (2003)
Additional Subwatershed Field Assessments	$1,000 per stream mile	$281	$2,808	Varies depending on volunteer involvement, summary reports prepared, difficulty of terrain
Reforestation and Riparian Buffer Restoration - per acre				
Herbaceous buffer in grassed area	$2,808	$1,404	$4,212	R.S. Means, depends on existing condition
Trees and Shrubs	$21,060	$7,020	$28,080	U.S. Forest Service Urban Watershed Forestry Manual (2006), R.S. Means
Reforestation of Paved Areas	$105,300	$70,200	$140,400	R.S. Means
Streambank Restoration	$0	$0	$0	
Bank Stabilization - linear foot of bank	$55	$14	$140	Derrick (1997), NOAA (2000)
Redirective Techniques - per structure	$5,500	$4,200	$14,000	Professional engineering experience
Channel Rehab. - linear foot of channel	$42	$16	$52	NOAA (2000)
Stream Daylighting - Linear foot of stream	$1,544	$420	$4,200	Small streams at less constrained sites
Priority Stream Cleanups	Varies significantly based on amount of donated supplies and services			
Fish Passage Enhancement	Varies significantly based on methods used			

							Order of Magniude Cost Range								
	Unit Cost	Unit	Quantity	Cost (2011$)	Design and Planning Allowance	Cost	Total Cost	-30%	50%	Lifespan (yrs)	Annual Cost over Lifespan	O&M (% Cost)	O&M ($/yr)	Total Capitalized Cost/yr over lifespan	Source
Hernan Ave															
Remove Pavement	4.8	sf	3,700	17760	55%	$10,000	$28,000	$20,000	$42,000	50	$1,090	0%	$0	$1,090	4
Bioretention Basins	24.57	sf	3,700	90909	55%	$50,000	$141,000	$99,000	$212,000	15	$11,810	8%	$940	$12,750	1
Hydrodynamic Separator	25,000	ea	1	25000	55%	$14,000	$39,000	$27,000	$59,000	20	$2,620	4%	$100	$2,720	3
Total							$208,000	$146,000	$313,000		$15,520		$1,040	$16,560	
Beekman Creek															
Remove Pavement	4.8	sf	82,300	395040	30%	118512	$514,000	$360,000	$771,000	100	$16,270	0%	$0	$16,270	4
Pervious pavement	4.2	sf	62,600	262920	30%	78876	$342,000	$239,000	$513,000	20	$22,990	4%	$920	$23,910	4
Bioretention Basins/Green Gutters	24.57	sf	9,700	238329	30%	71498.7	$310,000	$217,000	$465,000	15	$25,970	8%	$2,080	$28,050	1
Stream channel restoration	$100	lf	630	63000	30%	18900	$82,000	$57,000	$123,000	100	$2,600	0%	$0	$2,600	2
Riparian Buffer Restoration	0.34	sf	28,000	9520	30%	2856	$13,000	$9,000	$20,000	100	$410	4%	$20	$430	1
Floating Walkway	10,000	Lump Sum	1	10000	30%	3000	$13,000	$9,000	$20,000	20	$870	10%	$90	$960	3
Open Bottom Culvert	300,000	Lump Sum	1	300000	30%	90000	$390,000	$273,000	$585,000	50	$15,160	2%	$300	$15,460	3
Total							$1,664,000	$1,164,000	$2,497,000		$84,270		$3,410	$87,680	
Huntington Municipal Lot															
Remove Pavement	4.8	sf	21,200	101760	30%	30528	$133,000	$93,000	$200,000	100	$4,210	0%	$0	$4,210	4
Pervious Pavement	4.2	sf	17,850	74970	30%	22491	$98,000	$69,000	$147,000	20	$6,590	4%	$260	$6,850	4
Bioretention	24.57	sf	3,350	82309.5	30%	24692.85	$108,000	$76,000	$162,000	15	$9,050	8%	$720	$9,770	1
Tree Box Filters	15,000	ea	5	75000	30%	22500	$98,000	$69,000	$147,000	20	$6,590	5%	$330	$6,920	3
Total							$437,000	$307,000	$656,000		$26,440		$1,310	$27,750	
Oyster Bay Train Station															
Remove Pavement	4.8	sf	16,230	77904	30%	23371.2	$102,000	$71,000	$153,000	100	$3,230	0%	$0	$3,230	4
Pervious Pavers	4.2	sf	5,700	23940	30%	7182	$32,000	$22,000	$48,000	20	$2,150	4%	$90	$2,240	4
Pervious Concrete	6	sf	5,900	35400	30%	10620	$47,000	$33,000	$71,000	30	$2,400	4%	$100	$2,500	4
Biofiltration	24.57	sf	4,630	113759.1	30%	34127.73	$148,000	$104,000	$222,000	15	$12,400	8%	$990	$13,390	1
Pocket Gardens	10,000	ea	4	40000	30%	12000	$52,000	$36,000	$78,000	15	$4,360	8%	$350	$4,710	5
Total							$381,000	$266,000	$572,000		$24,540		$1,530	$26,070	
Fireman's Field															
Remove Pavement	4.8	sf	58,500	280800	30%	84240	$366,000	$256,000	$549,000	100	$11,580	0%	$0	$11,580	4
Pervious Pavement	4.2	sf	43,200	181440	30%	54432	$236,000	$165,000	$354,000	20	$15,860	4%	$630	$16,490	4
Biofiltration	24.57	sf	15,300	375921	30%	112776.3	$489,000	$342,000	$734,000	15	$40,960	8%	$3,280	$44,240	1
Tree Box Filters	15,000	ea	13	195000	30%	58500	$254,000	$178,000	$381,000	20	$17,070	5%	$850	$17,920	3
Total							$1,345,000	$941,000	$2,018,000		$85,470		$4,760	$90,230	
Oyster Bay Municipal Parking Lot															
Remove Pavement	4.8	sf	34,080	163584	30%	49075.2	$213,000	$149,000	$320,000	100	$6,740	0%	$0	$6,740	4
Pervious Pavement	4.2	sf	28,300	118860	30%	35658	$155,000	$109,000	$233,000	20	$10,420	4%	$420	$10,840	4
Biofiltration	24.57	sf	5,780	142014.6	30%	42604.38	$185,000	$130,000	$278,000	15	$15,500	8%	$1,240	$16,740	1
Pocket Gardens	10,000	ea	6	60000	30%	18000	$78,000	$55,000	$117,000	15	$6,530	8%	$520	$7,050	3
Total							$631,000	$443,000	$948,000		$39,190		$2,180	$41,370	
Aurdrey and Shore Avenues															
Remove Pavement	4.8	sf	34,410	165168	30%	49550.4	$215,000	$151,000	$323,000	100	$6,800	0%	$0	$6,800	4

							Order of Magniude Cost Range								
	Unit Cost	Unit	Quantity	Cost (2011$)	Design and Planning Allowance	Cost	Total Cost	-30%	50%	Lifespan (yrs)	Annual Cost over Lifespan	O&M (% Cost)	O&M ($/yr)	Total Capitalized Cost/yr over lifespan	Source
Pervious Pavement	4.2	sf	31,280	131376	30%	39412.8	$171,000	$120,000	$257,000	20	$11,490	4%	$460	$11,950	4
Biofiltration	24.57	sf	4130	101474.1	30%	30442.23	$132,000	$92,000	$198,000	15	$11,060	8%	$880	$11,940	1
Treebox Filters	15000	ea	30	450000	30%	135000	$585,000	$410,000	$878,000	20	$39,320	5%	$1,970	$41,290	3
Total							$1,103,000	$773,000	$1,656,000		$68,670		$3,310	$71,980	
South Street															
Remove Pavement	4.8	sf	20,500	98400	30%	29520	$128,000	$90,000	$192,000	100	$4,050	0%	$0	$4,050	4
Pervious Pavement	4.2	sf	18,250	76650	30%	22995	$100,000	$70,000	$150,000	20	$6,720	4%	$270	$6,990	4
Biofiltration	24.57	sf	2,300	56511	30%	16953.3	$74,000	$52,000	$111,000	15	$6,200	8%	$500	$6,700	1
Treebox Filters	15000	ea	15	225000	30%	67500	$293,000	$205,000	$440,000	20	$19,690	5%	$980	$20,670	3
Total							$595,000	$417,000	$893,000		$36,660		$1,750	$38,410	
Pine Hollow Shopping Center															
Remove Pavement	4.8	sf	27,750	133200	30%	39960	$174,000	$122,000	$261,000	100	$5,510	0%	$0	$5,510	4
Pervious Pavement	4.2	sf	18,000	75600	30%	22680	$99,000	$69,000	$149,000	20	$6,650	4%	$270	$6,920	4
Biofiltration	24.57	sf	9,750	239557.5	30%	71867.25	$312,000	$218,000	$468,000	15	$26,140	8%	$2,090	$28,230	1
Treebox Filters	15000	ea	15	225000	30%	67500	$293,000	$205,000	$440,000	20	$19,690	5%	$980	$20,670	3
Total							$878,000	$614,000	$1,318,000		$57,990		$3,340	$61,330	
White's Creek															
Remove Pavement	4.8	sf	39,000	187200	30%	56160	$244,000	$171,000	$366,000	100	$7,720	0%	$0	$7,720	4
Pervious pavement	4.2	sf	13,600	57120	30%	17136	$75,000	$53,000	$113,000	20	$5,040	4%	$200	$5,240	4
Bioretention Basins/Green Gutters	24.57	sf	15,000	368550	30%	110565	$480,000	$336,000	$720,000	15	$40,210	8%	$3,220	$43,430	1
Stream channel restoration	$70	lf	210	14700	30%	4410	$20,000	$14,000	$30,000	100	$630	0%	$0	$630	2
Riparian Buffer Restoration	0.34	sf	20,800	7072	30%	2121.6	$10,000	$7,000	$15,000	100	$320	4%	$10	$330	1
Open Bottom Culvert	300,000	ea	1	300000	30%	90000	$390,000	$273,000	$585,000	20	$26,210	2%	$520	$26,730	3
Pedestrian Bridge	10000	ea	1	10000	30%	3000	$13,000	$9,000	$20,000	50	$510	2%	$10	$520	3
Total							$1,232,000	$863,000	$1,849,000		$80,640		$3,960	$84,600	

Note:

Rate of Inflation used =	4%
Interest (discount) rate used =	7%

*Projects are proposed for these locations already. Costs estimated in this table are for adding ecological and water quality elements to the assumed original purpose of the proposed projects.
Costs include design allowance, no property acquisition required, basic local permitting, and minimal utility conflict for construction

Sources:

1. Derived by F&O based on R.S. Means
2. Derrick, David (1997). Harland Creek Bank Stabilization Demonstration Project. Land and Water Magazine, Sept/Oct 1997. Accessed at www.landandwater.com on July 7, 2010.
3. Estimate from Professional Exp
4. UNH Stormwater Center 2009 Biennial Report

Appendix D

Pollutant Load Reduction Model Results

Fecal Coliform Load Reductions with Watershed Management Recommendations

	Existing Conditions (billion/yr)	Future Buildout without Controls (billion/yr)	Future Buildout with Contols (billion/yr)									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	38,464	40,845	39,414	33,688	26,530	19,372	12,215	40,365	39,403	40,845	40,840	40,845
Beaver Brook (4,862 ac)	212,042	221,283	213,539	182,561	143,840	105,118	66,396	219,420	218,103	219,568	221,254	221,283
Centre Island (762 ac)	54,303	58,018	56,005	47,949	37,880	27,811	17,742	57,269	58,018	56,780	58,009	58,018
Cold Spring Brook (4,851 ac)	171,172	171,457	165,311	140,727	109,998	79,268	48,538	171,400	170,645	158,406	171,394	171,457
Cold Spring Harbor (2,953 ac)	231,337	233,719	225,112	190,683	147,647	104,611	61,575	233,239	233,719	233,719	233,701	233,719
Kentuck Brook (1,538 ac)	44,542	48,353	46,931	41,244	34,135	27,026	19,918	47,585	47,792	48,353	48,308	47,943
Lloyd Neck (894 ac)	66,579	66,579	64,145	54,405	42,230	30,055	17,880	66,579	66,579	66,579	66,574	66,579
Mill Neck Creek (968 ac)	78,045	78,809	76,070	65,114	51,419	37,725	24,030	78,655	78,809	77,189	78,769	74,106
Mill River (2,175 ac)	96,837	110,270	106,759	92,719	75,168	57,617	40,066	107,562	108,088	110,270	110,247	109,996
Oyster Bay Harbor (1,612 ac)	125,136	137,330	132,709	114,224	91,117	68,010	44,903	134,872	137,330	137,330	137,309	136,648
Tiffany Brook (1,923 ac)	96,381	103,717	100,240	86,334	68,950	51,567	34,184	102,238	103,085	103,717	103,700	103,034
White's Creek (292 ac)	23,148	23,910	23,215	20,433	16,957	13,480	10,003	23,757	23,866	23,910	23,892	22,886
Watershed Total	1,237,987	1,294,292	1,249,450	1,070,081	845,870	621,659	397,448	1,282,941	1,285,437	1,276,667	1,293,998	1,286,516

Fecal Coliform Load Reductions with Watershed Management Recommendations

	Existing Conditions (billion/yr)	Future Buildout without Controls (billion/yr)	Load Reduction due to Controls									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	38,464	40,845	3.5%	17.5%	35.0%	52.6%	70.1%	1.2%	3.5%	0.0%	0.0%	0.0%
Beaver Brook (4,862 ac)	212,042	221,283	3.5%	17.5%	35.0%	52.5%	70.0%	0.8%	1.4%	0.8%	0.0%	0.0%
Centre Island (762 ac)	54,303	58,018	3.5%	17.4%	34.7%	52.1%	69.4%	1.3%	0.0%	2.1%	0.0%	0.0%
Cold Spring Brook (4,851 ac)	171,172	171,457	3.6%	17.9%	35.8%	53.8%	71.7%	0.0%	0.5%	7.6%	0.0%	0.0%
Cold Spring Harbor (2,953 ac)	231,337	233,719	3.7%	18.4%	36.8%	55.2%	73.7%	0.2%	0.0%	0.0%	0.0%	0.0%
Kentuck Brook (1,538 ac)	44,542	48,353	2.9%	14.7%	29.4%	44.1%	58.8%	1.6%	1.2%	0.0%	0.1%	0.8%
Lloyd Neck (894 ac)	66,579	66,579	3.7%	18.3%	36.6%	54.9%	73.1%	0.0%	0.0%	0.0%	0.0%	0.0%
Mill Neck Creek (968 ac)	78,045	78,809	3.5%	17.4%	34.8%	52.1%	69.5%	0.2%	0.0%	2.1%	0.1%	6.0%
Mill River (2,175 ac)	96,837	110,270	3.2%	15.9%	31.8%	47.7%	63.7%	2.5%	2.0%	0.0%	0.0%	0.2%
Oyster Bay Harbor (1,612 ac)	125,136	137,330	3.4%	16.8%	33.7%	50.5%	67.3%	1.8%	0.0%	0.0%	0.0%	0.5%
Tiffany Brook (1,923 ac)	96,381	103,717	3.4%	16.8%	33.5%	50.3%	67.0%	1.4%	0.6%	0.0%	0.0%	0.7%
White's Creek (292 ac)	23,148	23,910	2.9%	14.5%	29.1%	43.6%	58.2%	0.6%	0.2%	0.0%	0.1%	4.3%
Watershed Total	1,237,987	1,294,292	3.5%	17.3%	34.6%	52.0%	69.3%	0.9%	0.7%	1.4%	0.0%	0.6%

Sediment (TSS) Load Reductions with Watershed Management Recommendations

	Existing Conditions (lb/yr)	Future Buildout without Controls (lb/yr)	Future Buildout with Contols (lb/yr)									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	174,046	174,906	171,269	156,723	138,541	120,359	102,177	174,686	168,546	174,906	174,906	174,906
Beaver Brook (4,862 ac)	1,077,803	1,081,139	1,059,333	972,109	863,079	754,050	645,020	1,080,286	1,065,596	1,080,520	1,081,139	1,081,139
Centre Island (762 ac)	268,413	269,754	264,223	242,100	214,445	186,791	159,136	269,411	269,754	269,307	269,754	269,754
Cold Spring Brook (4,851 ac)	1,283,981	1,284,084	1,263,680	1,182,063	1,080,042	978,021	876,000	1,284,058	1,279,402	1,279,373	1,284,084	1,284,084
Cold Spring Harbor (2,953 ac)	981,150	982,010	959,934	871,630	761,251	650,871	540,491	981,790	982,010	982,010	982,010	982,010
Kentuck Brook (1,538 ac)	371,876	373,252	369,083	352,411	331,570	310,729	289,888	372,900	370,397	373,252	373,252	373,221
Lloyd Neck (894 ac)	273,888	273,888	267,956	244,231	214,575	184,918	155,262	273,888	273,888	273,888	273,888	273,888
Mill Neck Creek (968 ac)	482,145	479,596	472,649	444,862	410,129	375,396	340,663	480,247	479,596	479,011	479,596	458,877
Mill River (2,175 ac)	570,989	575,838	563,702	515,160	454,482	393,804	333,126	574,599	562,746	575,838	575,838	575,817
Oyster Bay Harbor (1,612 ac)	590,972	595,373	583,307	535,041	474,709	414,377	354,045	594,248	595,373	595,373	595,373	595,322
Tiffany Brook (1,923 ac)	514,009	516,657	506,673	466,739	416,822	366,904	316,986	515,980	513,507	516,657	516,657	516,605
White's Creek (292 ac)	175,687	175,962	172,692	159,610	143,258	126,906	110,554	175,892	175,602	175,962	175,962	175,885
Watershed Total	6,764,959	6,782,458	6,654,502	6,142,680	5,502,903	4,863,125	4,223,348	6,777,985	6,736,416	6,776,096	6,782,458	6,761,508

Sediment (TSS) Load Reductions with Watershed Management Recommendations

	Existing Conditions (lb/yr)	Future Buildout without Controls (lb/yr)	Load Reduction due to Controls									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	174,046	174,906	2.1%	10.4%	20.8%	31.2%	41.6%	0.1%	3.6%	0.0%	0.0%	0.0%
Beaver Brook (4,862 ac)	1,077,803	1,081,139	2.0%	10.1%	20.2%	30.3%	40.3%	0.1%	1.4%	0.1%	0.0%	0.0%
Centre Island (762 ac)	268,413	269,754	2.1%	10.3%	20.5%	30.8%	41.0%	0.1%	0.0%	0.2%	0.0%	0.0%
Cold Spring Brook (4,851 ac)	1,283,981	1,284,084	1.6%	7.9%	15.9%	23.8%	31.8%	0.0%	0.4%	0.4%	0.0%	0.0%
Cold Spring Harbor (2,953 ac)	981,150	982,010	2.2%	11.2%	22.5%	33.7%	45.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Kentuck Brook (1,538 ac)	371,876	373,252	1.1%	5.6%	11.2%	16.8%	22.3%	0.1%	0.8%	0.0%	0.0%	0.0%
Lloyd Neck (894 ac)	273,888	273,888	2.2%	10.8%	21.7%	32.5%	43.3%	0.0%	0.0%	0.0%	0.0%	0.0%
Mill Neck Creek (968 ac)	482,145	479,596	1.4%	7.2%	14.5%	21.7%	29.0%	-0.1%	0.0%	0.1%	0.0%	4.3%
Mill River (2,175 ac)	570,989	575,838	2.1%	10.5%	21.1%	31.6%	42.1%	0.2%	2.3%	0.0%	0.0%	0.0%
Oyster Bay Harbor (1,612 ac)	590,972	595,373	2.0%	10.1%	20.3%	30.4%	40.5%	0.2%	0.0%	0.0%	0.0%	0.0%
Tiffany Brook (1,923 ac)	514,009	516,657	1.9%	9.7%	19.3%	29.0%	38.6%	0.1%	0.6%	0.0%	0.0%	0.0%
White's Creek (292 ac)	175,687	175,962	1.9%	9.3%	18.6%	27.9%	37.2%	0.0%	0.2%	0.0%	0.0%	0.0%
Watershed Total	6,764,959	6,782,458	1.9%	9.4%	18.9%	28.3%	37.7%	0.1%	0.7%	0.1%	0.0%	0.3%

Phosphorus Load Reductions with Watershed Management Recommendations

	Existing Conditions (lb/yr)	Future Buildout without Controls (lb/yr)	Future Buildout with Contols (lb/yr)									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	851	864	838	733	601	470	339	862	824	864	862	864
Beaver Brook (4,862 ac)	5,145	5,194	5,038	4,413	3,631	2,850	2,069	5,187	5,098	5,185	5,184	5,194
Centre Island (762 ac)	1,304	1,324	1,284	1,125	927	728	530	1,321	1,324	1,317	1,322	1,324
Cold Spring Brook (4,851 ac)	4,911	4,912	4,770	4,202	3,492	2,782	2,071	4,912	4,884	4,844	4,904	4,912
Cold Spring Harbor (2,953 ac)	4,995	5,008	4,850	4,218	3,428	2,639	1,849	5,006	5,008	5,008	4,999	5,008
Kentuck Brook (1,538 ac)	1,466	1,486	1,456	1,339	1,192	1,044	897	1,483	1,468	1,486	1,484	1,484
Lloyd Neck (894 ac)	1,394	1,394	1,351	1,178	961	745	528	1,394	1,394	1,394	1,391	1,394
Mill Neck Creek (968 ac)	2,053	2,049	1,998	1,795	1,541	1,287	1,033	2,049	2,049	2,040	2,046	2,049
Mill River (2,175 ac)	2,772	2,843	2,760	2,426	2,009	1,592	1,175	2,834	2,765	2,843	2,838	2,842
Oyster Bay Harbor (1,612 ac)	2,664	2,728	2,642	2,297	1,866	1,436	1,005	2,719	2,728	2,728	2,724	2,725
Tiffany Brook (1,923 ac)	2,291	2,330	2,260	1,979	1,629	1,278	927	2,324	2,311	2,330	2,326	2,326
White's Creek (292 ac)	628	632	612	532	433	333	233	632	630	632	632	628
Watershed Total	30,475	30,764	29,858	26,237	21,710	17,183	12,655	30,724	30,483	30,671	30,713	30,749

Phosphorus Load Reductions with Watershed Management Recommendations

	Existing Conditions (lb/yr)	Future Buildout without Controls (lb/yr)	Load Reduction due to Controls									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	851	864	3.0%	15.2%	30.4%	45.6%	60.8%	0.2%	4.6%	0.0%	0.2%	0.0%
Beaver Brook (4,862 ac)	5,145	5,194	3.0%	15.0%	30.1%	45.1%	60.2%	0.1%	1.9%	0.2%	0.2%	0.0%
Centre Island (762 ac)	1,304	1,324	3.0%	15.0%	30.0%	45.0%	60.0%	0.2%	0.0%	0.5%	0.2%	0.0%
Cold Spring Brook (4,851 ac)	4,911	4,912	2.9%	14.5%	28.9%	43.4%	57.8%	0.0%	0.6%	1.4%	0.2%	0.0%
Cold Spring Harbor (2,953 ac)	4,995	5,008	3.2%	15.8%	31.5%	47.3%	63.1%	0.0%	0.0%	0.0%	0.2%	0.0%
Kentuck Brook (1,538 ac)	1,466	1,486	2.0%	9.9%	19.8%	29.7%	39.6%	0.2%	1.2%	0.0%	0.1%	0.1%
Lloyd Neck (894 ac)	1,394	1,394	3.1%	15.5%	31.1%	46.6%	62.1%	0.0%	0.0%	0.0%	0.2%	0.0%
Mill Neck Creek (968 ac)	2,053	2,049	2.5%	12.4%	24.8%	37.2%	49.6%	0.0%	0.0%	0.4%	0.1%	0.0%
Mill River (2,175 ac)	2,772	2,843	2.9%	14.7%	29.3%	44.0%	58.7%	0.3%	2.7%	0.0%	0.2%	0.0%
Oyster Bay Harbor (1,612 ac)	2,664	2,728	3.2%	15.8%	31.6%	47.4%	63.2%	0.3%	0.0%	0.0%	0.2%	0.1%
Tiffany Brook (1,923 ac)	2,291	2,330	3.0%	15.0%	30.1%	45.1%	60.2%	0.2%	0.8%	0.0%	0.2%	0.1%
White's Creek (292 ac)	628	632	3.2%	15.8%	31.6%	47.4%	63.2%	0.1%	0.3%	0.0%	0.1%	0.8%
Watershed Total	30,475	30,764	2.9%	14.7%	29.4%	44.1%	58.9%	0.1%	0.9%	0.3%	0.2%	0.0%

Nitrogen Load Reductions with Watershed Management Recommendations

	Existing Conditions (billion/yr)	Future Buildout without Controls (billion/yr)	Future Buildout with Contols (billion/yr)									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	2,531	2,595	2,516	2,201	1,806	1,411	1,017	2,586	2,478	2,595	2,569	2,595
Beaver Brook (4,862 ac)	14,752	15,003	14,552	12,748	10,493	8,238	5,983	14,969	14,731	14,956	14,821	15,003
Centre Island (762 ac)	4,039	4,139	4,016	3,521	2,904	2,286	1,668	4,125	4,139	4,106	4,099	4,139
Cold Spring Brook (4,851 ac)	14,410	14,418	14,018	12,420	10,421	8,423	6,424	14,417	14,340	14,064	14,255	14,418
Cold Spring Harbor (2,953 ac)	14,843	14,907	14,414	12,439	9,971	7,503	5,035	14,899	14,907	14,907	14,754	14,907
Kentuck Brook (1,538 ac)	6,041	6,144	6,050	5,672	5,200	4,728	4,256	6,130	6,089	6,144	6,116	6,141
Lloyd Neck (894 ac)	3,676	3,676	3,559	3,091	2,506	1,921	1,336	3,676	3,676	3,676	3,627	3,676
Mill Neck Creek (968 ac)	7,556	7,531	7,368	6,715	5,900	5,085	4,269	7,534	7,531	7,487	7,482	7,531
Mill River (2,175 ac)	7,716	8,080	7,853	6,944	5,807	4,670	3,533	8,031	7,873	8,080	7,982	8,078
Oyster Bay Harbor (1,612 ac)	7,831	8,161	7,891	6,810	5,459	4,108	2,757	8,116	8,161	8,161	8,080	8,156
Tiffany Brook (1,923 ac)	7,143	7,342	7,119	6,225	5,109	3,992	2,875	7,315	7,283	7,342	7,275	7,337
White's Creek (292 ac)	2,229	2,250	2,168	1,844	1,438	1,032	626	2,247	2,242	2,250	2,236	2,241
Watershed Total	92,766	94,246	91,523	80,630	67,013	53,396	39,779	94,044	93,451	93,769	93,295	94,222

Nitrogen Load Reductions with Watershed Management Recommendations

	Existing Conditions (billion/yr)	Future Buildout without Controls (billion/yr)	Load Reduction due to Controls									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	2,531	2,595	3.0%	15.2%	30.4%	45.6%	60.8%	0.3%	4.5%	0.0%	1.0%	0.0%
Beaver Brook (4,862 ac)	14,752	15,003	3.0%	15.0%	30.1%	45.1%	60.1%	0.2%	1.8%	0.3%	1.2%	0.0%
Centre Island (762 ac)	4,039	4,139	3.0%	14.9%	29.9%	44.8%	59.7%	0.3%	0.0%	0.8%	1.0%	0.0%
Cold Spring Brook (4,851 ac)	14,410	14,418	2.8%	13.9%	27.7%	41.6%	55.4%	0.0%	0.5%	2.5%	1.1%	0.0%
Cold Spring Harbor (2,953 ac)	14,843	14,907	3.3%	16.6%	33.1%	49.7%	66.2%	0.1%	0.0%	0.0%	1.0%	0.0%
Kentuck Brook (1,538 ac)	6,041	6,144	1.5%	7.7%	15.4%	23.0%	30.7%	0.2%	0.9%	0.0%	0.5%	0.1%
Lloyd Neck (894 ac)	3,676	3,676	3.2%	15.9%	31.8%	47.7%	63.6%	0.0%	0.0%	0.0%	1.3%	0.0%
Mill Neck Creek (968 ac)	7,556	7,531	2.2%	10.8%	21.7%	32.5%	43.3%	0.0%	0.0%	0.6%	0.6%	0.0%
Mill River (2,175 ac)	7,716	8,080	2.8%	14.1%	28.1%	42.2%	56.3%	0.6%	2.6%	0.0%	1.2%	0.0%
Oyster Bay Harbor (1,612 ac)	7,831	8,161	3.3%	16.6%	33.1%	49.7%	66.2%	0.6%	0.0%	0.0%	1.0%	0.1%
Tiffany Brook (1,923 ac)	7,143	7,342	3.0%	15.2%	30.4%	45.6%	60.8%	0.4%	0.8%	0.0%	0.9%	0.1%
White's Creek (292 ac)	2,229	2,250	3.6%	18.0%	36.1%	54.1%	72.2%	0.1%	0.3%	0.0%	0.6%	0.4%
Watershed Total	92,766	94,246	2.9%	14.4%	28.9%	43.3%	57.8%	0.2%	0.8%	0.5%	1.0%	0.0%

Runoff Volume Reductions with Watershed Management Recommendations

	Existing Conditions (ac-in/yr)	Future Buildout without Controls (ac-in/yr)	Future Buildout with Contols (ac-in/yr)									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	2,531	2,595	481	416	334	252	170	2,586	2,478	2,595	2,569	2,595
Beaver Brook (4,862 ac)	14,752	15,003	2,911	2,521	2,033	1,545	1,058	14,969	14,731	14,956	14,821	15,003
Centre Island (762 ac)	4,039	4,139	730	631	507	383	259	4,125	4,139	4,106	4,099	4,139
Cold Spring Brook (4,851 ac)	14,410	14,418	2,674	2,314	1,865	1,416	967	14,417	14,340	14,064	14,255	14,418
Cold Spring Harbor (2,953 ac)	14,843	14,907	2,890	2,496	2,004	1,511	1,019	14,899	14,907	14,907	14,754	14,907
Kentuck Brook (1,538 ac)	6,041	6,144	535	462	371	279	187	6,130	6,089	6,144	6,116	6,141
Lloyd Neck (894 ac)	3,676	3,676	792	686	553	420	287	3,676	3,676	3,676	3,627	3,676
Mill Neck Creek (968 ac)	7,556	7,531	900	778	624	471	317	7,534	7,531	7,487	7,482	7,531
Mill River (2,175 ac)	7,716	8,080	1,595	1,381	1,113	845	578	8,031	7,873	8,080	7,982	8,078
Oyster Bay Harbor (1,612 ac)	7,831	8,161	1,562	1,348	1,082	815	548	8,116	8,161	8,161	8,080	8,156
Tiffany Brook (1,923 ac)	7,143	7,342	1,313	1,134	909	684	460	7,315	7,283	7,342	7,275	7,337
White's Creek (292 ac)	2,229	2,250	362	311	248	184	120	2,247	2,242	2,250	2,236	2,241
Watershed Total	92,766	94,246	16,746	14,478	11,642	8,806	5,970	94,044	93,451	93,769	93,295	94,222

Runoff Volume Reductions with Watershed Management Recommendations

	Existing Conditions (ac-in/yr)	Future Buildout without Controls (ac-in/yr)	Load Reduction due to Controls									
			Green Infrastructure/ LID Retrofits					Stormwater Management for New Devel. & Redevel.	Riparian & Wetland Buffer Restoration	Reforestation	Public Education	IDDE/Septic System Repairs
Watershed Management Recommendation			Retrofit 5% Total Land Area	Retrofit 25% Total Land Area	Retrofit 50% Total Land Area	Retrofit 75% Total Land Area	Retrofit 100% Total Land Area					
Bailey Arboretum (527 ac)	2,531	2,595	81.5%	84.0%	87.1%	90.3%	93.4%	0.3%	4.5%	0.0%	1.0%	0.0%
Beaver Brook (4,862 ac)	14,752	15,003	80.6%	83.2%	86.4%	89.7%	92.9%	0.2%	1.8%	0.3%	1.2%	0.0%
Centre Island (762 ac)	4,039	4,139	82.4%	84.8%	87.8%	90.8%	93.8%	0.3%	0.0%	0.8%	1.0%	0.0%
Cold Spring Brook (4,851 ac)	14,410	14,418	81.5%	83.9%	87.1%	90.2%	93.3%	0.0%	0.5%	2.5%	1.1%	0.0%
Cold Spring Harbor (2,953 ac)	14,843	14,907	80.6%	83.3%	86.6%	89.9%	93.2%	0.1%	0.0%	0.0%	1.0%	0.0%
Kentuck Brook (1,538 ac)	6,041	6,144	91.3%	92.5%	94.0%	95.5%	96.9%	0.2%	0.9%	0.0%	0.5%	0.1%
Lloyd Neck (894 ac)	3,676	3,676	78.4%	81.3%	85.0%	88.6%	92.2%	0.0%	0.0%	0.0%	1.3%	0.0%
Mill Neck Creek (968 ac)	7,556	7,531	88.0%	89.7%	91.7%	93.7%	95.8%	0.0%	0.0%	0.6%	0.6%	0.0%
Mill River (2,175 ac)	7,716	8,080	80.3%	82.9%	86.2%	89.5%	92.9%	0.6%	2.6%	0.0%	1.2%	0.0%
Oyster Bay Harbor (1,612 ac)	7,831	8,161	80.9%	83.5%	86.7%	90.0%	93.3%	0.6%	0.0%	0.0%	1.0%	0.1%
Tiffany Brook (1,923 ac)	7,143	7,342	82.1%	84.6%	87.6%	90.7%	93.7%	0.4%	0.8%	0.0%	0.9%	0.1%
White's Creek (292 ac)	2,229	2,250	83.9%	86.2%	89.0%	91.8%	94.6%	0.1%	0.3%	0.0%	0.6%	0.4%
Watershed Total	92,766	94,246	82.2%	84.6%	87.6%	90.7%	93.7%	0.2%	0.8%	0.5%	1.0%	0.0%

Appendix E

Potential Funding Sources

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
New York SEA Grant A number of grants are available throughout the year http://www.seagrant.sunysb.edu/					Varies
NYS DEC Water Quality Improvement Project (WQIP) Program http://www.dec.ny.gov/pubs/4774.html Region 1 contact – Cathy Haas (631) 444-0427					October
Green Innovation Grant Program http://www.nysefc.org/GreenGrants.aspx Suzanna Randall, Green Infrastructure Coordinator, 518-486-9246 or 1-800-200-2200	$750,000		50% for design, 10 % for construction		
State Revolving Fund (SRF) - Low interest loans and subsidies http://www.nysefc.org/CleanWaterStateRevolvingFund.aspx Dwight Brown. SRF Program Services Coordinator. 518-402-7396 or 1-800-882-9721					
New York State Department of State Shared Municipal Services Initiative Resources purchased for sharing under a cooperative agreement may be eligible for a Local Government Efficiency Grant http://www.dos.state.ny.us/lg/lge-index.html					
Brownfield Opportunity Areas Program http://www.nyswaterfronts.com/grantopps_BOA.asp Curtis Cravens, (212) 417-2252 David Ashton (518) 473-2473			10% or more of on-site costs	Continuous	3/31 for 5/31 decisions, 9/29 for 11/30 decisions
Environmental Protection Fund http://www.dec.ny.gov/lands/5071.html				6/1/11	9/1/11

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
EPA Green Infrastructure Funding Website http://cfpub.epa.gov/npdes/greeninfrastructure/fundingopportunities.cfm Index to funding opportunities for LID practices and pollution reduction projects.					
America the Beautiful Grant Program USDA Forest Service funding	$8000		50%	May	June
Eastman Kodak / Nat'l Geographic American Greenways Awards optional Program jwhite@conservationfund.org, Jen White	$2500	$300	Optional	April	June
EPA Healthy Communities Grant Program Padula.Jennifer@epa.gov 617-918-1698	$35,000	$5,000	Optional, up to 5%	March	May
EPA Targeted Watershed Grants Program http://www.epa.gov/twg/ Requires Governor nomination.			25% of total project costs (non-federal)		
DEC CWA Section 319 NPS Nonpoint Source Management program			40% of total project costs (non-federal)		

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
NYS Hazard Mitigation Grant Program http://www.dhses.ny.gov/ Provides financial assistance to state, county, and local governments for projects that reduce or eliminate the long-term risk to human life and property from the effects from natural hazards.			75% Federal / 25% Local		
NYS Clean Vessels Assistance Program To increase the availability and awareness of marine pumpout stations http://www.nysefc.org/	60,000		25% or more		
NYS Department of Transportation Environmental Initiative DOT funds and implements Environmental Benefit Projects that are well suited to its mission and capabilities https://www.nysdot.gov/portal/page/portal/divisions/engineering/environmental-analysis/environmental-initiative					
NRCS Conservation Stewardship Program http://www.nrcs.usda.gov/programs/csp/ This program is available to farmers and ranchers to address natural resource concerns on their lands.					

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
American Rivers – NOAA Community-Based Restoration Program Partnership http://www.americanrivers.org/our-work/restoring-rivers/dams/noaa-grants-program.html These grants are designed to provide support for local communities that are utilizing dam removal or fish passage to restore and protect the ecological integrity of their rivers and improve freshwater habitats important to migratory fish.					
FishAmerica Foundation Conservation Grants 703-519-9691 x247 fishamerica@asafishing.org	Average $7,500				
NOAA Open Rivers Initiative http://www.habitat.noaa.gov/funding/ori.html Tisa Shostik (Tisa.Shostik@noaa.gov) 301-713-0174 x184 Cathy Bozek (Cathy.Bozek@noaa.gov) 301-713-0174 x150	$3,000,000	$100,000	Optional 1:1 non-federal		Fall/Winter
NFWF Long Island Sound Futures Fund Small Grants	$6,000	$1,000	Optional (non-federal)	Fall/Winter	Spring/ Summer
NFWF Long Island Sound Futures Fund Large Grants 631-289-0150 Lynn Dwyer Lynn.Dwyer@nfwf.org	$150,000	$10,000	Optional (non-federal)	Fall/Winter	Spring/ Summer

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
NRCS Wildlife Habitat Incentives Program (WHIP) http://www.ny.nrcs.usda.gov For creation, enhancement, maintenance of wildlife habitat; for privately owned lands.	$50,000/year	$1,000	25%		
NRCS Environmental Quality Incentives Program (EQIP) http://www.ny.nrcs.usda.gov For implementation of conservation measures on agricultural lands.	$50,000/year		25-50%		
NRCS Healthy Forests Reserve Program http://www.nrcs.usda.gov/programs/hfrp/proginfo/index.html For restoring and enhancing forest ecosystems					
NRCS Wetlands Reserve Program http://www.ny.nrcs.usda.gov For protection, restoration and enhancement of wetlands					
USFS Watershed and Clean Water Action and Forestry Innovation Grants http://www.na.fs.fed.us/watershed/gp_innovation.shtm This effort between USDA FS-Northeastern Area and State Foresters is to implement a challenge grant program to promote watershed health through support of state and local restoration and protection efforts.					

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
Corporate Wetlands Restoration Partnership (CWRP) http://www.ny-cwrp.org/ Can also apply for in-kind services, e.g. surveying, etc.	Typically $20,000	Typically $5,000	3 to 1	April and August	
Trout Unlimited Embrace A Stream http://www.tu.org/conservation/watershed-restoration-home-rivers-initiative/embrace-a-stream	$5,000				
USFWS National Coastal Wetlands Conservation Grant Program Ken Burton 703-358-2229 Only states can apply.	$1 million		50%		
YSI Foundation 937-767-7241 x406 Susan Miller Susan Miller smiller@ysi.com	$60,000		Optional	March	April
Other Financial Opportunities					
Private Foundation Grants and Awards Private foundations are potential sources of funding to support watershed management activities. Many private foundations post grant guidelines on websites. Two online resources for researching sources of potential funding are provided in the contact information.					
Congressional Appropriation - Direct Federal Funding					
State Appropriations - Direct State Funding					

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
Membership Drives Membership drives can provide a stable source of income to support watershed management programs.					
Donations Donations can be a major source of revenue for supporting watershed activities, and can be received in a variety of ways.					
User Fees, Taxes, and Assessments Taxes are used to fund activities that do not provide a specific benefit, but provide a more general benefit to the community.					
Rates and Charges State law authorizes some public utilities to collect rates and charges for the services they provide.					
Stormwater Utility Districts A stormwater utility district is a legal construction that allows municipalities to designated management districts where storm sewers are maintained in order to the quality of local waters. Once the district is established, the municipality may assess a fee to all property owners.					
Impact Fees Impact fees are also known as capital contribution, facilities fees, or system development charges, among other names.					
Special Assessments Special assessments are created for the specific purpose of financing capital improvements, such as provisions, to serve a specific area.					
Property Tax These taxes generally support a significant portion of a county's or municipality's non-public enterprise activities.					
Excise Taxes These taxes require special legislation, and the funds generated through the tax are limited to specific uses: lodging, food, etc.					

Oyster Bay/Cold Spring Harbor Watershed Action Plan - Potential Funding Sources

Funding Source	Maximum Dollar Amount	Minimum Dollar Amount	Required Match	Applications Open	Deadline
Bonds and Loans Bonds and loans can be used to finance capital improvements. These programs are appropriate for local governments and utilities to support capital projects.					
Investment Income Some organizations have elected to establish their own foundations or endowment funds to provide long-term funding stability. Endowment funds can be established and managed by a single organization-specific foundation or an organization may elect to have a community foundation to hold and administer its endowment. With an endowment fund, the principal or actual cash raised is invested. The organization may elect to tap into the principal under certain established circumstances.					
Emerging Opportunities for Program Support Water Quality Trading Allows regulated entities to purchase credits for pollutant reductions in the watershed or a specified part of the watershed to meet or exceed regulatory or voluntary goals. There are a number of variations for water quality credit trading frameworks. Credits can be traded, or bought and sold, between point sources only, between NPSs only, or between point sources and NPSs.					
Mitigation and Conservation Banks Created by property owners who restore and/or preserve their land in its natural condition. Such banks have been developed by public, nonprofit, and private entities. In exchange for preserving the land, the "bankers" get permission from appropriate state and federal agencies to sell mitigation banking credits to developers wanting to mitigate the impacts of proposed development. By purchasing the mitigation bank credits, the developer avoids having to mitigate the impacts of their development on site. Public and nonprofit mitigation banks may use the funds generated from the sale of the credits to fund the purchase of additional land for preservation and/or for the restoration of the lands to a natural state.					