



TOWN OF SHELTER ISLAND

WATERSHED MANAGEMENT PLAN



PREPARED FOR:

TOWN OF SHELTER ISLAND
38 North Ferry Road
P.O. Box 970
Shelter Island, New York 11954

New York State Department of State
Office of Planning & Development
One Commerce Plaza
99 Washington Avenue, Suite 1010
Albany, New York 12231-0001

PREPARED BY:

NELSON, POPE & VOORHIS
572 Walt Whitman Road
Melville, New York 11747
(631) 427-5665



June 2014

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FINAL

For Information, Contact:

Laury Dowd
Town Attorney
Town of Shelter Island

38 North Ferry Road
P.O. Box 970
Shelter Island, NY 11954

Phone: (631) 749-0027
Email: ldowd@shelterislandtown.us

Tracey O'Malley
Coastal Resources Specialist
New York State Department of State
Office of Planning and Development

One Commerce Plaza
99 Washington Avenue, Suite 1010
Albany, NY 12231-0001

Phone: (518) 474-4457
Email: Tracey.O'Malley@dos.ny.gov

Prepared by:



Nelson, Pope & Voorhis, LLC
572 Walt Whitman Road
Melville, New York 11747

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TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Prepared for:

Jim Dougherty, Town Supervisor

Town Board

Edward Brown, Councilmen
Christine N. Lewis, Councilmen

Peter S. Reich, Councilmen
Paul Shepherd, Councilmen

Key Stakeholders & Participants:

| | | |
|-------------------|------------------------|---|
| Peter Reich | Town Board Member | Town of Shelter Island |
| Paul Shepherd | Town Board Member | Town of Shelter Island |
| Billy Banks | Building Inspector | Town of Shelter Island |
| Chris Tehan | Building Inspector | Town of Shelter Island |
| Laury Dowd | MS4 Coordinator | Town of Shelter Island |
| Jay Card | Highway Superintendent | Town of Shelter Island |
| Emory Breiner | Member | Town Planning Board |
| Ed Bausman | Chair | Town Conservation Advisory Council |
| Tim Hogue | Mayor | Village of Dering Harbor & Shelter Island Association |
| Laura Hildreth | Village Clerk | Village of Dering Harbor |
| Al Kilb | Project Manager | Shelter Island Heights Property Owners (SIHPOC) |
| Dr. Michael Hynes | Superintendent | Shelter Island School |
| Sara Gordon | Representative | Peconic Land Trust |
| Cara Loriz | Representative | Sylvester Manor Educational Foundation |
| Mike Laspia | Representative | The Nature Conservancy |
| Barbara Bloom | Secretary | Shelter Island Chamber of Commerce |

TABLE OF CONTENTS

| | <u>Page</u> |
|--|-------------|
| COVER SHEET | I |
| TABLE OF CONTENTS | III |
| EXECUTIVE SUMMARY | i |
| 1.0 INTRODUCTION | 1-1 |
| 1.1 Background and Purpose | 1-1 |
| 1.2 Goals and Objectives | 1-1 |
| 2.0 WATERSHED CHARACTERIZATION | 2-1 |
| 2.1 Watershed Study Area & Subwatershed Delineation | 2-1 |
| 2.2 Geographic Setting & Features | 2-1 |
| 2.2.1 Topography | 2-1 |
| 2.2.2 Geology | 2-2 |
| 2.2.3 Hydrography | 2-3 |
| 2.2.3.1 Surface Water | 2-3 |
| 2.2.3.2 Groundwater | 2-4 |
| Hydrogeology | 2-4 |
| Groundwater Elevation and Flow | 2-4 |
| Water Table Response to Precipitation | 2-6 |
| Sub-watersheds | 2-6 |
| Groundwater Contributing Areas (to Surface Waters) and Time of Travel Zones | 2-8 |
| Depth of Fresh Water | 2-8 |
| Water Use and Quantity | 2-12 |
| 2.2.4 Flood Zones | 2-14 |
| 2.2.5 Soils & Erosion | 2-16 |
| 2.2.6 Precipitation & Climate | 2-19 |
| 2.2.7 Infrastructure | 2-20 |
| 2.2.7.1 Transportation | 2-20 |
| 2.2.7.2 Stormwater | 2-21 |
| 2.2.7.3 Sanitary | 2-22 |
| 2.2.7.4 Potable Water | 2-23 |
| 2.3 Land Use & Land Cover | 2-23 |
| Land Use and Land Cover | 2-23 |
| Publicly Owned Land | 2-26 |
| Marinas, Yacht Clubs & Ferries | 2-26 |
| Town Landfill | 2-27 |
| 2.4 Human & Socioeconomic Resources | 2-27 |
| 2.4.1 Zoning | 2-27 |
| 2.4.2 Demographics | 2-29 |
| 2.5 Natural Resources | 2-29 |
| 2.5.1 Wetlands | 2-29 |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| | | |
|------------|---|------|
| | Freshwater Wetlands | 2-29 |
| | Tidal Wetlands | 2-33 |
| 2.5.2 | Living Resources | 2-34 |
| 2.5.3 | Habitats | 2-35 |
| | NYSDOS Significant Coastal Fish & Wildlife Habitat | 2-35 |
| | Eel Grass Beds & Submerged Aquatic Vegetation | 2-36 |
| | NYNHP Significant Natural Communities | 2-37 |
| | Wintering Harbour Seals | 2-40 |
| | PEP Critical Natural Resource Areas | 2-40 |
| | Peconic Bay Waterfowl Focus Area | 2-40 |
| 2.6 | Water Quality | 2-40 |
| 2.6.1 | Surface Water Quality Classifications | 2-40 |
| 2.6.2 | Water Quality Data | 2-42 |
| | Groundwater Quality | 2-42 |
| | Stormwater | 2-49 |
| | Surface Water Quality | 2-49 |
| 2.6.3 | Known Impairments | 2-54 |
| | NYS 303(d) List | 2-54 |
| | Shellfish Closure Areas | 2-56 |
| | GP 0-10-002 Pathogen Impaired Watersheds | 2-56 |
| | Harmful Algal Blooms | 2-57 |
| 3.0 | DESCRIPTION AND ASSESSMENT OF LOCAL LAWS, PROGRAMS AND PRACTICES AFFECTING WATER QUALITY | 3-1 |
| 3.1 | Federal and State Regulations | 3-1 |
| 3.2 | County Regulations | 3-6 |
| 3.3 | Town Regulations and Practices | 3-8 |
| | 3.3.1 Local Laws and Regulations | 3-8 |
| | 3.3.2 Land Use Plans | 3-15 |
| | 3.3.3 Watershed Management Plans | 3-16 |
| | 3.3.4 Town Programs and Municipal Best Management Practices | 3-16 |
| | 3.3.5 Building Permit and Special Permit Review | 3-24 |
| 3.4 | Best Management Practice Gap Analysis | 3-25 |
| 4.0 | RECOMMENDATIONS | 4-1 |
| 4.1 | Waterbody Recommendations | 4-1 |
| 4.2 | Upland Recommendations | 4-6 |
| | 4.2.1 Stormwater Runoff | 4-6 |
| | 4.2.2 Municipal Facilities Recommendations | 4-9 |
| | 4.2.3 Groundwater and Wastewater Recommendations | 4-11 |
| | 4.2.4 Regulatory Recommendations | 4-14 |
| | 4.2.5 Natural Resource and Invasive Species Management | 4-17 |
| | 4.2.6 Stewardship & Public Education Recommendations | 4-19 |
| 4.3 | Project Prioritization | 4-21 |
| 5.0 | IMPLEMENTATION STRATEGY | 5-1 |
| 5.1 | Implementation Actions | 5-1 |



5.2 Funding Sources
6.0 REFERENCES

5-20
6-1

TABLES

| | | <u>Page</u> |
|-----------------|---|-------------|
| Table 1 | FEMA Flood Zones | 2-15 |
| Table 2 | Soil Types & Abundance | 2-18 |
| Table 3 | State & County Owned Roadways | 2-21 |
| Table 4 | Land Use – Shelter Island | 2-24 |
| Table 5 | Land Cover – Shelter Island | 2-25 |
| Table 6 | Zoning – Shelter Island | 2-28 |
| Table 7 | NYSDEC Freshwater Wetlands | 2-32 |
| Table 8 | Rare Species Identified by the NYNHP | 2-35 |
| Table 9 | Shelter Island Significant Natural Communities | 2-38 |
| Table 10 | NYSDEC Surface Water Quality Classifications | 2-41 |
| Table 11 | SCDHS 2009 to 2011 Groundwater Quality Data | 2-47 |
| Table 12 | Surface Water Quality Results | 2-51 |
| Table 13 | Surface Water Quality Evaluation Criteria | 2-52 |
| Table 14 | NYS 303(d) List | 2-55 |
| Table 15 | Municipal Best Management Practices | 3-17 |
| Table 16 | Regulatory Gap Analysis | 3-26 |
| Table 17 | Pollutant Load – Subwatersheds with Proposed Improvements | 4-23 |
| Table 18 | Project Prioritization | 4-24 |
| Table 19 | Implementation Strategy | 5-2 |
| Table 20 | Measurable Objectives | 5-9 |
| Table 21 | Potential Funding Sources | 5-21 |

GRAPHS

| | | <u>Page</u> |
|-----------------|---|-------------|
| Graph 1A | Annual Rainfall, 1930 - 2011 | 2-19 |
| Graph 1B | Average Monthly Rainfall, 1930-2011 | 2-20 |
| Graph 2 | Pollutant Load – Subwatersheds with Proposed Improvements | 4-23 |



FIGURES

| | |
|------------------|---|
| Figure 1 | Shelter Island Surface Subwatersheds |
| Figure 2 | Topography |
| Figure 3 | Geologic Cross Sections |
| Figure 4 | Water Table Contour Map |
| Figure 5 | Major Groundwater Subwatersheds |
| Figure 6 | Groundwater Contributing Areas Travel Times |
| Figure 7 | FEMA Flood Zone Map |
| Figure 8 | SLOSH Map |
| Figure 9 | General Soil Types |
| Figure 10 | Soils Map |
| Figure 11 | Stormwater Infrastructure |
| Figure 12 | Water Districts and Well Locations |
| Figure 13 | Land Use |
| Figure 14 | Land Cover |
| Figure 15 | Publicly Owned Lands |
| Figure 16 | Zoning |
| Figure 17 | Population |
| Figure 18 | Wetlands |
| Figure 19 | Significant Natural Habitats |
| Figure 20 | Resource Management Areas |
| Figure 21 | Surface Water Quality Classifications & Sampling Stations |
| Figure 22 | Saltwater Encroachment and Upconing |
| Figure 23 | Interpolated Nitrate Levels |
| Figure 24 | Known Impairments |
| Figure 25 | Areas with Shallow Depth to Groundwater |
| Figure 26 | Stormwater Improvement Projects |
| Figure 27 | Additional Recommendations |

APPENDICES

| | |
|-------------------|--|
| Appendix A | Parcels Targeted For Acquisition |
| Appendix B | NYSDOS Significant Coastal Fish & Wildlife Habitat Assessments |
| Appendix C | NYNHP Significant Natural Community Descriptions |
| Appendix D | SCDHS Bathing Beach Data |
| Appendix E | STP Outfall Data |
| Appendix F | NYSDEC Shellfish Closure Area Regulations |
| Appendix G | Use of Alum for Phosphorus Remediation |
| Appendix H | Stormwater Retrofit Reconnaissance Inventory |
| Appendix I | Sample Vehicle Washing Areas |
| Appendix J | Example Cost Shared Pump Out Programs |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Appendix K
Appendix L
Appendix M

Sample Septic System Filters
Pollutant Load Model Results
Excerpt from Appendix K of the Peconic Estuary Program
Comprehensive Conservation and Management Plan (CCMP)



WATERBODY AND WATERSHED INVENTORY REPORT





EXECUTIVE SUMMARY



Why Prepare a Watershed Management Plan?

Watershed planning is a means to protect and restore water resources, as well as the local economies that rely on these essential coastal resources. The purpose of a Watershed Management Plan is to provide a comprehensive approach to educate, plan for and implement incremental improvements with a goal of protecting and restoring watershed health. Shelter Island’s resources are fragile, and human influences and actions affect the island’s waterbodies, both directly and indirectly. This is particularly evident in West Neck Bay and Dering Harbor, where known impairments due to pathogens, nitrogen levels and harmful algal blooms exist. Human actions have direct impact on water quality: discharge of stormwater and sanitary waste without adequate filtration to surface and groundwater, filling and removal of wetlands that provide natural filtering and biological uptake of pollutants, removal of trees and vegetated



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



buffers surrounding waterbodies that cause erosion and lower dissolved oxygen, fertilization of lawns, and the list continues. To facilitate the preparation of a Watershed Management Plan for Shelter Island, the Town applied for and received a grant from New York State Department of State (funds provided under Title 11 of the Environmental Protection Fund) to prepare this Watershed Management Plan.

The WMP provides a characterization of the existing natural, cultural and human resources within the watershed, identifies key factors impacting the watersheds of Shelter Island, provides general and site specific recommendations for watershed improvement, and provides implementation strategies for each of the recommendations provided.

What are the Goals for the Watershed?

- **Water Quality Goals**

- Improve water quality through the identification, control and reduction of non-point source pollution.
- Establish watershed improvement strategies and implementation of BMPs to ensure pathogen pollutant load reduction per NYSDEC MS4 General Permit requirements.
- Evaluate the existing inventory of stormwater infrastructure within the watershed and investigate pollution sources and major non-point source causes of water quality impairments.
- Target potential areas available for stormwater improvements and establish a prioritization of recommended stormwater improvements.
- Develop, implement, and enforce a program to detect and eliminate discharges to the municipal separate storm sewer system or directly to surface waters from on-





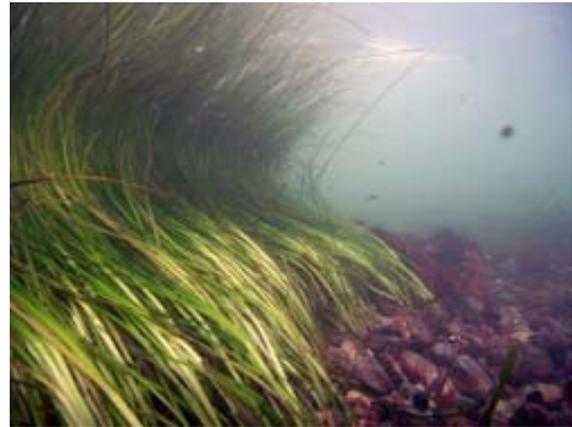
TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



site sanitary systems in areas of shallow groundwater, low infiltrative soils, historical on-site sanitary system failures, or proximity to pathogen-impaired waterbodies, etc.

- **Natural Resource Goals**

- Ensure protection of tidal and coastal freshwater wetlands for the benefits of water quality improvement, wildlife and fish habitat, marine food production, flood and storm control, open space, tourism and educational opportunities.
- Improve water quality of runoff to ensure the protection and continued inhabitation of shellfish in the tidal waters surrounding the island.
- Identify and protect important natural resources within the watershed.
- Restore wetland areas and wetland productivity by reestablishing wetland and riparian buffers and wetland restoration where possible.



- **Use Management Goals**

- Evaluate existing land use codes and update codes to incorporate water quality improvement measures (i.e., encouraging reduction in impervious surfaces, use of green infrastructure, retention of natural buffers, water conservation, etc.)
- Evaluate municipal operations and establish/promote best management practices to alleviate nonpoint source pollution.
- Maintain and promote appropriate water-dependent land use.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Educational Goals

- Improve water quality education by informing watershed residents and businesses of common activities that cause water quality issues and simple solutions to reduce impacts. Educational outreach efforts should focus in the following areas:
 - Stormwater discharges from private properties
 - Methods for addressing stormwater runoff on individual properties
 - Impacts of use of fertilizer and irrigation
 - Sources of pathogens and methods to reduce pathogen inputs to waterbodies
 - Information regarding the Island-wide tick control programs and impacts of insecticide applications to individual properties.
- Promote environmental stewardship to increase awareness of watershed resources by partnering with existing organizations to sponsor programs and outreach efforts.
- Increase awareness of sources of pathogens and impacts of pathogens on surface waters through educational outreach. Provide a focus on the impacts of cesspools and the importance of proper cesspool/septic system maintenance.

Current Watershed Characteristics

The Watershed

A total of 64 subwatershed areas were defined within Shelter Island, ranging from approximately 2.7 acres in size to over 240 acres in size. In total, the subwatersheds represent the individual drainage areas that are present on the 11.8 square mile Island.

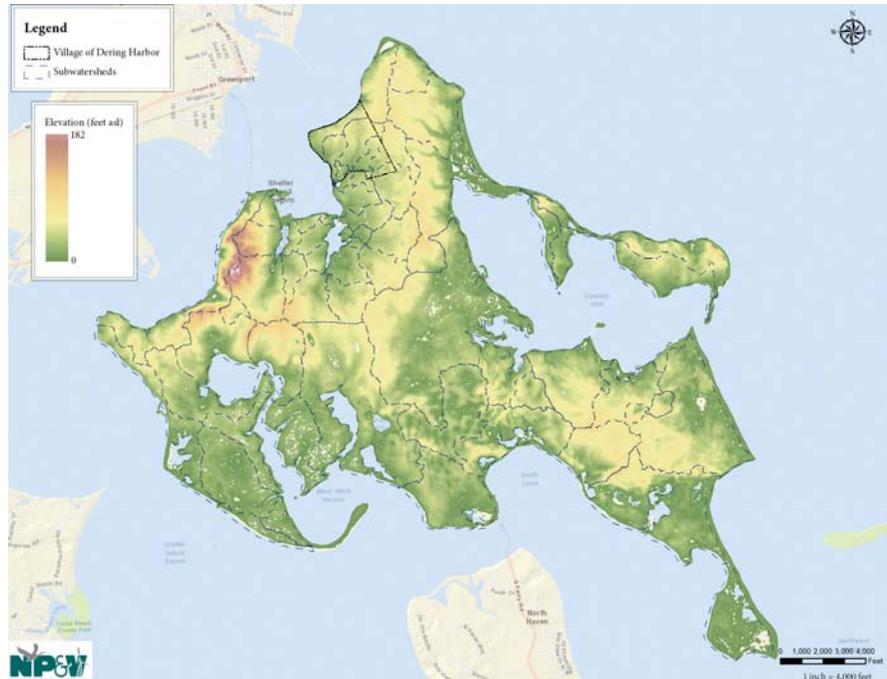


TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Topography

The topography of Shelter Island generally trends from higher elevations in the center of the Island to lower elevations along the shoreline. The northern peninsula on the Island exhibits greater elevations in the central portion of the peninsula. Shelter Island Heights exhibits the greatest topographic relief with areas of steep slopes. A topographically low area exists between the southwest corner of Coecles Inlet and the south-central peninsula of the Island. Mashomack Preserve located in the southeast peninsula of the Island exhibits greater relief in the north-central portion of the peninsula, while topography in the southwestern portion of the Island is generally flat.



Geology

Shelter Island is a sedimentary sand formation deposited as a result of glacial history, lying atop bedrock and other geologic units. The geology underlying Shelter Island is comprised of six geologic units. The first and deepest is comprised of crystalline bedrock. Above this bedrock lie the sedimentary deposits which form the three major water-bearing units that underlie the Island. Lying immediately atop the bedrock is the Raritan formation, which is comprised of the Lloyd sand layer and an overlying clay layer. Directly above the Raritan formation is the Magothy formation.

Soils

The soil survey identifies Shelter Island as lying within an area characterized entirely by Montauk-Haven-Riverhead Association soils. This association contains the minor soil groups of



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Carver, Plymouth, Montauk, Walpole, Atsion and Berryland soils. Soils of this association are characterized as deep, nearly level to strongly sloping, well-drained to moderately well-drained soils, having moderately coarse-textured and medium-textured soils on moraines. It is noted that Montauk soils within this association has a fragipan or compact layer that ranges from two to 20 feet in thickness.

Climate

Primarily due to its latitude and proximity of the Atlantic Ocean, Shelter Island has a predominantly temperate marine climate. Temperatures are moderate and precipitation is abundant during the fall, winter and spring. A brief dry spell commonly occurs during the summer. Data in the vicinity of Shelter Island collected by NOAA (National Oceanic and Atmospheric Administration) indicates that the average annual temperature of the region is 56 degrees Fahrenheit.

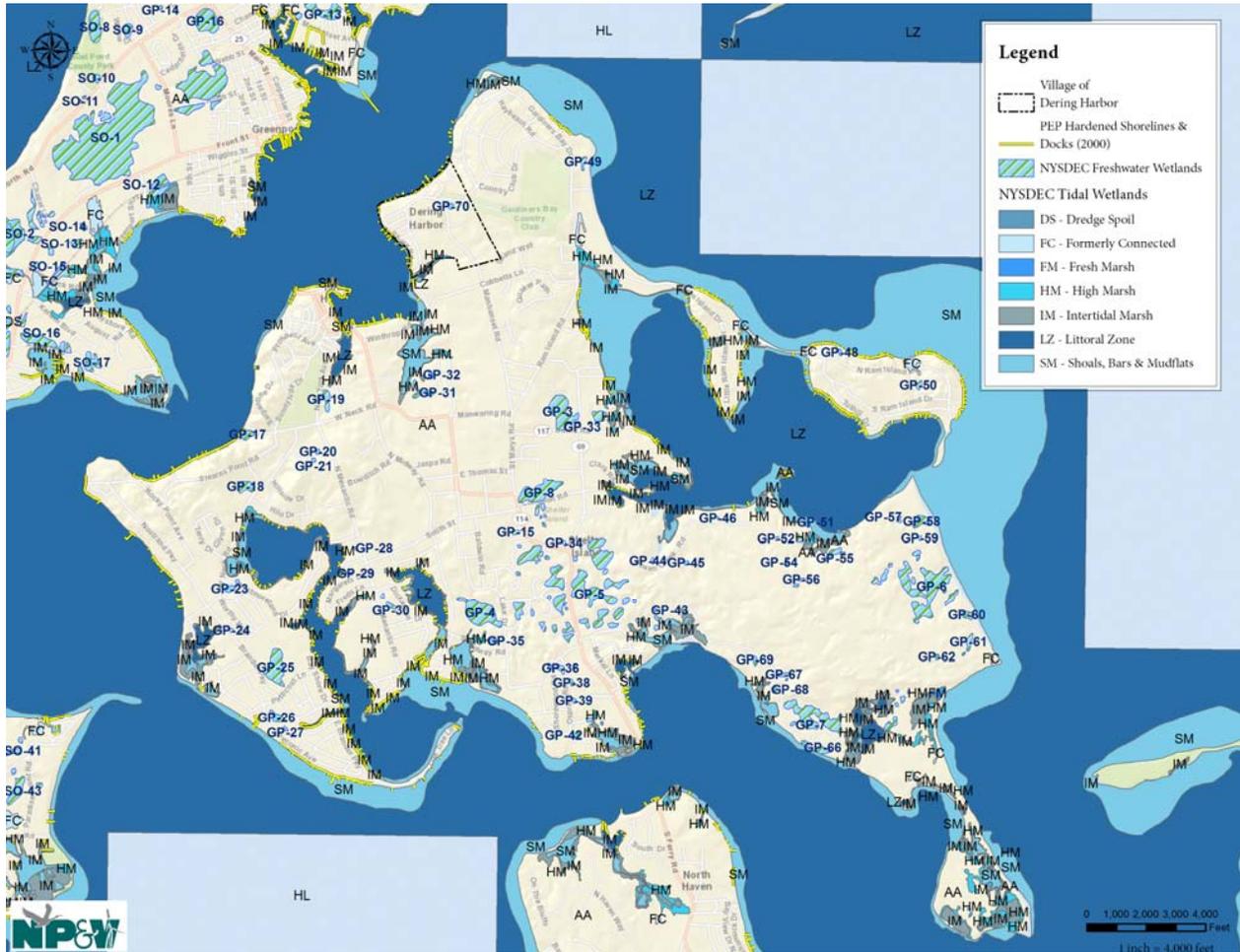
Surface Water Resources

The freshwater wetlands (i.e., ponds and marshes) are located primarily within the inland portions of Shelter Island and are particularly concentrated in the southern half of the Island. These features were formed during the retreat of the Laurentide Ice Sheet, when fresh meltwater collected in the kettle holes and depressions formed previously during glacial advance. These areas are of critical importance to the watershed underlying Shelter Island since they are major conduits of groundwater recharge in the region and represent ecologically sensitive resources.

The Town's tidal wetlands are located where the coastline is bounded by tidal waters. These wetlands contain saline waters, which originate from the ocean-fed surface waters surrounding Shelter Island. These features are formed by coastal processes and, with the exception of formerly connected tidal wetlands, are subject to tidal influence. These areas are not only vital to the ecological systems to which they serve, but also function to control storm surges during flood and major storm events which may impact sensitive watershed areas.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Groundwater Resources

The major water-bearing units beneath Shelter Island are of geologic origin include the Upper Glacial aquifer, the Magothy aquifer, and the Lloyd aquifer. Fresh groundwater used for water supply purposes is derived from water contained within the upper part of the Upper Glacial aquifer, principally above an underlying clay layer. Groundwater contained within the lower part of the Upper Glacial aquifer, as well as the Magothy and Lloyd aquifers is saline and is unsuitable for consumption or irrigation.



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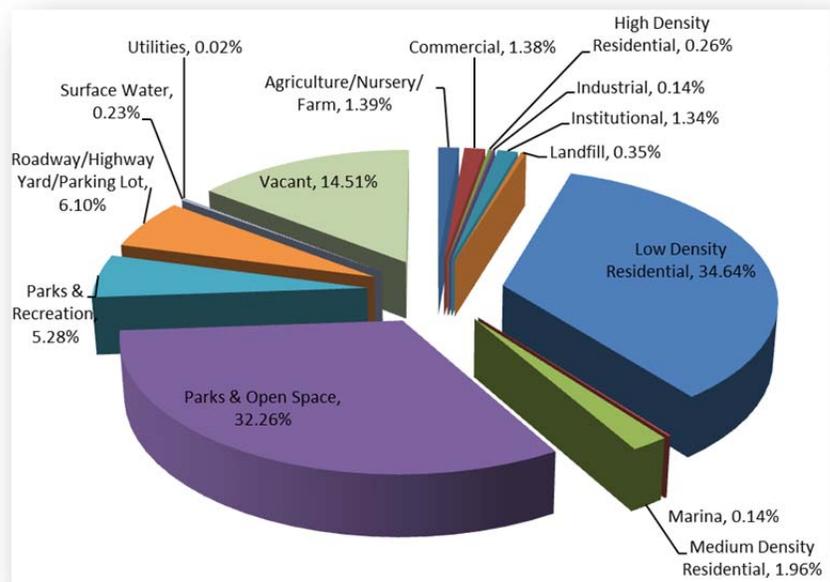
The elevation of groundwater underlying Shelter Island ranges from 8 feet above mean sea level (msl) in the northwest part of the Island, to zero (0) at the above ground surface in areas of wetlands and surface water. As groundwater migrates away from areas of higher elevation toward the shore, it eventually discharges to surface water as a result of surface seepage and subsea (or subsurface) outflow. Near the shore, water entering the system tends to flow horizontally along a shallow flow system and is discharged from the subsurface into streams or marine surface waters. Water that enters the system farther inland and along the western end of the Island generally flows vertically downward deeper into the Upper Glacial aquifer before flowing toward the shores where it is discharged as subsurface outflow.

Land Use

Shelter Island is approximately 7,600 acres in size, the majority of which is occupied by Low Density Residential (34.64%) and Open Space & Parkland (32.26%) uses. Vacant Land also occupies a significant portion of the island, as it currently comprises 14.51% of lands.

Although Roadway/Highway Yard/Parking Lot (6.10%) and Parks & Recreation (5.28%)

occupy a much smaller portion of the island, these uses represent the remainder of the major uses that occupy lands. All other uses within the island occupy less than 2% of the overall land mass.



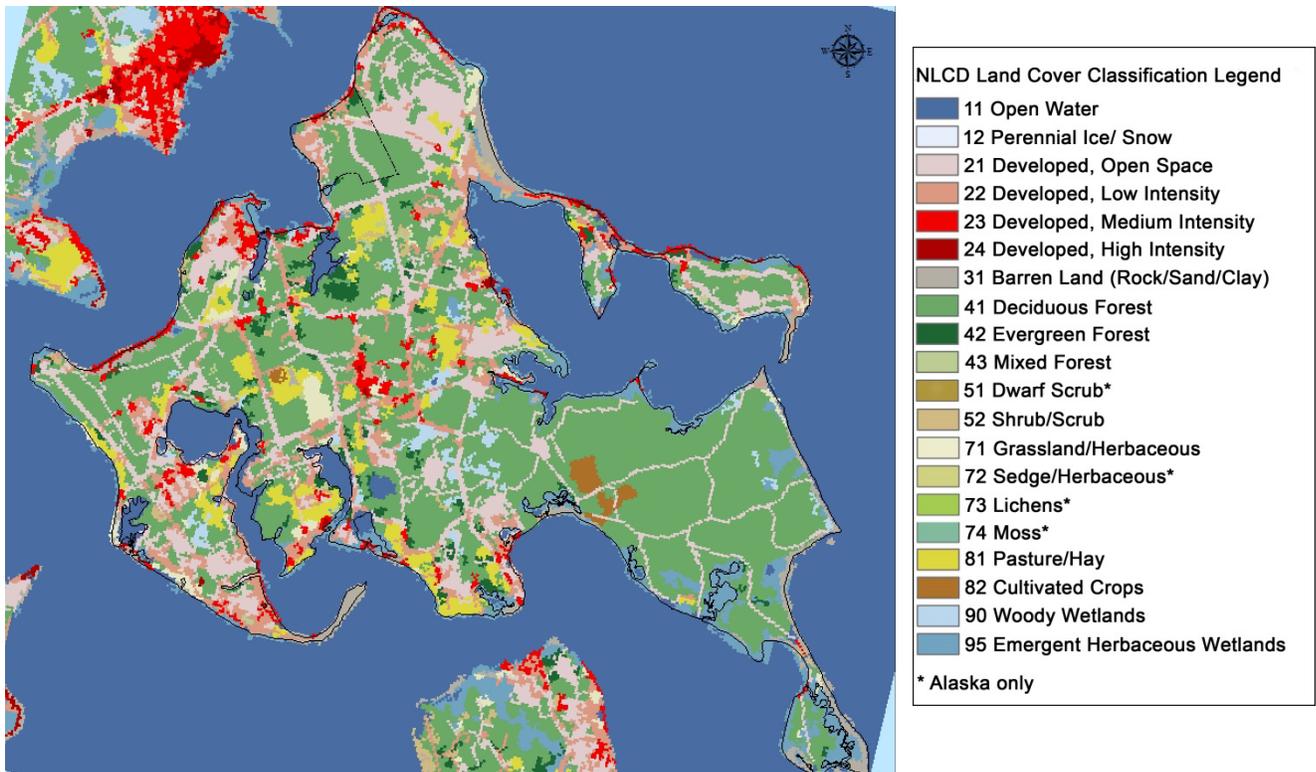


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Land Cover

The majority of Shelter Island is occupied by deciduous forest (3621.22 acres or 47.19%). This generally reflects the large quantity of trees that comprise the surface of the island. The second greatest land cover that occupies the island is categorized as Developed, Open Space (17.35%) which generally represents roadways and pathways that traverse the island in addition to large areas of lawn/landscaped areas. Other major land cover categories include Developed, Low Intensity (9.01%), Pasture/Hay (5.15%), and Emergent Herbaceous Wetlands (5.58%). The Developed, Low Intensity category primarily reflects residential areas and some associated roadways, while the Pasture/Hay category represents large mowed areas or large areas of tall grasses. Emergent Herbaceous Wetlands primarily represent the vegetated tidal wetlands on the island.





TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Water Quality

While the open, well flushed portions of the waterbodies surrounding Shelter Island exhibit good water quality, waterbodies that do not receive significant tidal flushing and have significant pollution inputs from the watershed exhibit poor water quality. Water quality data examined was collected by both the NYSDEC and SCDHS, which demonstrated the following impairments:

Poor Water Column Clarity

- West Neck Bay, Creek and Harbor
- Paradise Point
- Coecles Harbor
- Majors Harbor

High Chlorophyll- α Levels

- West Neck Creek

Harmful Algal Blooms

- West Neck Bay
- Coecles Harbor

High Nitrogen Levels

- West Neck Creek
- Majors Harbor

Shellfishing Closure Due to Potential Pathogens

- Dering Harbor

High Phosphorus Levels

- Fresh Pond



What Can be Done to Improve Water Quality?

The characterization of water resources on Shelter Island, input from the WAC and the public, and regulatory considerations were all considered and factored into the development of recommendations in support of improvement of water quality. The overall intent of this document is to identify those measures that can be implemented to reduce existing water quality impacts and make meaningful strides toward water quality improvement.



Recommendations are divided into six categories: Waterbody Recommendations and Upland Recommendations, including: Stormwater Runoff Recommendations, Municipal Facilities Recommendations, Groundwater and Wastewater Recommendations, Regulatory Recommendations, Natural Resource and Invasive Species Management and Stewardship and Public Education.

Primary Recommendations – Waterbodies

West Neck Bay, Creek and Harbor

- Reduce nitrogen sources (poorly functioning sanitary systems, fertilizer, etc.)
- Conduct further study to pin point causes and potential remedial actions for harmful algal blooms in the Bay, Creek and Harbor.

Dering Harbor

- Explore long term funding sources for tertiary treatment or the removal of surface water discharge from the Shelter Island Heights STP in order to allow for the potential re-opening of shellfishing in Dering Harbor and increase recharge.



Fresh Pond

- Investigate the use of various techniques to remove high levels of phosphorus from Fresh Pond and to reduce existing phosphorus inputs.
 - Control existing concentrations through use of alum
 - Prevent additions to pond through use of vegetative buffers and public education



Primary Recommendations – Stormwater Runoff

- Stormwater Improvement Projects
 - Reduce unused asphalt
 - Provide upland stormwater catchment, detention and recharge prior to stormwater reaching surface waterbodies
 - Use green infrastructure where appropriate

Primary Recommendations – Municipal Facilities

- Use of Best Management Practices including:
 - GIS Mapping of outfalls and dry weather monitoring
 - Provide employee training
 - Audit facility operations and practices
 - Regular drainage system maintenance

Primary Recommendations – Groundwater and Wastewater

- Work with other east end municipalities to encourage updates to Suffolk County Sanitary Code in order to allow for the use of alternative sanitary disposal systems.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- Consider a cost-shared pump-out and water conservation kit program to aid in cost reduction for sanitary system maintenance.
- Revise Town Code to require inspection and certification once every five years for sanitary systems located in areas with shallow depth to groundwater. Pursue grants and incentivize sanitary system maintenance and/or replacement in these areas.



Primary Recommendations – Regulatory

- Revise Town and Village Code regulations to require drainage containment on residential properties proposing greater than 1,000 SF of impervious area increase (minimum of ½” of storage be required for existing impervious surfaces and 2” for proposed impervious surfaces).
- Revise Town and Village Code regulations to provide stormwater containment requirements for commercial, industrial and newly developed residential properties (minimum of 2” of storage be provided for all proposed impervious surfaces)

Primary Recommendations – Natural Resource and Invasive Species Management

- Encourage use of native plants and buffers, particularly surrounding West Neck Bay, Creek and Harbor as they provide natural filtration of pollutants that enter waterbodies.



Primary Recommendations – Stewardship and Public Education

- Develop a variety of volunteer programs to aid in monitoring and beach and roadway clean ups.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- Develop a variety of public education materials regarding key watershed pollutants (phosphorus, invasive species).

How Do These Recommendations Get Funded?

Adoption of this Watershed Management Plan is a key component in securing funding, as it demonstrates the need for the various recommendations to improve water quality. A variety of funding sources have been identified as part of the plan, which include:



- U.S Department of Housing & Urban Development
- New York State Office of Housing & Community Renewal
- New York State Environmental Facilities Corporation
- New York State Department of Environmental Conservation (NYSDEC)
- U.S. Environmental Protection Agency
- FHWA administered by NYS DOT thru Suffolk County DPW-Federal Funding administered by NYS DOT / New York Metropolitan Planning Council (NYMTCC)
- New York State Dept. of Transportation
- New York State Department of State (NYSDOS)
- New York State Office of Parks, Recreation & Historic Preservation
- National Fish and Wildlife Foundation
- Federal Emergency Management Agency (FEMA) thru NYS Division of Homeland Security & Emergency Services (DHSES) (formally NYS SEMO)
- Federal Legislative Grants-Earmarks
- NYS Member Item Funding

Section 5.1 (Table 19) provides a prioritization of the recommendations, as well as implementation responsibilities, order of magnitude cost estimates for the various actions and



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



potential funding sources to aid the Town and Village in implementing the recommended actions.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Section 1.0 Introduction



1.0 INTRODUCTION

1.1 Background and Purpose

Shelter Island, located between the north and south forks of Long Island, is a unique geographical feature, separated from the mainland of Long Island and surrounded by multiple bays, harbors and tidal creeks. Shelter Island's resources are fragile, and human influences and actions affect the island's waterbodies, both directly and indirectly. This is particularly evident in West Neck Bay and Dering Harbor, where known impairments due to pathogens, nitrogen levels and harmful algal blooms exist (see **Section 2.0**). Human actions have direct impact on water quality: discharge of stormwater and sanitary waste without adequate filtration to surface and groundwater, filling and removal of wetlands that provide natural filtering and biological uptake of pollutants, removal of trees and vegetated buffers surrounding waterbodies that cause erosion and lower dissolved oxygen, fertilization of lawns, and the list continues. Watershed planning is a means to protect and restore water resources, as well as the local economies that rely on these essential coastal resources. The purpose of a Watershed Management Plan is to provide a comprehensive approach to educate, plan for and implement incremental improvements with a goal of protecting and restoring watershed health. To facilitate the preparation of a Watershed Management Plan for Shelter Island, the Town applied for and received a grant from New York State Department of State (funds provided under Title 11 of the Environmental Protection Fund) to prepare this Watershed Management Plan.

A watershed is the total area of land draining to a body of water such as a stream, river, wetland, estuary, or aquifer. A total of 64 sub-watershed areas were defined within Shelter Island, ranging from approximately 2.7 acres in size to over 240 acres in size. During precipitation events, stormwater flows overland and into stormwater conveyance systems in each watershed and eventually discharges to the island's waterbodies. During this process, stormwater collects and deposits pollutants in this waterbodies. As a result, minimization of pollutants carried through each watershed to the waterbodies is critical to protecting the islands bays, creeks and harbors. This document provides measures to minimize pollutant inputs and protect existing resources, as well as methods and best management practices to improve water quality and restore watershed health.

1.2 Goals and Objectives

The specific goals of the WMP were tailored based upon the goals and recommendations of the Watershed Advisory Committee. They are organized into four major categories and are presented below.

■ Water Quality Goals

- Improve water quality through the identification, control and reduction of non-point source pollution.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- Prepare the Town/Village Stormwater Management Program with time lines / schedules and milestones for development and implementation of best management practices (BMPs)
- Establish watershed improvement strategies and implementation of BMPs to ensure pathogen pollutant load reduction per NYSDEC MS4 General Permit requirements.
- Evaluate the existing inventory of stormwater infrastructure within the watershed and investigate pollution sources and major non-point source causes of water quality impairments.
- Target potential areas available for stormwater improvements and establish a prioritization of recommended stormwater improvements.
- Develop, implement, and enforce a program to detect and eliminate discharges to the municipal separate storm sewer system or directly to surface waters from on-site sanitary systems in areas of shallow groundwater, low infiltrative soils, historical on-site sanitary system failures, or proximity to pathogen-impaired waterbodies, etc.



■ Natural Resource Goals

- Ensure protection of tidal and coastal freshwater wetlands for the benefits of water quality improvement, wildlife and fish habitat, marine food production, flood and storm control, open space, tourism and educational opportunities.
- Improve water quality of runoff to ensure the protection and continued inhabitation of shellfish in the tidal waters surrounding the island.
- Identify and protect important natural resources within the watershed.
- Restore wetland areas and wetland productivity by reestablishing wetland and riparian buffers and wetland restoration where possible.

■ Use Management Goals

- Evaluate existing land use codes and update codes to incorporate water quality improvement measures (i.e., encouraging reduction in impervious surfaces, use of green infrastructure, retention of natural buffers, water conservation, etc.)
- Evaluate municipal operations and establish/promote best management practices to alleviate nonpoint source pollution.
- Maintain and promote appropriate water-dependent land use.

■ Educational Goals

- Improve water quality education by informing watershed residents and businesses of common activities that cause water quality issues and simple solutions to reduce impacts. Educational outreach efforts should focus in the following areas:
 - Stormwater discharges from private properties
 - Methods for addressing stormwater runoff on individual properties
 - Impacts of use of fertilizer and irrigation



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- Sources of pathogens and methods to reduce pathogen inputs to waterbodies
- Information regarding the Island-wide tick control programs and impacts of insecticide applications to individual properties.
- Promote environmental stewardship to increase awareness of watershed resources by partnering with existing organizations to sponsor programs and outreach efforts.
- Increase awareness of sources of pathogens and impacts of pathogens on surface waters through educational outreach. Provide a focus on the impacts of cesspools and the importance of proper cesspool/septic system maintenance.

The Watershed Management Plan has been designed as a long term guidance and planning tool for the Town and Village to utilize and implement over the upcoming decade and beyond. The WMP provides a characterization of the existing natural, cultural and human resources within the watershed, identifies key factors impacting the watersheds of Shelter Island, provides general and site specific recommendations for watershed improvement, and provides implementation strategies for each of the recommendations provided. Existing island characteristics and environmental resources are described in **Section 2.0**. Resources detailed include geology, topography, soils, wetlands, rare, threatened and endangered species, cultural and historic sites, land use and water quality. **Section 3.0** provides an overview of local laws, programs and practices, and identifies potential gaps that warrant consideration in an effort to provide watershed protection and enhancement. Recommendations derived from analysis of resources and existing laws are provided in **Section 4.0**, and an implementation strategy providing details on how to complete each recommendation and funding sources available are provided in **Section 5.0**.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Section 2.0 Watershed Characterization

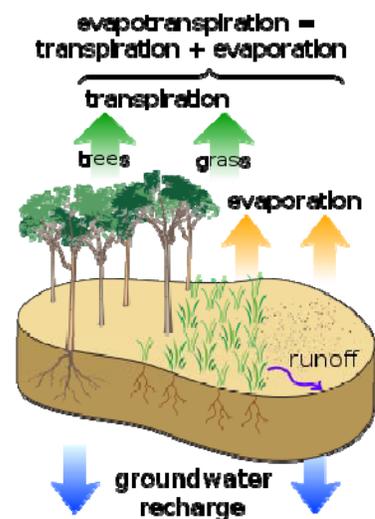


2.0 WATERSHED CHARACTERIZATION

A watershed is defined as “...the total area of land draining to a body of water such as a stream, river, wetland, estuary, or aquifer” (NYSDOS, 2009). Watershed management is of vital importance for the protection of the resources that exist both within the watershed itself and within the water bodies that the watershed drains to. In order to identify the management needs of the watershed and the most efficient opportunities for addressing the identified needs, the physical and biological resources within the watershed must first be characterized. This section serves to define the overall watershed and sub-watershed areas of Shelter Island, and provides a characterization of the resources found within these watershed areas.

2.1 Watershed Study Area and Subwatershed Delineation

Shelter Island is a glacial sand deposition feature that is surrounded by marine waters. Shelter Island is underlain with a fresh water aquifer that floats atop saline waters. Of the precipitation that falls on the land, that which is not subject to evapotranspiration¹, becomes either runoff (overland flow) or recharge (water returned downward into the aquifer). Key elements of the hydrologic water budget (water cycle) are illustrated in the embedded figure. As Shelter Island consists of an isolated island system, the entirety of the Island comprises the overall surface watershed. In order to further define areas of stormwater runoff, sub watersheds were delineated utilizing the Suffolk County Light Detecting and Ranging (LiDAR) data collected in 2007. A total of 64 subwatershed areas were defined within Shelter Island ranging from approximately 2.7 acres in size to over 240 acres in size (Figure 1)². In total, the subwatersheds represent the individual drainage areas that are present on the 11.8 square mile Island.



2.2 Geographic Setting and Features

2.2.1 Topography

The topography of Shelter Island generally trends from higher elevations in the center of the Island to lower elevations along the shoreline. Figure 2 illustrates the LiDAR (Light Detecting and Ranging) topography generated from data collected by Suffolk County in 2007. The highest elevation of 182 feet above sea level (asl) occurs in the

¹ Evapotranspiration (ET) is a term used to describe the sum of [evaporation](#) and [plant transpiration](#) from the Earth's land surface to [atmosphere](#). Evaporation accounts for the movement of water to the air from sources such as the [soil](#), [canopy interception](#), and [waterbodies](#). Transpiration accounts for the movement of water within a [plant](#) and the subsequent loss of water as vapor through [stomata](#) in its [leaves](#). Evapotranspiration is an important part of the [water cycle](#) as pictured above. <http://en.wikipedia.org/wiki/Evapotranspiration>

² All referenced figures are included at the end of this report section.



northwest portion of the Island in the vicinity of Shelter Island Heights. This area is subject to erosion as the high elevation declines rapidly at the coastline forming bluffs. The northern peninsula on the Island exhibits greater elevations in the central portion of the peninsula with a maximum elevation of approximately 80 feet asl. Ram Island and Little Ram Island exhibit varying topographic relief with maximum elevations of 80 feet and 53 feet asl, respectively. A topographically low area exists between the southwest corner of Coecles Inlet and the south-central peninsula of the Island. Elevations within this area range from 0 to 30 feet asl. Mashomack Preserve located in the southeast peninsula of the Island exhibits greater relief in the north-central portion of the peninsula with elevations reaching approximately 95 feet asl. Finally, topography in the southwestern portion of the Island is generally flat and exhibits a maximum elevation of approximately 30 feet asl.

It should be noted that the Island generally exhibits slopes of less than 10%. Shelter Island Heights is one notable exception, as this area exhibits slopes of up to 45%. Small areas in the vicinity of Smith's Cove, Ram Island and Little Ram Island also exhibit steep slopes. Additional information on soils and erosion is contained in **Section 2.2.5**.

2.2.2 Geology

Shelter Island is a sedimentary sand formation deposited as a result of glacial history, lying atop bedrock and other geologic units. The geology underlying Shelter Island (see **Figure 3**) is comprised of six geologic units. The first and deepest is comprised of crystalline bedrock, which is found at an elevation of approximately 700 to 1,000 feet below sea level (bsl). Above this bedrock lie the sedimentary deposits which form the three major water-bearing units that underlie the Island (**Simmons, 1986; Jensen and Soren, 1974**).

Lying immediately atop the bedrock is the Raritan formation, which is comprised of the Lloyd sand layer and an overlying clay layer. The Lloyd sand lies at an elevation of approximately 510 to 800 feet bsl, indicating a thickness of approximately 190 to 200 feet. This deposit is comprised of coarse quartz sand, gravel and sandy clay with isolated layers of clay dispersed throughout. The overlying clay layer is encountered at an elevation of 400 to 625 feet bsl, indicating a thickness of 110 to 175 feet and consists of gray, clay to silty clay with some sandy layers.

Directly above the Raritan formation is the Magothy formation. This formation is found at an elevation of 300 feet bsl, indicating a thickness of 100 to 325 feet. The Magothy formation is comprised of fine to medium sand mixed with silt and clay and some beds of coarse sand and gravel.

Exploratory drilling revealed the presence of an overlying clay layer formed by two distinct units comprised of an upper unit of marine origin and a lower unit of non-



marine origin. The marine clay is encountered at elevations ranging from 60 to 100 feet bsl with a representative thickness ranging from 50 to 95 feet. This unit was found to consist of a gray-green to dark gray clay containing many large shell fragments as well as some laminae and thin beds of sand and granule gravel. The top of the non-marine clay is encountered at elevations ranging from approximately 160 to 180 feet bsl. The thickness of this unit has been noted to be approximately 120 feet in borings installed on Shelter Island; however, it was not fully penetrated in others. The lower non-marine unit consists of brown and reddish brown clay, as well as, some laminae and thin beds of silt and fine sand.

Due to limited boring information, the full horizontal extent of each of these units could not be completely ascertained. However, the referenced literature indicates that the marine unit probably extends under all of Shelter Island and the underlying non-marine unit probably extends under a majority of the Island (**Simmons, 1986**).

The uppermost unit underlying Shelter Island consists of the surficial deposits that comprise the Upper Glacial formation. This layer is encountered throughout Shelter Island at the land surface, which ranges from 180 feet above sea level (asl) at the bluffs along the western part of Shelter Island to approximately 40 feet bsl in isolated depressions encountered across the Island. The thickness of the Upper Glacial formation ranges from 120 to 360 feet. These deposits consist primarily of stratified and unstratified sand and gravel interspersed with clay and isolated beds of clay.

Shelter Island's water supply is contained entirely within the Upper Glacial aquifer which floats atop the more dense saline waters contained in the lower and surrounding Upper Glacial aquifer and deeper geologic deposits. Hydrogeology is discussed in more detail in **Section 2.2.3.2** (Groundwater).

2.2.3 Hydrography

2.2.3.1 Surface Water

Shelter Island is surrounded by marine surface waters consisting of an interconnected network of harbors, coves, sounds and bays.

There is no significant freshwater stream network present on Shelter Island; however, there are several saltwater creeks, marshes and bays located along the coastline. In addition, there are a number of small kettle hole ponds located within the interior of the Island created by past glacial events. Freshwater and tidal wetland habitats are further discussed in **Section 2.5.1**.



2.2.3.2 Groundwater

Hydrogeology

The major water-bearing units beneath Shelter Island are of geologic origin as described in **Section 2.2.2** and include the Upper Glacial aquifer, the Magothy aquifer, and the Lloyd aquifer. Fresh groundwater used for water supply purposes is derived from water contained within the upper part of the Upper Glacial aquifer, principally above an underlying clay layer. Groundwater contained within the lower part of the Upper Glacial aquifer, as well as the Magothy and Lloyd aquifers is saline and is unsuitable for consumption or irrigation (**Soren, 1978**). Two cross-sections illustrating the major water bearing units, and the vertical dimension flow components are provided in **Figure 3**.

Groundwater Elevation and Flow

Groundwater on the Shelter Island is derived from precipitation. Rainfall and meltwater entering the ground (“recharge”) passes downward through the unsaturated zone to a level below which all porous layers are saturated. The upper surface of this level is referred to as the “water table”. Groundwater is a mild expression of topography and consequently, the water table coincides with sea level along the shoreline of Shelter Island, and rises in elevation towards its center and western bluffs where topographic elevations increase.

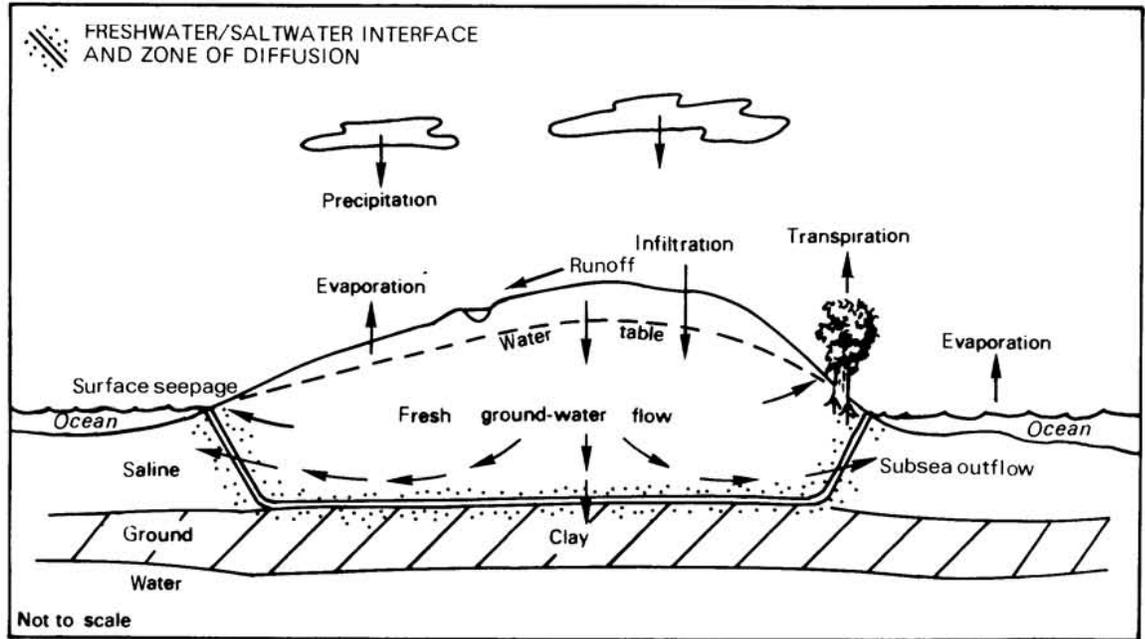
The elevation of groundwater underlying Shelter Island ranges from 8 feet above mean sea level (msl) in the northwest part of the Island, to zero (0) at the above ground surface in areas of wetlands and surface water. Differences in groundwater elevation create a hydraulic gradient, which causes groundwater to flow downward perpendicular to contours of equal elevation. High points formed by the water table create “groundwater divides”, such that groundwater flows radially away from mounds in the water table elevations. The illustration below shows the basic components of the hydrologic cycle and groundwater flow beneath Shelter Island. The fresh groundwater is illustrated above the marine clay deposits, separated by the freshwater/saltwater interface.³

In general, groundwater flows from the 4 foot elevation mound in the center of the Island toward the north, south, east and west. A secondary mound of groundwater forms in the northwest, higher elevation parts of the Island, such that the high points of these two groundwater mounds form a watershed divide between groundwater that flows generally toward the north or toward the south. **Figure 4** illustrates the water table elevations underlying Shelter Island from which the inferred directions of groundwater flow may be determined. As noted, groundwater underlying Shelter Island flows radially outward toward surface water perpendicular to the contours of equal groundwater elevation. Additional

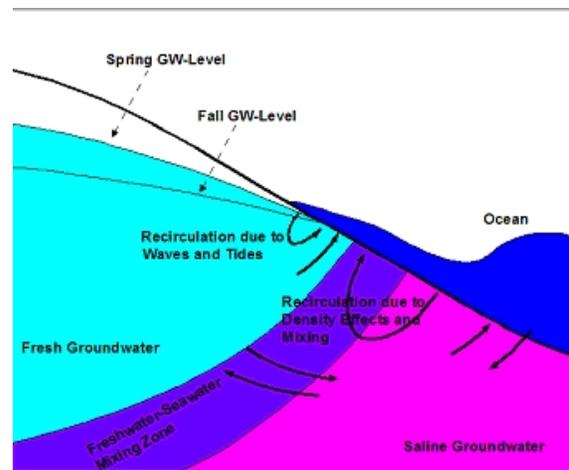
³ Illustration from Simmons, 1986; Figure 4, Hydrologic cycle and pattern of ground-water movement on Shelter Island.



groundwater subwatersheds are formed in the peninsula areas around Shelter Island as will be discussed in greater detail below.



As groundwater migrates away from areas of higher elevation toward the shore, it eventually discharges to surface water as a result of surface seepage and subsea (or subsurface) outflow⁴. Near the shore, water entering the system tends to flow horizontally along a shallow flow system and is discharged from the subsurface into streams or marine surface waters. Water that enters the system farther inland and along the western end of the Island generally flows vertically downward deeper into the Upper Glacial aquifer before flowing toward the shores where it is discharged as subsurface outflow.



The rate of groundwater flow in the aquifer is dependent on the hydraulic conductivity which describes the ease with which water is transmitted through the saturated pore space of an aquifer. Based on published information, the horizontal hydraulic conductivity of the Upper Glacial aquifer on Shelter Island

⁴ Illustration shows spring/fall groundwater levels, fresh-salt water mixing zone and outflow at shoreline.



ranges from 200 to 272 feet per day (ft/day) (**Schubert, 1999**) with a vertical hydraulic conductivity of approximately 27 feet per day (**Franke & Cohen, 1972**) resulting in an anisotropic ratio of approximately 10:1. The anisotropic condition that is created by differences in horizontal and vertical hydraulic conductivities is likely due to variations in stratigraphy within the Upper Glacial aquifer. Groundwater flow is also influenced by porosity of the aquifer sediments and is defined as the ratio of void space to a volume of a soil. In the case of the Upper Glacial aquifer on Shelter Island the porosity is estimated to be 0.30.

While hydraulic conductivity and porosity convey the ability of an aquifer to transmit water, the rate of movement is expressed as groundwater velocity. This can be used to estimate groundwater travel times within an aquifer which is important in relation to contamination and discharge. Published literature (**Soren, 1978**) place estimates of groundwater velocity in the Upper Glacial aquifer on Shelter Island as ranging from 0.5 to 1 ft/day.

Water table fluctuations occur in response to changes in the hydrologic water budget (precipitation, evapotranspiration, runoff and recharge) and resultant changes in recharge. Seasonal fluctuations in the water table occur such that the water table rises during the early part of the year, and declines from the beginning of summer through late fall. Water table fluctuations also occur as a result of longer term climatic conditions such as droughts and periods of high rainfall. Groundwater pumpage also affects water table elevations on a more localized basis, dependent upon pumpage rates and well placement.

Water Table Response to Precipitation

Data obtained from the United States Geological Survey (USGS) from the early 1970's to 2012 illustrate the annual variation in water levels. Recharge of groundwater mainly occurs during late winter to early spring as a result of precipitation. Review of the high and low precipitation rates from 1970 to 2012 during the month of March generally correlate with hydrograph data provided by the USGS. Specifically, the high rate of precipitation during this time period typically results in above average increases in groundwater levels. In contrast the lowest rates of precipitation were observed to typically result in significant decreases in groundwater levels below average. This is specifically illustrated in 2010 which is considered to have been a flood year where 13.25 inches of precipitation was recorded to have fallen during the month of March. In contrast, during 2006, a year generally considered a drought year, only 0.85 inches of precipitation was noted to have fallen during the month of March. **Section 2.2.6** (Precipitation and Climate) provides a description of long-term precipitation and monthly averages, as well hydrographs.

Sub-watersheds

As noted, the water table configuration on Shelter Island is characterized by one principal water table mound that contains two (2) local areas of relatively high



water table altitude each of which are located within the western and central portions of the Island (**Schubert, 1999**). **Figure 4** (previously referenced) provides an illustration of the configuration of the water table beneath Shelter Island. Based on the configuration of the water table, the freshwater flow system of Shelter Island can be further divided into seven (7) separate sub-watersheds, each of which correspond to the area contributing groundwater to an individual coastal embayment (**Schubert, 1999**). These sub-watersheds are separated from each other by local groundwater divides that extend inland from the coast and converge toward the respective water table mounds. A general description of each sub-watershed area is presented below and illustrated on **Figure 5**:

- ♦ **Greenport Harbor contribution area** – The area is located along the northwestern coast of Shelter Island and extends from the center of the Island to Jennings Point in the west and Hay Beach Point in the north. Freshwater flow from this area discharges to the surface waters of Dering and Greenport Harbors.
- ♦ **Gardiners Bay contribution area** – This area is located along the northeastern coast of Shelter Island and extends from the Hay Beach Point, across the central spine of the land area which connects the mainland with Ram Island, to the Reel Point. Freshwater flow from this area discharges to the northern area of Gardiners Bay.
- ♦ **Coecles Inlet contribution area** – This area is located on the eastern side of Shelter Island and is comprised of an area that nearly encircles Coecles Inlet. This area extends east from the central spine of Shelter Island to Reel and Sungic Points. Freshwater flow from this area discharges to the surface waters of Coecles Inlet, Congdons Creek, Cedar Cove Island and Shanty Bay.
- ♦ **Shelter Island Sound/Gardiners Bay contribution area** – This area is located on the southeastern side of Shelter Island and is comprised of an area which discharges freshwater to Smith Cove, Majors Harbor, eastern portion of Shelter Island Sound and the southern portion of Gardiners Bay. This area extends along the central axis of the Nature Conservancy’s Mashomack Preserve from Sungic Point to the terminal end of South Ferry Road.
- ♦ **West Neck Harbor/Shelter Island Sound contribution area** – This area is located within the south central section of Shelter Island and is comprised of an area which discharges freshwater to Menantic Creek, Dickerson Creek, Fresh Pond, West Neck Harbor and the central portion of Shelter Island Sound. This area extends from the approximate center of Shelter Island south to the Montclair Avenue and the terminal end of South Ferry Road.
- ♦ **West Neck Bay contribution area** – This area surrounds and contributes to freshwater discharge to West Neck Bay, West Neck Creek and West Neck Harbor. This area begins at the topographic high in the vicinity of the intersection of Serpentine Drive and Sunnyside Avenue and extends south to West Neck Point and Montclair Avenue.



- ♦ **Southold Bay/Shelter Island Sound contribution area** – This area is located on the southwestern side of Shelter Island and extends along the central axis of West Neck from Jennings Point to West Neck Point. Freshwater from this area is contributed to the surface waters of Southold Bay and the western end of Shelter Island Sound.

Groundwater Contributing Areas (to Surface Waters) and Time of Travel Zones

As discussed previously, groundwater continuously flows from high areas of the water table toward the perimeter of the Island and discharges to the inlets, coves, bay surrounding the Island as well as the streams and surface water ponds within the Island. In 2009, CDM on behalf of the SCDHS prepared a computer model simulation to delineate groundwater contributing areas to each stream and embayment for 2 years, 5 years, 10 years, 25 years and 50 years. The travel time for this discharge varies, but was found to generally decrease from the center and elevated portions of the Island down towards the coastal and stream shoreline areas. Specifically, the results of the model run estimated travel times ranging from 25 to 50 years from the center of the Island which decrease to 0 to 2 years along the Island's coastal areas. The groundwater contributing area time of travel is illustrated in **Figure 6**.

Depth of Fresh Water

In coastal marine environments, the thickness and position of freshwater may be influenced by saltwater intrusion. Generally, since the specific gravity of freshwater is less than that of the underlying salt water, the freshwater tends to “float” on the salt water within the boundaries of a watershed area. However, this interface between fresh and saline groundwater is not a sharp boundary but a zone of diffusion in which the chloride concentration of the freshwater gradually increases with horizontal and vertical distance from the Island until it equals the salinity of the surrounding bays. In most situations involving the interaction of fresh and saline groundwater the interface between the two is governed by the Ghyben-Herzberg Relationship, which results in freshwater extending 40 feet below sea level for each foot it extends above sea level. Ultimately, this will result in a “salt water wedge” which extends from the coastline inland (**Simmons, 1986**).

However, the interaction of fresh and saline groundwater underlying Shelter Island varies from the ratio predicted by the Ghyben-Herzberg relationship due to the presence of the marine clay underlying the deposits of the Upper Glacial aquifer. Due to this clay unit, intrinsically low hydraulic conductivity saline groundwater is confined beneath it and retards its mixing with the freshwater above. In addition, lateral movement of saline groundwater from shoreline areas, inland is enhanced by the nearly horizontal arrangement of the marine clay. This ultimately results in the infiltration of saline water into the aquifer from coastal areas and limits the amount of freshwater that can be stored between the clay and the water table. What generally results is a thicker than expected zone of saline

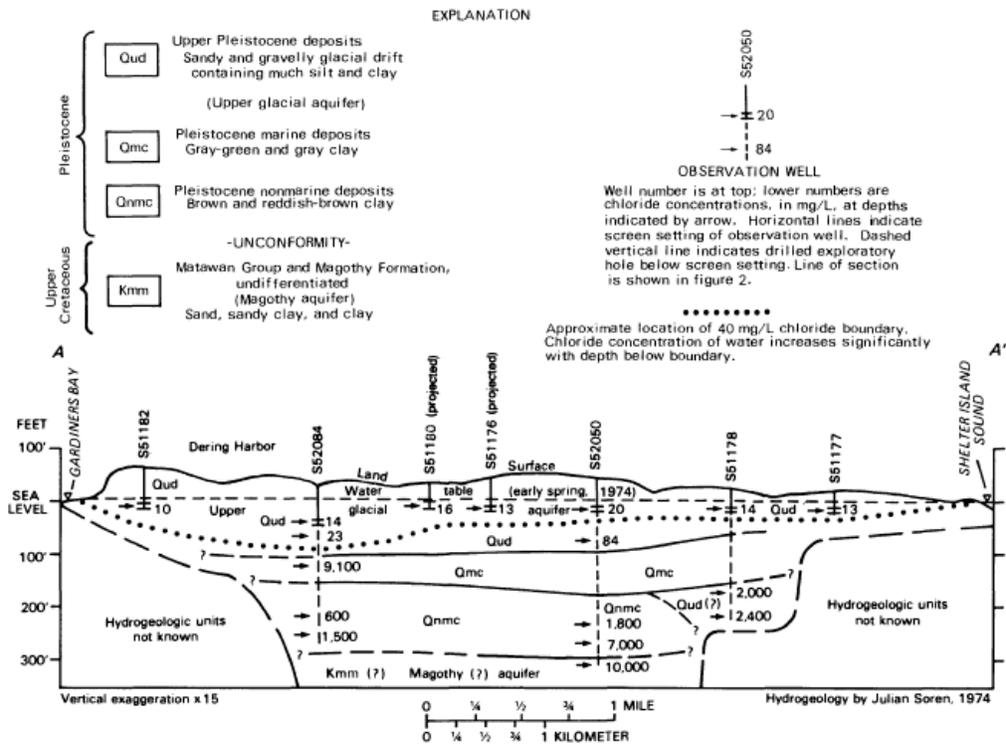


TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



groundwater which results in an increase in freshwater discharge to coastal regions of Shelter Island (**Schubert, 1999**).

The boundary between fresh and saline groundwater was estimated by Dale Simmons in the USGS Water-Resources Investigations Report 85-4165, "Geohydrology and Ground-Water Quality on Shelter Island, Suffolk County, New York 1983-84" (**1986**). This document involved well monitoring to determine the chloride concentration at various depths below Shelter Island. Chloride is <10 mg/l in native fresh groundwater. The drinking water standard for chloride is 250 mg/l and the chloride concentration in seawater approaches or exceeds 19,000 mg/l. A chloride concentration of 40 milligrams per liter (mg/l) was determined to be indicative of the uppermost boundary of the fresh-saltwater mixing zone. Well monitoring found that the mixing zone, or zone of diffusion where elevated chlorides were detected, was above the marine clay unit. Chloride concentrations were found to increase with depth below the 40 mg/l chloride boundary. In the nearshore areas, the concentration of chloride exceeded 250 mg/l at depths of 20-30 feet (**Simmons, 1986; Table 4**); however, in central parts of the Island concentrations above the drinking water standard were not detected in the Upper Glacial aquifer above the marine clay. Based on these data, the above hydrogeologic cross section was prepared illustrating the geologic units and the 40 mg/l chloride boundary as a "dotted" line (see also **Figure 3**).⁵



⁵ Illustration from Simmons, 1986; Figure 3, Hydrogeologic section through Shelter Island.



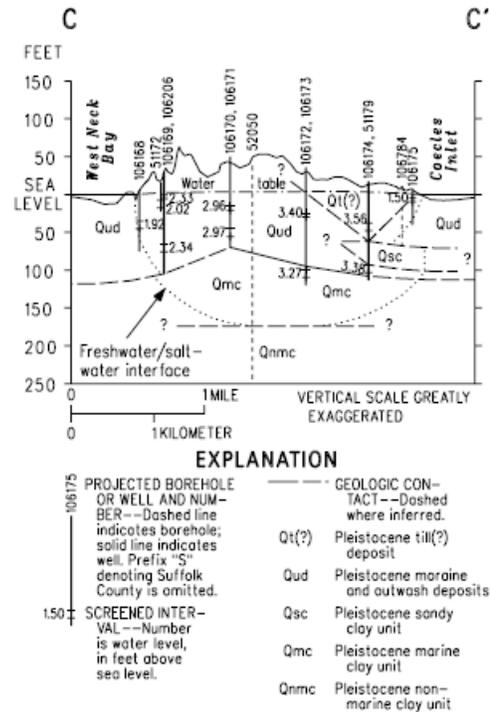
The water table elevation, which ranges from zero (0) to eight (8) feet with an average of approximately 3 feet, would predict a much deeper freshwater lens based on the Ghyben-Herzberg Relationship of 40 to 1 of freshwater depth for every one (1) foot of groundwater elevation above sea level. The data derived from chloride sampling of wells by Simmons (1986) indicates the effect of the marine clay and resultant change in the fresh-saltwater mixing zone.

The depth of the marine clay varies from about 75 feet bsl beneath the south part of Shelter Island to about 110 feet bsl beneath the north part of the Island (Simmons, 1986; SCCWRMP, 2011). The depth of freshwater above the 40 mg/l chloride boundary varies from zero (0) at the shorelines to approximately 80-90 feet below sea level beneath the north part of the Island (where the water table elevation is the highest) and 50 feet bsl or less beneath the south part of the Island. Schubert (1999) prepared an east-west cross section across Shelter Island from Coecles Inlet to West Neck Bay and approximated the depth of the freshwater/saltwater interface into the marine clay unit based on very limited well data⁶. The reduced hydraulic conductivity in the marine clay limits the water supply yield of this geologic unit. As a result, the depth of useable freshwater in the aquifer is limited by the extent of clay.

The Simmons report includes several references to the vulnerability of Shelter Island with respect to withdrawal and use of groundwater for water supply. Simmons reports that:

- The island depends entirely on this aquifer for public water supply; thus, the quantity and quality of fresh groundwater is a matter of local concern.
- Increased withdrawal of fresh ground water in nearshore areas will cause further landward movement of saline ground water; in other areas, excessive pumping may cause upconing.

Simmons also notes that higher summer populations cause an increased demand for water (which is highest during the summer, when recharge is lowest) and increases the stress on the system, which in turn may result in upconing and



⁶ Illustration from Schubert, 1999; Figure 4C. Vertical section C-C' showing hydro-geologic units, freshwater/saltwater interface, boreholes and wells screened with interfaces, and water-table altitude with groundwater levels on Marcy 17-20, 1995 in the West Neck Bay study area, eastern Suffolk County, N.Y.



intrusion of saline ground water. A further description of the relationship of aquifer pumping and effect on the freshwater/saltwater interface is noted as follows:

“Under natural conditions, recharge and discharge are in equilibrium, so that the freshwater/saltwater interface is maintained in a relatively constant position. When water is pumped from the aquifer, however, the flow of fresh ground water toward the zone of diffusion is decreased, which allows landward movement of the interface and reduces the volume of fresh ground water in storage.” (p. 12)

The information Simmons derived from monitoring wells in 1983-84, were representative of conditions at that time. It is noted that differences in aquifer recharge between water years and seasons will influence the depth and landward-seaward migration of the fresh-saltwater interface. During drought years and seasons with low precipitation, the elevation of the water table decreases thus reducing the volume of freshwater and increasing the landward and upward migration of the fresh-saltwater interface (salt water encroachment). During high precipitation years and rainfall seasons, the elevation of the water table increases with a corresponding increased depth and seaward migration of the fresh-saltwater interface. Likewise, significant well pumping (withdrawal) will reduce the volume of freshwater in the aquifer with a corresponding response in migration of the fresh-saltwater interface. Simmons (1986) estimated that annual pumpage was approximately 6 percent of the annual recharge (and not all pumpage was used consumptively as a result of sanitary system recharge and irrigation at that time). As a result, it was estimated that 94 percent of recharge was available to maintain the position of the fresh-saltwater interface. Simmons further indicates the following with respect to the relationship of water use and salt water encroachment:

“From an islandwide perspective, significant landward movement of saline ground water would be unlikely under these conditions. However, the geographic distribution of pumping wells is a critical factor. Excessive withdrawal of fresh ground water in nearshore areas will undoubtedly cause a local disturbance of the freshwater-saltwater equilibrium that will result in locally increased chloride concentrations in water near the pumping well. The degree of saltwater encroachment is dependent on the distance of the well from the shore, the amount of pumping, and the local characteristics of the aquifer. In other areas, excessive ground-water withdrawals may result in upconing of the saline groundwater into the freshwater lens.” (p.13)

As a result, the relationship of aquifer recharge and withdrawal must be carefully considered in order to ensure that salt water encroachment and upconing do not adversely affect the ability of the Island to sustain an adequate water supply for its residents and visitors.



Water Use and Quantity

Water quantity is a function of recharge to the aquifer, discharge from the aquifer, and water in storage within the aquifer. Total annual recharge and pumpage were estimated by Simmons (1986) to be 4,380 million gallons (Mgal) and 260 Mgal, respectively. This results in daily recharge and water use estimates of 12 million gallons per day (mgd) and 0.7 mgd, respectively.

Estimates have since been updated as part of the Suffolk County Comprehensive Water Resource Management Plan Update. Current estimates indicate that the total recharge to the Upper Glacial aquifer underlying Shelter Island is 17.6 million gallons per day (mgd), of which 3.8 mgd is discharged directly to tidal streams, harbors and embayments and 13.7 mgd is discharged directly to coastal areas (i.e., areas of open water). The remaining 0.1 mgd consists of the total water demand related to water supply withdrawals from community supply sources (i.e., water districts) resulting in an estimated public water supply consumption of 92 gallons per capita per day and 241 gallons per capita per household per day (SCCWRMP, 2011).

Other sources of water supply that exist on the Island consist of non-community sources (i.e. schools, public buildings, parks, etc.) and private wells. It is estimated that 0.033 mgd is removed by non-community sources and 0.45 mgd is withdrawn by private wells. Thus, total water use is estimated to be 0.58 mgd as a result of the combination of community supply wells, non-community sources and private wells. Not all of this water is used consumptively as much is eventually recharged back into the underlying aquifer through sanitary effluent and irrigation (minus loss by evapotranspiration) (SCCRWMP, Task 7.6/7.7, 2010). Of the water withdrawn it is estimated that approximately 0.35 mgd is used for irrigation purposes while 0.05 mgd is used for sanitary discharge, with the remainder being consumptive loss.

Fresh groundwater is stored in the Upper Glacial aquifer deposits beneath Shelter Island. The quantity of fresh water varies with the water year and/or seasonal conditions, primarily due to precipitation, which results in changes in the position of the freshwater/saltwater interface. As described, the zone of diffusion is the mixing area between fresh and saline groundwaters; this zone is defined by increased chloride concentrations which increase with depth until chloride concentrations are consistent with the chloride concentration of seawater. Low precipitation years and seasons reduce the elevation of the water table, thus causing a landward and upward migration of the fresh-saltwater interface and thus reducing the quantity of fresh groundwater in storage. The nearshore areas are most susceptible to changes in water table elevations influencing the position of the interface.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



A review of literature pertaining to hydrogeology of Shelter Island did not produce any referenced estimates of the quantity of water in storage in the aquifer. A chronology of pertinent references that were consulted is provided as follows:

- Soren, J., 1978. "Hydrogeologic Conditions in the Town of Shelter Island, Suffolk County, Long Island, New York." USGS Water Resource Investigations 77-77.
- Simmons, Dale. 1986. "Geohydrology and Ground Water Quality on Shelter Island." USGS Water Resource Investigations Report 85-4165.
- Schubert, C. E., 1998. "Areas Contributing Ground Water to the Peconic Estuary, and Ground-water Budgets for the North and South Forks and Shelter Island, Eastern Suffolk County, New York." USGS Water Resource Investigations Report 97-4136.
- Schubert, C. E., 1999. "Ground-Water Flow Paths and Traveltime to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York." USGS Water Resource Investigations Report 98-4181.
- Suffolk County Comprehensive Water Resource Management Plan, 2011. Sections 3, 4 and 5, Tasks 4.4 and 7.6/7.7 of SCCWRMP prepared by SCDHS with CDM, Yaphank, NY.

Several agencies and consultants were also contacted for information during the course of this investigation. Personal communication with Chris Schubert of USGS, Ron Paulsen and Andy Rapiejko of SCDHS, and Mary Ann Taylor of CDM did not identify any further information other than what is referenced in the literature.

Simmons (1986) was a seminal document that addressed overall hydrogeology and water quality of Shelter Island, with later documents addressing specific aspects of groundwater contribution to surface water of the Peconic Estuary, creation of a Shelter Island groundwater flow model and updates of the water balance for Shelter Island. Although documentation does not provide an estimate of freshwater contained in the aquifer, there are references of the need to maintain water levels in order to maintain the position of the freshwater/saltwater interface that defines the separation between salty groundwater and freshwater.

Based on the land area of Shelter Island, the depth of freshwater and the porosity of the aquifer, there is a large amount of freshwater in storage. However, this water is limited vertically as a result of the marine clay and limited horizontally as a result of the surrounding and interior surface waters of Shelter Island (i.e., Flanders Bay, Gardiners Bay, Coecles Inlet and West Neck Bay. In addition, freshwater must remain in storage in order to maintain the equilibrium conditions that affect the position of the fresh-saltwater interface. Nearshore areas are most susceptible to pumpage and water table fluctuations as a result of changes in recharge; thus making these areas most susceptible to salt water encroachment and upconing. Other parts of the Island are less sensitive to changes; however, withdrawal must be considered in connection with seasonal fluctuations in the water table (i.e., water demand is greatest during the summer when the water table



is typically lower in elevation), changes in recharge (drought versus flood years), salt water encroachment and upconing, water supply and demand, water quality, and long-term water management.

In addition, the depth of freshwater is of concern, given the chloride concentrations detected in monitoring wells observed by Simmons (1986) which indicate that the freshwater-saltwater interface is relatively shallow beneath Shelter Island and does not follow the principles of the Ghyben-Herzberg relationship due to the presence of the marine clay. Simmons observed chloride concentrations above 40 mg/l at 50 feet or less where the depth of the marine clay is approximately 75 feet bsl in the southern portions of Shelter Island. This is a limited vertical reserve, particularly in consideration of private water system standards for Suffolk County which recommend that private wells be installed to a depth of 40 feet into the water table. As a result, water conservation is a prudent course of action, with extreme caution regarding groundwater withdrawal in the nearshore areas.

While groundwater resources and groundwater management are of extreme importance to Shelter Island, this document is not a water supply report for Shelter Island. Rather, this document is a watershed management plan directed primarily toward stormwater management and maintaining surface water quality in the embayments of the Peconic Estuary. Groundwater conditions are part of the characterization of existing resources needed to understand the watershed and provide stormwater management recommendations. It is beyond the scope of this study to determine the future water supply needs of Shelter Island and particularly to set policy regarding conservation of water resources. Information contained herein is the best available at the time of this study, and is intended to provide increased understanding of the groundwater resources of Shelter Island. Further investigation may be warranted to assist the Town and Village address future specific water supply management needs.

2.2.4 Flood Zones

The Federal Emergency Management Agency (FEMA) has prepared Flood Insurance Rate Maps (FIRM) which identify zones as well as the frequency which areas may be subject to flooding. In particular, there are four (4) flood zones which have been identified particularly along the coastal areas of Shelter Island. **Table 1** provides a summary and description of each of these flood zones. The location of each flood zone is illustrated in **Figure 7**.



TABLE 1
FEMA FLOOD ZONES

| FLOOD ZONES | Description of Flooding Conditions |
|----------------------------------|--|
| Zone X | Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood level |
| 0.02% Change Annual Flood Hazard | “500-year flood” - has a 0.02 percent chance of a flood occurring in any year. |
| Zone AE | Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. The base floodplain where base flood elevations are provided. |
| Zone AO | River or stream flood hazard areas, and areas with a 1% or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Average flood depths derived from detailed analyses are shown within these zones. |
| Zone VE | Coastal areas with a 1% or greater chance of flooding and an additional hazard associated with storm waves. These areas have a 26% chance of flooding over the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones. |

Source: Federal Emergency Management Agency (FEMA)

As illustrated, the majority of areas susceptible to flooding occur within the low-lying areas along the coast of the Island. Additional inland areas subject to flooding include the causeway leading to Little Ram Island, portions of Little Ram Island, the lands immediately east of Coecles Harbor, the southern portion of Mashomack Preserve, and areas within the southwestern peninsula of the Island.

Additionally, Sea, Lake and Overland Surge from Hurricanes (SLOSH) data was reviewed to determine potential flooding areas from hurricanes (**Figure 8**). This dataset was developed by the National Weather Service to estimate potential surge heights from each hurricane category. As illustrated, the majority of the low lying areas in the southern portion of the island would be vulnerable to Category 1 and 2 hurricanes. Additional inland areas, particularly in the lands immediately east of Coecles Harbor, the southeastern peninsula of the island and Little Ram Island become vulnerable from Category 3, 4 and 5 hurricanes.

Generally, both data sets illustrate similar key areas susceptible to flooding during major storm events, indicating that flooding on Shelter Island would be mainly the result of low topographic elevation.

Additionally, areas of localized flooding currently occur during regular storm events at several locations within the Island. Locations of localized regular flooding include:

- Congdon Road (between SR 114 and North Cartwright Road)



- Dogwood Lane (near the intersection with SR 114)
- Shore Road (near the Sunset Beach Hotel)
- Bridge Street
- Ram Island Drive causeways
- West Neck Road (various locations)

A variety of factors contribute to flooding within these areas, including proximity to surface water, depth to groundwater, inadequate drainage for catchment area, and high tide. More specifically, in areas with shallow groundwater, very little soil depth exists for stormwater leaching and as a result, the soil void space temporarily reaches capacity during large storm events and thus water ponds on the surface. Similarly, in areas in close proximity to the shore that are low in elevation and have a large tidal range, high tide can bring an influx of water that fills soil void space and drains preventing immediate dissipation of water.

In areas with adequate depth to groundwater, flooding can occur as a result of inadequate capacity of drainage structures for the land area draining to said structures. Areas with larger amounts of impervious surfaces require more drainage capacity, and as a result, the more impervious surfaces within a catchment area, the greater the drainage capacity needed for that area.

2.2.5 Soils & Erosion

The USDA Soil Survey of Suffolk County, New York provides a complete categorization, mapping and description of the soil types found in Suffolk County. Soils are classified by similar characteristics and depositional history into soil series, which are in turn grouped into associations. A soil association is a landscape that has a distinctive proportional pattern of soils; it normally consists of one or more major and at least one minor soil series.

The soil survey identifies Shelter Island as lying within an area characterized entirely by Montauk-Haven-Riverhead Association soils (see **Figure 9**). This association contains the minor soil groups of Carver, Plymouth, Montauk, Walpole, Atsion and Berryland soils. Soils of this association are characterized as deep, nearly level to strongly sloping, well-drained to moderately well-drained soils, having moderately coarse-textured and medium-textured soils on moraines. It is noted that Montauk soils within this association has a fragipan or compact layer that ranges from two to 20 feet in thickness. In general, these soils are well-suited to farming, but the more sloping areas are subject to erosion. Because these soils generally have a deep root zone, the productive potential for trees on the soils in this association is one of the best in all of Suffolk County. Montauk soils within this association present moderate to severe limitations for housing development, due to slow infiltration in the fragipan (low permeability) layer, and excavation may be difficult in places where this layer is several feet thick.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



The predominant soil types located on Shelter Island (**Figure 10**) include MfB and MfC (Montauk fine sandy loam) which are generally well drained to moderately well drained. Significant quantities of CpE (Carver and Plymouth sand), PIB and PIC (Plymouth loamy sand) and RdB (Riverhead sandy loam) are also located in the watershed. These soils are generally excessively drained to well drained. A small portion of the island consists of poorly drained soils (At – Atsion sand, Bd – Berryland mucky sand, Mu – Muck, Ra – Raynham loam, Tm – Tidal marsh, W – Water and Wd – Walpole sandy loam) which are primarily located in proximity to surface waterbodies and known freshwater and tidal wetlands. As illustrated in **Figure 10**, a variety of other soils types comprise the remainder of the watershed. **Table 2** below provides a quantification of each soil type within the watershed in addition to the drainage category the soil type falls within.



Table 2
SOIL TYPES AND ABUNDANCE

| WELL DRAINED SOILS | | |
|--------------------|--------------|---------|
| Soil Type | Area (Acres) | Percent |
| Bc | 228.41 | 3.00% |
| BgA | 119.97 | 1.57% |
| BgB | 224.67 | 2.95% |
| BhB | 58.11 | 0.76% |
| Bm | 6.72 | 0.09% |
| CpA | 32.31 | 0.42% |
| CpC | 15.69 | 0.21% |
| CpE | 514.08 | 6.74% |
| CuB | 8.99 | 0.12% |
| De | 15.58 | 0.20% |
| Du | 93.46 | 1.23% |
| Es | 34.27 | 0.45% |
| Fd | 86.87 | 1.14% |
| Gp | 12.59 | 0.17% |
| HaA | 258.62 | 3.39% |
| HaB | 297.37 | 3.90% |
| HaC | 48.31 | 0.63% |
| He | 113.09 | 1.48% |
| MfA | 93.96 | 1.23% |
| MfB | 1243.58 | 16.31% |
| MfC | 824 | 10.81% |
| MkA | 5.26 | 0.07% |
| MkB | 351.18 | 4.61% |
| MkC | 36.8 | 0.48% |

| MnA | 18.89 | 0.25% |
|----------------------|-----------------|----------------|
| MnB | 154.98 | 2.03% |
| MnC | 360.41 | 4.73% |
| PIA | 149.96 | 1.97% |
| PIB | 411.93 | 5.40% |
| PIC | 472.88 | 6.20% |
| PmB3 | 4.57 | 0.06% |
| PsA | 55.98 | 0.73% |
| PsB | 4.9 | 0.06% |
| RdA | 60.4 | 0.79% |
| RdB | 389.48 | 5.11% |
| RdC | 325.8 | 4.27% |
| RhB | 15.57 | 0.20% |
| SdA | 2.5 | 0.03% |
| Su | 18.69 | 0.25% |
| <i>Subtotal</i> | <i>7,170.83</i> | <i>94.06%</i> |
| POORLY DRAINED SOILS | | |
| Soil Type | Area (Acres) | Percent |
| At | 5.93 | 0.08% |
| Bd | 39.68 | 0.52% |
| Mu | 92.53 | 1.21% |
| Ra | 17.63 | 0.23% |
| Tm | 218.65 | 2.87% |
| W | 70.92 | 0.93% |
| Wd | 7.58 | 0.10% |
| <i>Subtotal</i> | <i>452.92</i> | <i>5.94</i> |
| TOTAL | 7623.75 | 100.00% |

Source: Suffolk County Soil Survey; Wulforst, 1975; NCRS SSURGO Database; see Figure 9

Erosion is caused by unconsolidated soils becoming subject to overland transport as a result of weathering conditions such as wind and rain. Since the surface of Shelter Island is comprised of glacial sand deposits, unstabilized surfaces are subject to erosion. Natural erosion exists in areas where the topographic elevation declines rapidly toward the coastline causing bluff features. The most pronounced example of this is the area of Shelter Island Heights in the northwest corner of the island, though smaller bluffs exist sporadically around Shelter Island. Erosion can also be caused by increased impervious surfaces resulting in channelized runoff that causes scouring



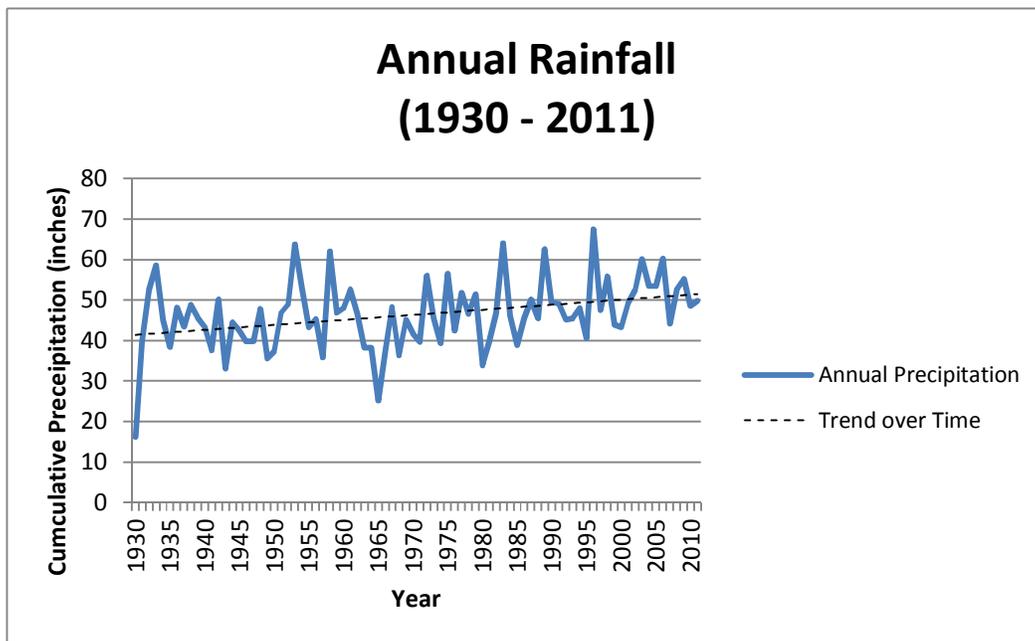
and sediment transport, as well as removal of vegetation that stabilizes surface soils. Erosion and sediment transport throughout Shelter Island should be managed through proper grading and drainage practices incorporating sound engineering principles and erosion control measures.

2.2.6 Precipitation and Climate

Primarily due to its latitude and proximity of the Atlantic Ocean, Shelter Island has a predominantly temperate marine climate. Temperatures are moderate and precipitation is abundant during the fall, winter and spring. A brief dry spell commonly occurs during the summer. Data in the vicinity of Shelter Island collected by NOAA (National Oceanic and Atmospheric Administration) indicates that the average annual temperature of the region is 56 degrees Fahrenheit.

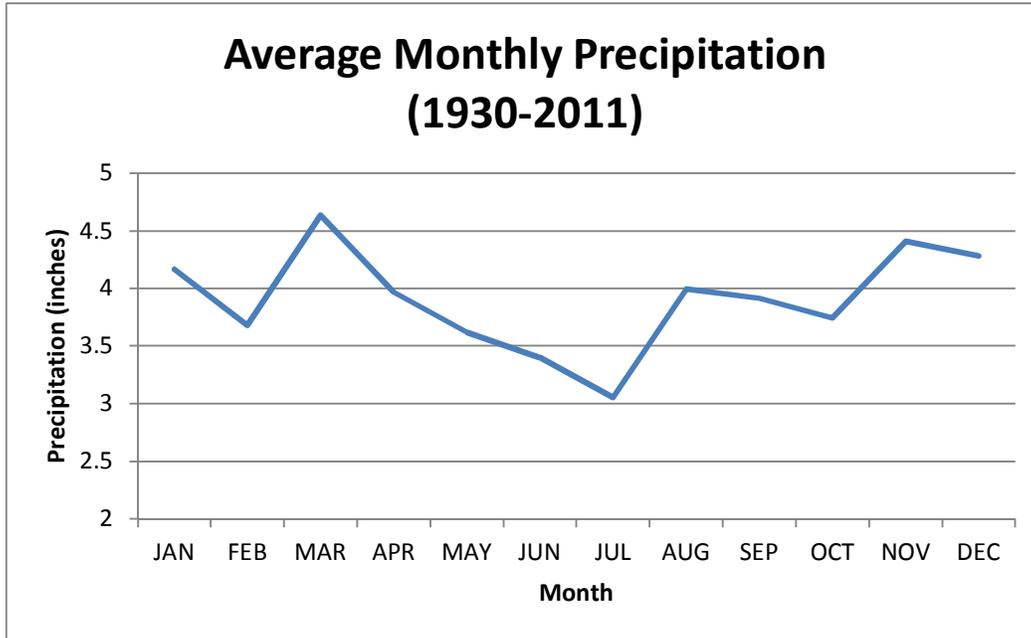
More specific precipitation data for the region was obtained from the Northeast Regional Climate Center (NRCC) who maintains a precipitation measurement station in Bridgehampton. Data from this provider indicates that average annual precipitation is approximately 42.4 inches per year. As illustrated in Graph 1 below, there has been a steady increase in annual precipitation since the station began collecting measurements in 1930. Data from the NRCC also illustrates the seasonal precipitation trends. Graph 1B below displays the average monthly precipitation for the period of 1930 to 2011.

Graph 1A ANNUAL RAINFALL, 1930 - 2011





Graph 1B
AVERAGE MONTHLY RAINFALL, 1930 - 2011



As illustrated, the wettest season is late winter/early spring when Shelter Island (and Long Island) receives seasonal rains. The dry period for the island peaks in July, and precipitation tends to increase by late August. As indicated in **Section 2.2.3.2**, this precipitation trend is reflected in the island’s groundwater levels, which fluctuate as a function of precipitation input to the island.

2.2.7 Infrastructure

Infrastructure on Shelter Island includes the road system, stormwater infrastructure, waste treatment facilities and water supply. The north and south private ferry companies provide transportation to and from Shelter Island; however, there are no rail or bus transit systems on the Island.

2.2.7.1 Transportation

Although Shelter Island is relatively small in size, it contains approximately 85 miles in roadways. Within this network, one roadway (SR 114) is State maintained, while five are County owned and maintained. It is noted that the portion of SR 114 in the vicinity of the North Ferry terminal is owned by the Shelter Island Heights Property Owners Corporation (SIHPOC) and has an easement for the State. A majority of the roads located in Shelter Island Heights are privately owned and maintained by the Shelter Island Heights Property Owners Corporation. The remaining roads are either owned and maintained by



the Town or are privately owned/maintained. **Table 3** below summarizes the State and County roadways found on the Island. It is noted that State and County roadways comprise approximately 9.5 miles of the 85 miles of roadways, or approximately 11% with the rest being Town or private roads.

Table 3
STATE AND COUNTY OWNED ROADWAYS

| Roadway Designation | Roadway Name | Jurisdiction | Approximate Length |
|---------------------|---|--|--------------------|
| SR 114 | North Ferry Road/ South Ferry Road | State (easement) | 4.5 Miles |
| | Summerfield Place/Clinton Avenue/Cedar Avenue/Grand Avenue/Chase Avenue | State (easement), maintained by SIHPOC | |
| CR 42 | Rocky Shore Road | County | 1.2 Miles |
| CR 69 | North Cartwright Avenue | County | 1.4 Miles |
| CR 115 | West Neck Road | County | 0.6 Miles |
| CR 116 | North Menantic Road/Smith Street | County | 1.4 Miles |
| CR 117 | Burns Road | County | 0.4 Miles |

2.2.7.2 Stormwater

As illustrated in **Figure 11**, a network of stormwater and drainage infrastructure currently exists throughout the Shelter Island; these installations are primarily located within the network of roadways described above. The data illustrated in **Figure 11** was collected from a variety of sources, including the Peconic Estuary Program, data collected by Cashin Associates under a contract to the Town, as well as data collected by the Town’s Highway Department, the West Neck Bay Watershed Management plan, the Dering Harbor Subwatershed Assessment and field data collected by NP&V. It is noted that the data collected by Cashin Associates provides the locations of drainage structures; however no data was collected on structure type, connections, or structure conditions. Additionally, while the data provided by the PEP is useful, the dataset is older (data collected in 2000) and requires verification and updating.

Field inspections and meetings with the Town Highway Superintendent indicate that much of the drainage infrastructure on Shelter Island consists of leaching catch basins which recharge stormwater directly to groundwater, however, a large quantity of direct outfalls to either the bays or freshwater wetlands exist as well.



Field inspections by NP&V resulted in the identification of several direct outfalls and areas of overland flow, which were incorporated into the overall drainage infrastructure map provided in **Figure 11**.

Stormwater information from the West Neck Bay Watershed Management plan indicated that all stormwater infrastructure surrounding West Neck Bay consisted of leaching catch basins as the Town requires all drainage infrastructure to recharge to groundwater. No direct outfalls or areas of overland flow were noted in this plan.

The Dering Harbor Subwatershed Assessment is currently in progress; however, available data was obtained and reviewed for the assessment study area. Although specific drainage infrastructure data was not available during the time of review, four “stormwater hotspot” areas were identified within the Dering Harbor assessment area. Hotspot areas include the Gardiners Bay Country Club, the Bridge Street gas station, the Yacht Club, and the alley behind Chequitt Inn/Pharmacy. The Gardiners Bay Country Club is considered a hotspot due to the potential large quantities of nutrients that would runoff from the golf course. The remaining three hotspot locations were identified as such due to the presence of gas, oils and grease that are present and exposed at each site, thus running off into the harbor during storm events.

2.2.7.3 Sanitary

Sanitary infrastructure within Shelter Island is comprised both of a sewer system and associated Sewage Treatment Plant (STP) located in Shelter Island Heights and individual sanitary systems located within the remainder of the island.

The Shelter Island Heights STP was originally permitted by the EPA in May of 1974 and serves the same area as the Shelter Island Heights water district. The STP is currently permitted a flow rate of $\leq 53,000$ gpd of treated sanitary effluent. Review of EPA data reveals that discharge violations occurred on only two dates within the past two years; these violations include high total and fecal coliform counts in July 2011 and a high level of total coliform in May 2009. No other discharge violations have been reported during this time period.

Individual sanitary systems serve the majority of residents and visitors on Shelter Island and are comprised of installations with a wide variety of age, functionality, and depth to groundwater characteristics. Generally, sanitary systems in the northern portion of the Island and in the vicinity of Little Ram Island are considered to be newer as development within these areas occurred primarily in the 1970's. Systems throughout the remainder of the island are in varying states of age, as some have been replaced through necessity while others have not. Systems located in areas of lower elevation (i.e., less than 10 feet asl) are more



likely to have either a very shallow depth to groundwater or may intersect groundwater and as a result, may not meet current design standards or have full function in terms of waste handling.

2.2.7.4 Potable Water

The majority of Shelter Island residents utilize private wells to obtain potable water; however, three water districts exist and are located in the northwest portion of the Island. These water districts include the West Neck Water District, which is owned and operated by the Town for approximately 56 residential and commercial users; the Village of Dering Harbor Water District, which is operated for approximately 23 residential users; and a private water district, operated by the Shelter Island Heights Property Owners Corporation for approximately 160 residential and commercial customers. A depiction of the water district boundaries and the location of supply wells is provided in **Figure 12**. Water quality results from the water districts and available private well data are provided in **Section 2.6.2**.

2.3 Land Use & Land Cover

Quantifying and identifying land use and land cover within a watershed are one of the most important tasks in characterizing a watershed. Land use and land cover provide a reflection of the impervious surfaces within a watershed, which generally contribute the greatest quantity of pollutants running off into surface waterbodies during rain events. By identifying the areas with the greatest quantity of impervious surfaces, improvement projects targeted at either reducing these surfaces or capturing and treating runoff from these surfaces can be identified. Additionally, industrial and commercial uses generally contain the greatest quantity of impervious surfaces, and also have the potential to contribute harsher pollutants (chemical solvents, by products of industrial processes, etc.) to stormwater runoff. As a result, these uses are often appropriate targets for stormwater improvements. Both land use and land cover within Shelter Island are described in further detail below.

Land Use & Land Cover

Shelter Island is approximately 7,600 acres in size, the majority of which is occupied by Low Density Residential (34.64%) and Open Space & Parkland (32.26%) uses (**Table 4**). Vacant Land also occupies a significant portion of the island, as it currently comprises 14.51% of lands. Although Roadway/Highway Yard/Parking Lot (6.10%) and Parks & Recreation (5.28%) occupy a much smaller portion of the island, these uses represent the remainder of the major uses that occupy lands. All other uses within the island occupy less than 2% of the overall land mass (**Figure 13**).



Table 4
LAND USE – SHELTER ISLAND

| Land Use | Area (Acres) | Percent |
|----------------------------------|---------------------|----------------|
| Agriculture/Nursery/Farm | 105.46 | 1.39% |
| Commercial | 105.42 | 1.38% |
| High Density Residential | 19.51 | 0.26% |
| Industrial | 10.85 | 0.14% |
| Institutional | 102.15 | 1.34% |
| Landfill | 26.77 | 0.35% |
| Low Density Residential | 2637.20 | 34.64% |
| Marina | 10.81 | 0.14% |
| Medium Density Residential | 149.20 | 1.96% |
| Parks & Open Space | 2455.50 | 32.26% |
| Parks & Recreation | 401.61 | 5.28% |
| Roadway/Highway Yard/Parking Lot | 464.09 | 6.10% |
| Surface Water | 17.62 | 0.23% |
| Utilities | 1.86 | 0.02% |
| Vacant | 1104.54 | 14.51% |
| TOTAL | 7612.60 | 100.00% |

Land cover data represents the biophysical use of the surface of the earth. Land cover data for Shelter Island was obtained from the 2006 USGS National Land Cover Dataset (NLCD). This dataset is generated from 30 meter resolution Landsat imagery that classifies land cover based on the color bands provided by the Landsat imagery. A depiction of the 2006 NLCD data is provided in **Figure 14**, and coverage quantities are provided in **Table 5** below.



Table 5
LAND COVER – SHELTER ISLAND

| Land Cover Category | Area (Acres) | Percent |
|--------------------------------|----------------|----------------|
| Open Water | 154.10 | 2.02% |
| Developed, Open Space | 1323.09 | 17.35% |
| Developed, Low Intensity | 686.83 | 9.01% |
| Developed, Medium Intensity | 219.17 | 2.87% |
| Developed, High Intensity | 18.57 | 0.24% |
| Barren Land (Rock, Sand, Clay) | 180.04 | 2.36% |
| Deciduous Forest | 3621.22 | 47.49% |
| Evergreen Forest | 184.20 | 2.42% |
| Mixed Forest | 27.82 | 0.36% |
| Shrub/Scrub | 66.49 | 0.87% |
| Grassland/Herbaceous | 147.83 | 1.94% |
| Pasture/Hay | 392.76 | 5.15% |
| Cultivated Crops | 56.39 | 0.74% |
| Woody Wetlands | 121.33 | 1.59% |
| Emergent Herbaceous Wetlands | 425.23 | 5.58% |
| TOTAL | 7625.05 | 100.00% |

As illustrated in **Table 5**, the majority of Shelter Island is occupied by deciduous forest (3621.22 acres or 47.19%). This generally reflects the large quantity of trees that comprise the surface of the island. The second greatest land cover that occupies the island is categorized as Developed, Open Space (17.35%) which generally represents roadways and pathways that traverse the island in addition to large areas of lawn/landscaped areas. Other major land cover categories include Developed, Low Intensity (9.01%), Pasture/Hay (5.15%), and Emergent Herbaceous Wetlands (5.58%). The Developed, Low Intensity category primarily reflects residential areas and some associated roadways, while the Pasture/Hay category represents large mowed areas or large areas of tall grasses. Emergent Herbaceous Wetlands primarily represent the vegetated tidal wetlands on the island. It should be noted that there is a slight discrepancy in the acreage total between the Land Use and Land Cover tables. This is a result of the Land Use quantities being parcel based and the Land Cover quantities being area based and not delimited by parcel boundaries.

Generally, these two sets of data indicate that Shelter Island is primarily comprised of Parks and Open Space and Low Density Development; few areas of higher intensity development currently exist within the Island.



Publicly Owned Land

Publicly owned lands within the watershed are an important factor in understanding the current status of protected land and lands used for municipal purposes. Depending on location of public land, needs of the watershed, and ability to make use of identified holdings, these lands may also provide opportunities for improvements (such as stormwater detention and/or treatment) which would ultimately improve handling or water quality of stormwater runoff.

Figure 15 depicts the publicly owned land within Shelter Island. As illustrated, the Town owns the majority of the publicly owned parcels, in addition to the Mashomack Preserve which is owned by The Nature Conservancy. Several smaller parcels of land are owned by the State, Suffolk County, the Village of Dering Harbor and the Peconic Land Trust and are interspersed throughout the Island.

More specifically, NYS owned land is mostly comprised of the underwater lands' surrounding the Island; however, the State owns two parcels of land just north of Mashomack Preserve that primarily consist of vacant wooded land. Suffolk County owns 22 parcels of land on the Island, two of which are roadways within developments. The majority of County owned lands consist of vacant wooded parcels; however, one of the larger County owned parcels is a former airstrip located in the northeast portion of the Island, west of North Cartwright Road. Town owned lands are interspersed throughout the Island and include vacant wooded land, the Town landfill, portions of Sylvester Manor, former agricultural land, a portion of the airstrip located west of North Cartwright Road and the golf course located in Shelter Island Heights. A total of 2,689 acres (or 35%) of the Island is in public ownership.

The Town Community Preservation Project Plan (adopted in 2008) identifies parcels targeted for acquisition for the purpose of conservation. A list of the target parcels is provided as **Appendix A**. It is noted that a portion of the Fiske Estate and Klen's Airstrip have been acquired at this time. It is also noted that the Town purchases development rights to targeted parcels where deemed appropriate when funds permit.

Marinas, Yacht Clubs and Ferries

There are three marina facilities located within Shelter Island; the Shelter Island Yacht Club, located on the north shore of the Island in Dering Harbor, Coecles Harbor Marina & Boatyard, located on the eastern shore of the Island in Coecles Harbor, and Island Boatyard located on the south shore of the island in Menantic Creek. Both the Coecles Harbor Marina and Island Boatyard are full service marinas offering boat repair, maintenance, storage, pump out and fueling. Additionally, Island Boatyard permits boat owners to wash and paint vessels within the marina facility.

Two ferries provide access to the Island: one is located on the north shore with a terminal at S.R. 114/Summerfield Place while the other is located at south shore terminal at S.R. 114/South Ferry Road. The North ferry is owned and operated by the



Shelter Island Heights Property Owner's Corporation while the South ferry is owned and operated by the South Ferry Company. Both services have multiple ferries operating on a constantly rotating schedule.

Town Landfill

The Town landfill is located on the east side of North Menantic Road, immediately to the west of an existing sand mine and masonry facility. The landfill processed and buried material from the 1940's to 1991, when the landfill was closed and capped. Three groundwater monitoring wells are located at the Town facility and are sampled twice a year for pollutants identified in 6 NYCRR Part 360 for baseline and routine sampling events. Results from 2009 and 2011 sampling events were reviewed and have indicated both high levels of metals and ammonia within the wells. The high levels of metals have been attributed to high turbidity levels within one of the monitoring wells, while the ammonia levels may indicate contamination from the landfill. Additional information on water quality, including the landfill well monitoring is contained in **Section 2.6.2**.

2.4 Human and Socioeconomic Resources

2.4.1 Zoning

As illustrated on the Zoning Map (**Figure 16**) zoning within Shelter Island is primarily residential, with a small area of commercial zoning located in the central portion of the Island. Shelter Island has six zoning categories in total, four of which are residential and two of which are commercial. Additionally, Shelter Island has a Near Shore and Peninsular Overlay district for those properties located along the shoreline. As illustrated in **Table 6** below, Shelter Island requires a minimum lot size of 40,000 SF in any zoning district, and permits a maximum impervious lot coverage of 40% with the exception of the business districts, which are permitted a maximum lot coverage of 75%.



Table 6
ZONING – SHELTER ISLAND

| Zone | Minimum Lot Size | Maximum Impervious Lot Coverage | Total Area (Acres) | Percent of Island |
|------------------------|------------------|---------------------------------|--------------------|-------------------|
| A Residential | 40,000 SF | 40% | 1188.85 | 16.37% |
| AA Residential | 80,000 SF | 40% | 4501.75 | 62.00% |
| B Business | 40,000 SF | 75% | 168.31 | 2.32% |
| B1 Restricted Business | 40,000 SF | 75% | 6.1 | 0.08% |
| C Residential | 40,000 SF | 40% | 1302.22 | 17.94% |
| Causeway District | 80,000 SF | * | 93.33 | 1.29% |
| TOTAL | -- | -- | 7260.56 | 100.00% |

* Based on lot size, as follows:

- >200,000 SF Lot: 1,800 SF building plus a 25' radius surrounding the building
- 40,000 SF - 200,000 SF Lot: 1,800 SF building plus a 25' radius surrounding the building
- <40,000 SF Lot: 1,000 SF plus a 25' radius surrounding the building

As less than 3% of the Island is zoned for business uses, these uses will have minimal impacts in terms of impervious lot coverage. Conversely, as the majority of Shelter Island is permitted for residential uses, these uses will provide the largest component of impervious surfaces on the Island.

It is noted that the Causeway District was incorporated into Town zoning code recently (December 2, 2011) in order to further protect the scenic causeway located within the Ram Island and Little Ram Island peninsula. It was recognized that this area was subject to frequent flooding and as such, maintenance of existing natural vegetation within this area was imperative in protecting both the scenic quality and stabilization of the bluffs within the district.

Additionally, Shelter Island has a Near Shore and Peninsular Overlay District. The overlay district was created to protect the aquifer in the most sensitive areas of Shelter Island, where depletion of potable water and salt water intrusion are most likely. Generally, this Overlay District applies to the most sensitive areas of the Island where one or more of the following criteria apply:

1. The freshwater table is close to sea level and risk of salt water intrusion exists or has occurred through consumptive use of available potable water.
2. The land surface is close to the level of the freshwater table, increasing the risk of pollution of the aquifer.
3. The land drains toward creek or bay waters, increasing potential pollution from surface or below-ground drainage.
4. Density of development and anticipated future development threaten the ecologically sensitive areas.



5. The land drains toward freshwater ponds which are hydraulically connected to outcroppings of the freshwater table which may result in pollution of the freshwater table.

New subdivisions which are located within the Near Shore and Peninsular Overlay District require a shoreline vegetative buffer, park or recreation area requirement, contiguous area and acreage averaging.

2.4.2 Demographics

Data from the 2010 census was utilized to determine the population of Shelter Island. 2010 census data reveals that the population of Shelter Island is 2,392 persons, which represents an increase of 164 people or 7.36% over the 2000 population (2,228 persons). As illustrated in **Figure 17**, despite the increase in population, the relative population density on the Island has not changed significantly since the 2000 census.

There is a prominent seasonal population that inhabits Shelter Island in the summer season. Data from the 2010 census indicates that 1,459 of the 2,755 households on Shelter Island are seasonal (52.96%) suggesting that the Island experiences a significant population increase in the summer months. A 1986 Water Resources Investigation Report reported that the population increased to 10,000 during summer months (**Simmons, 1986**).

2.5 Natural Resources

2.5.1 Wetlands

Freshwater Wetlands

The freshwater wetlands (i.e., ponds and marshes) are located primarily within the inland portions of Shelter Island and are particularly concentrated in the southern half of the Island. These features were formed during the retreat of the Laurentide Ice Sheet, when fresh meltwater collected in the kettle holes and depressions formed previously during glacial advance. These areas are of critical importance to the watershed underlying Shelter Island since they are major conduits of groundwater recharge in the region and represent ecologically sensitive resources.

The NYSDEC has identified 63 surface water bodies as freshwater wetlands within the Town of Shelter Island; these areas comprise approximately 314.3 acres of wetlands. These freshwater wetlands are all catalogued by the NYSDEC on the Greenport United States Geological Survey (USGS) 7.5-minute quadrangle and are illustrated in **Figure 18**. NYSDEC classifies freshwater wetlands into four categories, which are described in §664.5 of the NYSDEC regulations. Class I wetlands are considered the most pristine and therefore the most valuable, while



Class IV wetlands lack characteristics which would give the wetland a high value. The definitions of each class category, as provided by the NYSDEC, are listed below.

Class I wetlands:

A wetland shall be a Class I wetland if it has any of the following seven enumerated characteristics:

Ecological associations

- (1) it is a classic kettlehole bog

Special features

- (2) it is resident habitat of an endangered or threatened animal species
- (3) it contains an endangered or threatened plant species
- (4) it supports an animal species in abundance or diversity unusual for the state or for the major region of the state in which it is found

Hydrological and pollution control features

- (5) it is tributary to a body of water which could subject a substantially developed area to significant damage from flooding or from additional flooding should the wetland be modified, filled, or drained
- (6) it is adjacent or contiguous to a reservoir or other body of water that is used primarily for public water supply, or it is hydraulically connected to an aquifer which is used for public water supply or

Other

- (7) it contains four or more of the enumerated Class II characteristics. The department may, however, determine that some of the characteristics are duplicative of each other, therefore do not indicate enhanced benefits, and so do not warrant Class I classification.

Class II wetlands:

A wetland shall be a Class II wetland if it has any of the following seventeen enumerated characteristics:

Covertypes

- (1) it is an emergent marsh in which purple loosestrife and/or reed (*Phragmites*) constitutes less than two-thirds of the covertype

Ecological association

- (2) it contains two or more wetland structural groups
- (3) it is contiguous to a tidal wetland
- (4) it is associated with permanent open water outside the wetland
- (5) it is adjacent or contiguous to streams classified C(t) or higher under article 15 of the environmental conservation law

Special features

- (6) it is traditional migration habitat of an endangered or threatened animal species
- (7) it is resident habitat of an animal species vulnerable in the state
- (8) it contains a plant species vulnerable in the state
- (9) it supports an animal species in abundance or diversity unusual for the county in which it is found
- (10) it has demonstrable archaeological or paleontological significance as a wetland



(11) it contains, is part of, owes its existence to, or is ecologically associated with, an unusual geological feature which is an excellent representation of its type

Hydrological and pollution control features

(12) it is tributary to a body of water which could subject a lightly developed area, an area used for growing crops for harvest, or an area planned for development by a local planning authority, to significant damage from flooding or from additional flooding should the wetland be modified, filled, or drained

(13) it is hydraulically connected to an aquifer which has been identified by a government agency as a potentially useful water supply

(14) it acts in a tertiary treatment capacity for a sewage disposal system

Distribution and location

(15) it is within an urbanized area

(16) it is one of the three largest wetlands within a city, town, or New York City borough or

(17) it is within a publicly owned recreation area

Class III wetlands:

A wetland shall be a Class III wetland if it has any of the following fifteen enumerated characteristics:

Covertypes

(1) it is an emergent marsh in which purple loosestrife and/or reed (Phragmites) constitutes two-thirds or more of the covertype

(2) it is a deciduous swamp

(3) it is a shrub swamp

(4) it consists of floating and/or submergent vegetation

(5) it consists of wetland open water

Ecological associations

(6) it contains an island with an area or height above the wetland adequate to provide one or more of the benefits described in section

Special features

(7) it has a total alkalinity of at least 50 parts per million

(8) it is adjacent to fertile upland

(9) it is resident habitat of an animal species vulnerable in the major region of the state in which it is found, or it is traditional migration habitat of an animal species vulnerable in the state or in the major region of the state in which it is found

(10) it contains a plant species vulnerable in the major region of the state in which it is found

Hydrological and pollution control features

(11) it is part of a surface water system with permanent open water and it receives significant pollution of a type amenable to amelioration by wetlands

Distribution and location

(12) it is visible from an interstate highway, a parkway, a designated scenic highway, or a passenger railroad and serves a valuable aesthetic or open space function

(13) it is one of the three largest wetlands of the same covertype within a town

(14) it is in a town in which wetland acreage is less than one percent of the total acreage or



(15) it is on publicly owned land that is open to the public

Class IV wetlands:

A wetland shall be a Class IV wetland if it does not have any of the characteristics listed as criteria for Class I, II or III wetlands. Class IV wetlands will include wet meadows and coniferous swamps which lack other characteristics justifying a higher classification.

Table 7 below lists each wetland, their approximate size, and the NYSDEC classification.

**Table 7
NYSDEC FRESHWATER WETLANDS**

| NYSDEC Wetland ID | Wetland Classification | Area (Acres) | NYSDEC Wetland ID | Wetland Classification | Area (Acres) | NYSDEC Wetland ID | Wetland Classification | Area (Acres) |
|-------------------|------------------------|--------------|-------------------|------------------------|--------------|-------------------|------------------------|--------------|
| GP-3 | 3 | 16.1 | GP-31 | 2 | 4.4 | GP-52 | 3 | 0.5 |
| GP-4 | 3 | 19.6 | GP-32 | 2 | 1.2 | GP-53 | 3 | 1.4 |
| GP-5 | 3 | 85 | GP-33 | 2 | 4 | GP-54 | 3 | 0.5 |
| GP-6 | 2 | 46.2 | GP-34 | 3 | 0.6 | GP-55 | 2 | 3.6 |
| GP-7 | 2 | 24.4 | GP-35 | 3 | 1.4 | GP-56 | 3 | 1.2 |
| GP-8 | 2 | 19.8 | GP-36 | 3 | 2.8 | GP-57 | 3 | 0.9 |
| GP-12 | 2 | 0.8 | GP-37 | 3 | 0.7 | GP-58 | 3 | 4.6 |
| GP-15 | 2 | 1.5 | GP-38 | 3 | 1.1 | GP-59 | 3 | 0.6 |
| GP-17 | 2 | 2.8 | GP-39 | 3 | 0.8 | GP-60 | 3 | 2.4 |
| GP-18 | 3 | 4.4 | GP-40 | 3 | 1 | GP-61 | 3 | 2.9 |
| GP-19 | 1 | 3.8 | GP-41 | 3 | 0.4 | GP-62 | 3 | 0.8 |
| GP-20 | 3 | 0.7 | GP-42 | 2 | 1 | GP-63 | 3 | 2.3 |
| GP-21 | 2 | 0.7 | GP-43 | 3 | 2.7 | GP-64 | 3 | 1 |
| GP-22 | 2 | 0.6 | GP-44 | 3 | 0.7 | GP-65 | 2 | 3.1 |
| GP-23 | 3 | 1.8 | GP-45 | 3 | 0.7 | GP-66 | 2 | 4.1 |
| GP-24 | 3 | 0.6 | GP-46 | 3 | 0.3 | GP-67 | 3 | 1.7 |
| GP-25 | 2 | 13.9 | GP-47 | 3 | 0.3 | GP-68 | 3 | 1 |
| GP-26 | 2 | 2.9 | GP-48 | 3 | 0.8 | GP-69 | 3 | 1.3 |
| GP-27 | 3 | 0.6 | GP-49 | 2 | 1.8 | GP-70 | 2 | 0.9 |
| GP-28 | 2 | 0.5 | GP-50 | 3 | 1.4 | GP-74 | 2 | 1.4 |
| GP-29 | 2 | 0.3 | GP-51 | 2 | 0.8 | TOTAL | | 314.3 |
| GP-30 | 3 | 2.2 | | | | | | |

As illustrated in **Table 7** above, only one freshwater wetland on Shelter Island is a Class I wetland, while the majority of the wetlands are Class II (23 wetlands) and III (39 wetlands). This indicates the generally compromised quality of freshwater wetlands encountered on Shelter Island. It is noted that the largest freshwater wetland, GP-5, occurs in the south central portion of the Island and is approximately 85 acres in size. This wetland is generally of poor quality as it is a Class III wetland. The Class I wetland (GP-19) is located immediately to the south of Chase Creek in the northwest portion of the Island.



Tidal Wetlands

The Town's tidal wetlands are located where the coastline is bounded by tidal waters. These wetlands contain saline waters, which originate from the ocean-fed surface waters surrounding Shelter Island. These features are formed by coastal processes and, with the exception of formerly connected tidal wetlands, are subject to tidal influence. These areas are not only vital to the ecological systems to which they serve, but also function to control storm surges during flood and major storm events which may impact sensitive watershed areas. The NYSDEC maintains a series of tidal wetlands maps which document the location and type of tidal wetlands within New York State and includes a complete inventory for the area of Shelter Island. Tidal wetlands surrounding Shelter Island are illustrated in **Figure 18**. The NYSDEC classifies tidal wetlands into fourteen distinct categories. Definitions for those categories present within Shelter Island are provided below.

SM - Coastal Shoals, Bars and Mudflats: The tidal wetland zone that at high tide is covered by saline or fresh tidal waters, at low tide is exposed or is covered by water to a maximum depth of approximately one foot, and is not vegetated.

LZ - Littoral Zone: 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.

FC - Formerly Connected: The tidal wetlands zone in which normal tidal flow is restricted by man-made causes. *Phragmites sp.* is the dominant vegetation.

IM - Intertidal Marsh: The vegetated tidal wetland zone lying generally between average high and low tidal elevation in saline waters. The predominant vegetation in this zone is low marsh cord grass, *Spartina alterniflora*.

HM - High Marsh: 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*.

DS - Dredged Spoil All areas of fill material.

The majority of the shoreline along the western portion of the Island is dominated by LZ, indicating few areas of tidal wetlands vegetation and greater areas of hardened shorelines. The eastern portion of Shelter Island contains larger areas of SM, suggesting fewer areas of hardened shorelines. Vegetated tidal wetlands (HM and IM) exist within tidal inlets and areas along the shoreline that receive lesser amounts of natural disturbance and greater sediment deposition, allowing for the establishment of tidal wetland vegetation. In particular, Coecles Harbor, West Neck Creek and Mashomack Preserve exhibit the greatest quantity of vegetated tidal wetlands on the



island. The quality of these wetland areas will depend heavily on the amount of anthropogenic disturbance and influence the wetland areas receive.

2.5.2 Living Resources

Living resources include the significant flora and fauna that are present on the Island. While significant natural communities are discussed in **Section 2.5.3** below, this section focuses on the significant plants and animals known to occur within the bays and harbors of Shelter Island. These resources should be considered in water quality improvements as the habitat of each species should be protected to ensure the continuance of the species. The NYNHP has identified two rare fish, a rare damselfly, a rare beetle, one rare plant, six threatened plants and one endangered plant as either presently or historically occurring on the island. It is noted that the island does not support any anadromous fish populations as the island contains no freshwater streams. **Table 8** below provides a summary of the species identified by habitat type as it provides an indication of where the species would be expected since the NYNHP does not provide specific locations due to the sensitivity of the information.



**Table 8
RARE SPECIES IDENTIFIED BY THE NYNHP**

| Habitat Type | | NYS Legal Status (Endangered, Threatened, Rare, Special Concern) | Year Last Documented |
|--|---|--|----------------------|
| TIDAL RIVER | | -- | -- |
| Species Common Name | Species Scientific Name | -- | -- |
| Inland Silverside | <i>Menidia beryllina</i> | Unlisted | 1980 |
| Atlantic Silverside | <i>Menidia menidia</i> | Unlisted | 1980 |
| SUCCESSIONAL FIELD/GRASSLAND/CLEARING | | -- | -- |
| Species Common Name | Species Scientific Name | -- | -- |
| White Milkweed | <i>Asclepias variegata</i> | Endangered | 2010 |
| Little-leaf Tick-trefoil | <i>Desmodium ciliare</i> | Threatened | 1923 |
| Oakes' Evening-primrose | <i>Oenothera oakesiana</i> | Threatened | 1996 |
| Whip Nutrush | <i>Scleria triglomerata</i> | Threatened | 1996 |
| TIDAL WETLANDS/SALT MARSH | | -- | -- |
| Species Common Name | Species Scientific Name | -- | -- |
| Marsh Fimbry | <i>Fimbristylis castanea</i> | Threatened | 1996 |
| Rambur's Forktail | <i>Ischnura ramburii</i> | Unlisted | 1994 |
| Seaside Plantain | <i>Plantago maritima var. juncoidea</i> | Threatened | 2010 |
| Seabeach Knotweed | <i>Polygonum glaucum</i> | Rare | 2005 |
| Dwarf Glasswort | <i>Salicornia bigelovii</i> | Threatened | 2010 |
| PINE BARRENS | | -- | -- |
| Species Common Name | Species Scientific Name | -- | -- |
| New Jersey Pine Barrens Tiger Beetle | <i>Cicindela patruela consentanea</i> | Unlisted | 1946 |

2.5.3 Habitats

A variety of important habitats exist on Shelter Island or within the coastal waters of the Island. In total, six different categories of significant habitats occur within the Island or along the coast. Each of these habitats is described in further detail below and is depicted in **Figures 19** and **20**.

NYSDOS Significant Coastal Fish & Wildlife Habitat

NYSDOS has designated three Significant Coastal Fish & Wildlife Habitats on the island which are identified as Shell Beach, Shelter Island Eastern Shallows and Mashomack Preserve Shelter Island. These areas are designated due to the presence of rare, threatened or endangered species and populations of waterfowl which use the area, the rarity of the ecosystem, the availability of sport fishing, and the irreplaceability of the ecosystem. The habitat narratives which describe the reasoning behind the SCFWH designation for each habitat is provided in **Appendix B**.



As discussed in the habitat narrative, the three habitat areas were designated a SCFWH for the following reasons:

Shell Beach:

- Shell Beach is a small segment of sand and pebble beach, subject to human disturbance; not rare in Suffolk County.
- Shell Beach provides nesting sites for Least Tern (threatened species) and Piping Plover (Federal and State endangered species).
- There are no significant fish or wildlife related human uses of the area.
- The concentrations of piping plover utilizing Shell Beach is significant in Suffolk County.
- The habitat at Shell Beach may be replaced through independent processes within two years.

Shelter Island Eastern Shallows:

- Shelter Island Eastern Shallows contains eelgrass beds of State importance.
- Atlantic ridley (endangered species) and loggerhead turtles (threatened species) have been identified in this habitat.
- The Eastern Shallows has a bay scallop fishery of recreational and commercial significance in the State of New York.
- The bay scallop population is at a level of significance between the State of New York and the Mid-Atlantic region of the United States.
- The habitat is irreplaceable.

Mashomack Preserve Shelter Island:

- Mashomack Preserve is an undeveloped marine coastal ecosystem that is rare in New York State.
- Mashomack Preserve hosts Osprey (Special Concern species) nesting and feeding, Piping plover (Federal and State endangered species) nesting and occasional least tern (threatened species) nesting.
- Mashomack Preserve provides recreational and educational uses important to residents of Long Island.
- Mashomack Preserve provides the second largest concentration of nesting osprey in the State of New York.
- Mashomack Preserve is irreplaceable.

It is noted that a restoration and replanting plan for Shell Beach is currently in preparation as part of a habitat restoration initiative by the Peconic Estuary Program.

Eel Grass Beds & Submerged Aquatic Vegetation

Eel grass (*Zoster marina*) is a significant habitat vital to the establishment and success of shellfish, finfish and other marine organisms present in Peconic Bay. Two surveys were performed to locate existing patches of eel grass and submerged aquatic vegetation (SAV) in Peconic Bay, the first in 1994 and the second in 2000. The 1994 eel grass bed locations were delineated by Cashin Associates who utilized aerial photography and field surveys to determine the extent of each bed. In 2000



Cornell Cooperative Extension utilized similar methodology to determine the location of SAV (both macroalgae and eel grass) within Peconic Bay, the difference of which is displayed in **Figure 19**. As illustrated, eel grass beds were reduced in some areas while other areas exhibited bed expansion. Overall, there appears to have been a net loss in SAV in the vicinity of Shelter Island between 1994 and 2000. Data regarding eel grass has not been collected since 2000, however, a survey update is scheduled for 2012.

NYNHP Significant Natural Communities

Shelter Island hosts a total of nine NYNHP recognized significant natural communities, all of which are associated with Mashomack Preserve or the immediate surrounding area. The communities present include Coastal oak-beech forest, Coastal oak-hickory forest, Coastal salt pond, Highbush blueberry bog thicket, Marine eelgrass meadow, Maritime beach, Maritime post oak forest, Saltwater tidal creek, and Successional maritime forest.

Each of these communities was deemed significant due to their quality, age, or rarity within New York State. **Table 9** below summarizes each community, the approximate size, and the reason for the community designation. A full description of each community type as defined by **Edinger (2002)** is provided as **Appendix C**.



**Table 9
SHELTER ISLAND SIGNIFICANT NATURAL COMMUNITIES**

| Community Name | Community Location | Size (Acres) | EO Rank ¹ | Global Rank ² | State Rank ³ | Description |
|--------------------------------|--------------------------------|--------------|----------------------|--------------------------|-------------------------|--|
| Coastal Oak-Beech Forest | Mashomack Preserve | 219 | A | G4 | S3 | This is an oak-beech codominated forest on a moraine in the interior of an island peninsula in the Peconic Estuary of Long Island. The forest is associated with coastal oak-hickory forest in a mosaic forming a matrix forest and includes several small vernal pools. It is part of a relatively large intact landscape for the coastal region consisting of 1450 acres of mostly continuous forest cover and 2000 acres of natural cover lacking paved roads. |
| Coastal Oak-Hickory Forest | Mashomack Preserve | 446 | A | G4 | S3 | This is an oak-hickory codominated forest in the interior of an island peninsula in the Peconic Estuary of Long Island. The community is associated with coastal oak-beech forest as part of a matrix forest, and may include several small vernal pools in kettlehole depressions. The forest grades into maritime post oak forest closer to the salt spray influenced island shoreline. Successional maritime forest is associated in more heavily disturbed areas to the west. The forest is part of a landscape relatively intact for the coastal zone which is about 1450 acres generally with continuous forest cover and 2000 acres of natural cover lacking paved roads. |
| Coastal Salt Pond | Cedar Cove Pond | 0.56 | C | G4 | S1S2 | Small polyhaline pond complex centered on a small point in a small cove of a polyhaline tidal bay on an island in the middle of the Peconic Estuary of eastern Long Island. The pond occurs along a narrow band of marine intertidal shore and is separated from the subtidal waters of the adjacent bay by a narrow terrace. A salt marsh complex with pools similar to coastal salt ponds is situated nearby along the intertidal shore. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous natural cover and 1443 acres lacking paved roads. |
| Coastal Salt Pond | Plum Pond | 31 | BC | G4 | S1S2 | Mesohaline to oligohaline pond complex behind a barrier beach on a large island in the middle of the Peconic Estuary of eastern Long Island. The pond is separated from the polyhaline to euhaline subtidal waters of an adjacent tidal bay by a 4 m tall barrier dune. It is one of a chain of several pond complexes on the southeast part of a large peninsula. There is no direct outlet to the bay, but an artificial connection (estuarine ditch) to a tidal creek to the west has been made. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous natural cover and 1443 acres lacking paved roads. |
| Highbush Blueberry Bog Thicket | Mashomack Preserve | 28 | AB | G4 | S3 | The community is a series of small patches in a northwest to southeast orientation straddling Route 114. At the edges of the kettles, the swamp grades into a narrow wet mucky moat like area dominated by <i>Decodon verticillatus</i> . The kettles are bordered by coastal oak-hickory forest. The swamp complex is at the west edge of Mashomack Preserve. Residences occur to the north, south, and west. |
| Marine Eelgrass Meadow | Gardiner's Bay, Shelter Island | 330 | AB | G5 | S3 | Eelgrass-dominated patches in a mosaic of densely to sparsely vegetated nearshore subtidal shoal associations at the head of a large open part of a bay with semi-diurnal tides and at the outlet of a narrow sound at the interface of the middle and the outer portions of the Peconic Estuary of eastern Long Island. Associated subtidal associations include macroalgae beds variously dominated by <i>Polysiphonia</i> spp., <i>Sargassum filipendula</i> and <i>Codium fragile</i> , as well as sparsely vegetated sand. Landward the community is bordered by intact marine intertidal areas and strips of forested to open canopy maritime uplands, including a complex of coastal oak forests and an unconsolidated maritime bluff formed from headward erosion. One tidal creek empties into the sound. |
| Maritime beach | Mashomack | 59 | B | G5 | S3S4 | The community follows the shoreline of Mashomack peninsula for approximately 11.4 miles below low maritime dune ridges or eroding till bluffs and above mean high tide which separates it from marine intertidal gravel/sand beach. Approximately 20% of the community is bordered by development including docks and houses. |
| Maritime post oak forest | Mashomack | 571 | A | G3G4 | S2S3 | This is an oak-dominated maritime strand forest on an island peninsula in the Peconic Estuary of Long Island. Seaward, the forest abuts marine, estuarine and maritime communities (marine beaches, maritime beach, salt marshes, and salt shrub). Inland, the forest grades into interior coastal oak forests (oak-hickory, oak-beech). Successional maritime forest is associated in more heavily disturbed areas to the west. The forest is part of a landscape relatively intact for the coastal zone with about 2000 acres of natural cover with no paved roads and 1450 acres with generally continuous forest cover. |
| Saltwater tidal creek | Fan Creek | 4 | B | G4 | S3 | Small, tidally influenced creek in a small salt marsh emptying into a small cove of a large inlet adjacent to a large polyhaline to euhaline tidal bay in the outer Peconic Estuary of eastern Long Island. The creek is bordered by intact, unditched low and high salt marsh. Intact maritime post oak forest surrounds the salt marsh with a small watershed of about 20 acres. The mouth of the creek cuts across a small intertidal barrier beach with a small delta deposited in the adjacent tidal bay. Semidiurnal tides enter the creek from the bay. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous natural cover and 1443 acres lacking paved roads. |
| Saltwater tidal creek | Miss Annies Creek | 15 | B | G4 | S3 | This is a tidally influenced creek in a small salt marsh emptying into a small cove of a narrow sound connecting two polyhaline to euhaline tidal bays in the outer Peconic Estuary of eastern Long Island. The creek is bordered by intact low and high salt marsh with only a few small historical ditches. Intact maritime post oak forest borders the salt marsh landward with a small watershed of about 60 acres. The mouth of the creek cuts across a small barrier beach and dune with a small delta deposited in the adjacent tidal bay. Semidiurnal tides enter the creek from the bay. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous natural cover and 1443 acres lacking paved roads. |
| Saltwater tidal creek | Bass Creek | 26 | AB | G4 | S3 | This is a tidally influenced creek in a moderately small salt marsh emptying into a narrow sound connecting two polyhaline to euhaline tidal bays in the outer Peconic Estuary of eastern Long Island. The creek is bordered by mostly intact low and high salt marsh. Intact maritime post oak forest borders the salt marsh landward with a small watershed of about 200 acres. The mouth of the creek cuts across a small barrier beach and dune with a moderate-sized subtidal delta of coarse sediments deposited in the adjacent tidal bay. Semidiurnal tides enter the creek from the bay. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous natural cover and 1443 acres lacking paved roads. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Community Name | Community Location | Size (Acres) | EO Rank ¹ | Global Rank ² | State Rank ³ | Description |
|------------------------------|--------------------|--------------|----------------------|--------------------------|-------------------------|---|
| Saltwater tidal creek | Mashomack Creek | 22 | AB | G4 | S3 | This is a tidally influenced creek in a moderate-sized salt marsh emptying into a narrow sound connecting two polyhaline to euhaline tidal bays, on a peninsula of an island in the outer Peconic Estuary of eastern Long Island. The creek is bordered by mostly intact low and high salt marsh. Intact maritime post oak forest borders the salt marsh towards the interior of the peninsula with a small watershed of about 100 acres. The mouth of the creek cuts across a small barrier beach and dune with a moderate-sized subtidal delta of coarse sediments deposited in the adjacent tidal bay. Semidiurnal tides enter the creek from the bay. The adjacent upland is a regionally large complex of maritime and coastal oak forests with about 2000 acres of mostly contiguous. |
| Successional maritime forest | Mashomack | 187 | BC | G4 | S3S4 | This is a successional forest at the edge of an island peninsula in the Peconic Estuary of Long Island. The forest is associated to the east with mature oak forests (oak-hickory, oak-beech, and maritime post oak). Developed lands to the west limit natural connections to the rest of the island. Several small pine barrens shrub swamps are embedded in the forest. It is part of a landscape relatively intact for the coastal region with 1450 acres generally with continuous forest cover and 2000 acres of natural cover lacking paved roads. |

1. EO RANK

- A = excellent quality and viability
- B = good quality and viability
- C = fair quality and viability
- D = poor quality and viability
- E = verified extant (with insufficient information to rank A D)
- F = failed to find during most recent surveys (but may still be present)
- H = historical with no recent information
- X = extirpated (no longer exists) from that location (most often due to destruction of habitat)

2. GLOBAL RANK:

- G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences), or very few remaining acres, or miles of stream) or especially vulnerable to extinction because of some factor of its biology.
- G2 = Imperiled globally because of rarity (6 - 20 occurrences, or few remaining acres, or miles of stream) or very vulnerable to extinction throughout its range because of other factors.
- G3 = Either rare and local throughout its range (21 to 100 occurrences), or found locally (even abundantly at some of its locations) in a restricted range (e.g., a physiographic region), or vulnerable to extinction throughout its range because of other factors.
- G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.
- GH = Historically known, with the expectation that it might be rediscovered.
- GX = Species believed to be extinct.
- GU = Status unknown.

3. STATE RANK

- S1 = Typically 5 or fewer occurrences, very few remaining individuals, acres, or miles of stream, or some factor of its biology making it especially vulnerable in New York State.
- S2 = Typically 6 to 20 occurrences, few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State.
- S3 = Typically 21 to 100 occurrences, limited acreage, or miles of stream in New York State.
- S4 = Apparently secure in New York State.
- S5 = Demonstrably secure in New York State.
- SH = Historically known from New York State, but not seen in the past 15 years.
- SX = Apparently extirpated from New York State.
- SE = Exotic, not native to New York State.
- SR = State report only, no verified specimens known from New York State.
- SU = Status unknown.



Wintering Harbour Seals

Harbour seals (*Phoca vitulina*) utilize the easternmost portion of the Peconic Estuary as wintering habitat. Wintering habitat is important for many species as it provides sustenance for species between breeding seasons. As described on the Coastal Research and Education Society of Long Island (CRESLI), “Harbor seals, like most other seal species, migrate southward every winter, returning to New England and Canada in the summer. On Long Island, a large influx of these seals arrive in November and remain through mid-May, although some are thought to stay throughout the year.” The USF&WS identified two locations on Shelter Island that serve as sites for wintering harbour seals, one of which is located on the north side of Ram Island and one of which is located at the southern tip of Mashomack Preserve.

PEP Critical Natural Resource Areas

In 1996, the PEP identified areas within the estuary that provided ecologically significant habitat to a variety of species that utilize the estuary. These areas were delineated by the PEP in order to provide a focus for habitat protection. One such area was designated on the eastern shore of Shelter Island, and encompasses the entirety of Mashomack Preserve, Ram Island, Little Ram Island and the associated coastal waters.

Peconic Bay Waterfowl Focus Area

The bay area and associated coastal waters located on the western shore of Shelter Island serves as the waterfowl focus area for both the roseate tern, which utilizes the habitat for foraging, and the common tern which utilizes the habitat for nesting. The waterfowl focus area is defined by the Atlantic Coastal Joint Venture (ACJV) which focuses on habitat conservation for native avian species. Although no specific recommendations are made for the Long Island South Shore Complex, the ACJV seeks to provide quality waterfowl habitat wherever feasible.

2.6 Water Quality

2.6.1 Surface Water Quality Classifications

The NYSDEC classifies surface waters into several categories, depending on whether the water body is freshwater or tidal. As indicated by the NYSDEC, “All waters of the state are provided a class and standard designation based on existing or expected best usage of each water or waterway segment.” Descriptions of these classifications are provided in **Table 10** below, and classifications for waters within and along the coast of Shelter Island are provided in **Figure 21**.



Table 10
NYSDEC SURFACE WATER QUALITY CLASSIFICATIONS

| Freshwater Classification | Best Usage |
|----------------------------------|--|
| AA | Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| A | Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| B | Primary and secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| C | Suitable for fish, shellfish and wildlife propagation and survival. Also, for primary and secondary contact recreation, although other factors may limit the use for these purposes. |
| D | Due to such natural conditions as intermittency of flow, water conditions not being conducive to propagation of game fishery, or unsuitable stream bed conditions, the waters will not support fish propagation. Suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. |

| Marine Water Classification | Best Usage |
|------------------------------------|---|
| SA | Shellfishing for market purposes, primary and secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| SB | Primary or secondary contact recreation and any fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| SC | Suitable for fish, shellfish and wildlife propagation and survival. Also, suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. |
| I | Secondary contact recreation and fishing. Suitable for fish, shellfish and wildlife propagation and survival. |
| SD | Suitable for fish, shellfish and wildlife survival. This classification may be given to those waters that cannot meet the requirements for primary and secondary contact recreation and fish propagation for reasons of natural or man-made conditions. |

Source: 6NYCRR Parts 700-705, Water Quality Regulations for Surface Waters and Groundwaters, effective September 1, 1991.

Note: Examples of Primary contact recreation include swimming, diving, and surfing. Examples of Secondary contact recreation include fishing and boating.

As previously indicated, there are no freshwater streams located on Shelter Island; however, there are several small fresh ponds scattered throughout the Island. All of these ponds have received a classification of C, indicating that these ponds are primarily suitable as fish and wildlife habitat. These ponds are appropriate for recreation; however, other factors affecting the ponds (e.g. size, invasive species) may not make them the most appropriate locations for recreation.



The open, tidal waters surrounding Shelter Island are classified SA, while the tidal creeks, ponds and narrow embayments are classified SC. As classified, the open waters surrounding the Island are appropriate as habitat, for recreation, and for shellfishing for human consumption. The small embayments are most appropriately utilized as fish and wildlife habitat, and may be utilized for recreational purposes, however, other factors (e.g. size, invasive species) may limit their use for recreation. Generally, both fresh and tidal waters within Shelter Island are suitable for both fish and wildlife habitat and for recreational purposes.

2.6.2 Water Quality Data

A variety of surface and groundwater quality data is available for Shelter Island and its harbors. Groundwater quality data was obtained and reviewed from USGS and the SCDHS. Surface water quality data was obtained and reviewed from NYSDEC, SCDHS, and the EPA.

Groundwater Quality

Shelter Island derives its water supply from groundwater stored in the aquifer beneath the Island. Protection of groundwater quality and maintaining an adequate supply of fresh groundwater is therefore of paramount importance to ensure availability of water supply for human consumption.

Because freshwater floats atop saline groundwater in a lens that is used for water supply on Shelter Island, the concentration of chloride is of interest with respect to water quality. Elevated chloride concentrations result from the wide zone of diffusion where freshwater mixes with salty groundwater and from salt water intrusion and upconing as a result of low precipitation years/seasons and groundwater withdrawal. **Section 2.2.3** describes the sensitivity of Shelter Island's water supply and provides some information with respect to freshwater and chloride concentrations in groundwater as a result of natural conditions and man-induced changes to the equilibrium conditions that determine the position of the freshwater/saltwater interface. These conditions are an overarching factor in the availability of freshwater for water supply on Shelter Island. The potential impact of upconing due to well withdrawal and salt water encroachment are illustrated in **Figure 22**. Other water quality factors include activities that take place on the land surface that result in recharge or discharge of pollutants that impair groundwater quality.

This subsection identifies available water quality information for Shelter Island, with a focus on nitrogen as a primary contaminant of concern resulting from land use density and fertilization. An overview of sanitary discharge limitations and water quality with respect to nitrogen is provided. Further information on Shelter Island water quality is available from local water purveyor well sampling, USGS reports, SCDHS private well database results and Shelter Island landfill data.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



As noted, nitrogen is a primary water quality constituent of concern. Nitrogen is a component of sanitary waste disposal and fertilizer application. There is one sewage treatment plant on Shelter Island (Shelter Island Heights) that treats sanitary waste and discharges to marine surface waters (Dering Harbor). The remainder of Shelter Island uses on-site sanitary disposal systems. Such systems, when properly designed and installed, use a septic tank for solids removal and leaching pools placed above groundwater that allow ammonium (NH_4^+) in sewage to be converted to nitrite (NO_2) and nitrate (NO_3). This process drives off some nitrogen as a gas and recharges wastewater effluent with elevated nitrogen concentrations. Sanitary systems that do not have adequate unsaturated leaching depth below the leaching pool discharge do not allow for sufficient conversion of ammonia to nitrate and therefore have a greater groundwater impact (and surface water impact when placed in areas proximate to surface water) than properly functioning sanitary systems.

In 1978, the Long Island Regional Planning Board completed the Comprehensive Waste Treatment Management Study (known as the 208 study funded under Section 208 of the Water Pollution Control Act) that established a basis for control of density of development to maintain water quality. In 1980, SCDHS promulgated Article 6 of the Suffolk County Sanitary Code (SCSC) that identified groundwater management zones (GMZ's) and lot sizes for residential development. Lot sizes ranged from 20,000 SF (approximate equivalent of 2 units per acre) in zones other than deep aquifer recharge areas and areas that contribute to water quality of the Long Island south shore bays, to 40,000 SF (approximate equivalent of 1 unit per acre) for long term water supply aquifer recharge areas and areas that do contribute to water quality of south shore bays.

Shelter Island lies in GMZ IV, which is the less stringent zone in terms of development densities (20,000 SF per dwelling or about 2 units per acre). Developments at densities of 2 units per acre are expected to result in nitrogen concentrations elevated above natural conditions, but are also expected to ensure that nitrogen in groundwater will remain below the drinking water standard of 10 mg/l. Development at densities above 2 units per acre may result in elevated nitrogen above the drinking water standard, depending on the density.

Nitrogen exists in groundwater due to historic high density residential development areas in the central and south-central parts of the Island. Current modeling for existing development shows a discharge of nearly 30,000 kg/year through on-site disposal systems and lawn fertilizer (SCCWRMP, 2011). In addition, a nitrate trend analysis (1980–2002) prepared for Shelter Island showed an expected increase from 2.22 mg/l to 3.85 mg/l on average and a 0.4 mg/l increase in the Mashomack Preserve.

The basis for the nitrate trend analysis is a database maintained by SCDHS for private well data for Suffolk County. These data result from private homeowner requests for the Department of Health Services to test their wells to ensure safe drinking water



quality. The database is proprietary as it involves names and addresses of the homes that are sampled; however, it provides useful information on the spatial distribution of contaminants detected in the wells. The database is limited in the fact that the depth of wells is not typically known, so that the horizontal distribution of contaminants is not available. SCDHS (Ronald Paulsen) prepared a review of private well data for Shelter Island approximately 10 years ago, and generated a map of nitrate concentrations across the Island based on these data. This map is included as **Figure 23**. This analysis shows that existing groundwater in many parts of the central and south-central parts of the Island is compromised as a result of elevated concentrations of nitrogen. Ensuring proper density of development, proper sanitary system maintenance and minimization of fertilizer use are important factors with respect to nitrogen in groundwater.

An overview of contaminants of concern in Shelter Island groundwater is provided in review of water quality reports from local water purveyors. As noted in **Section 2.2.7.4**, three water districts exist and are located in the northwest portion of the Island. These water districts include: the West Neck Water District (which is owned and operated by the Town) which serves approximately 56 residential and commercial users; the Village of Dering Harbor Water District, which is operated for approximately 23 residential users; and a private water district, operated by the Shelter Island Heights Property Owners Corporation for approximately 160 residential and commercial customers. In order to comply with State regulations, each water district issues an annual report to inform residents of the quality of their drinking water and involves analysis of a variety of organic and inorganic compounds (metals) as well as total coliform, nitrate, nitrite, total trihalomethanes (disinfection by-products) and synthetic organic compounds. The most recent available reports available for review were from 2010.

Review of the results presented in the West Neck Water District report detected varying concentrations of several analyzed constituents which included coliform bacteria, nitrate chloroform, total trihalomethane, bromodichloromethane, chlorodibromide, bromoform, lead, copper and iron. Concentrations for all of these compounds were found to be within their respective groundwater standard limits except for coliform bacteria and iron but both were attributed to be natural environmental sources.

Review of the results presented in the Village of Dering Harbor Water District Report detected varying levels of several analyzed constituents which included iron, sodium chloride, sulphate lead, copper, trihalomethane, bromoform and Radium 228. Concentrations for all of these compounds were found to be within their respective groundwater standard limits.

Review of the results presented in the Shelter Island Heights Property Owners Corporation Report detected varying levels of several analyzed constituents which included barium, chlorides, iron, sodium, sulphate, nitrate, zinc, trihalomethane,



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



chlorine, MTBE, Dinoseb, Gross Alpha and Radium 228. Concentrations for all of these compounds were found to be within their respective groundwater standard limits except for MTBE which is a gasoline additive attributed to releases from gasoline storage tanks.

A summary of the detection results for key inorganic parameters was compiled from 2010 Annual Water Quality Reports (regulatory groundwater standards in parenthesis):

| | |
|----------|--------------------------------|
| Chloride | 15-22.9 mg/l (250 mg/l) |
| Sulphate | 8.5-15 mg/l (250 mg/l) |
| Iron | 0.01-0.41 mg/l (0.3 mg/l) |
| Nitrate | 0.5-6.4 mg/l (10 mg/l) |
| Sodium | 10-35.2 mg/l (NA) |
| Lead | 0.0022-.0067 mg/l (0.015 mg/l) |
| Copper | 0.13-0.69 mg/l (1.3 mg/l) |

Based on water quality reports from local water purveyors, iron is the only constituent that exceeded drinking water standards. Iron is typically a natural contaminant present as a result of leaching of the metal from geologic deposits, particularly as a result of the low pH of water recharging and in storage in the aquifer. Iron is primarily an aesthetic parameter that can result in discoloration of water with minimal health concerns in the relatively low concentrations detected. Lead and copper tend to result from corrosion of household plumbing and sulfate and sodium are naturally occurring compounds. Nitrate and chloride are discussed earlier in this subsection.

Other references that address Shelter Island groundwater conditions include USGS reports and particularly Simmons (1986); as noted previously, this was a seminal document in understanding groundwater conditions of Shelter Island. Groundwater results from the Simmons report were from 1983-1984 and indicated the following with respect to groundwater quality for Shelter Island:

| | |
|--------------|---|
| Chloride | Generally chloride concentrations were below 40 mg/l and ranged from 7.8 mg/l to 310 mg/l. Only one (1) sample exceeded the 250 mg/l regulatory standard. Sample results from nearshore wells during previous or subsequent sample events revealed large fluctuations in concentration indicating large and rapid fluctuations in response to increased pumpage, reduced recharge or reduced precipitation. |
| Iron | Concentrations ranged from non-detect to 5 mg/l and were generally less than the 0.3 mg/l. 20% of the samples exceeded 0.3 mg/l, the result of natural influences most typical to Long Island. |
| Manganese | Detections ranged from non-detect to 3 mg/l and 33% of the samples exceeded 0.05 mg/l. |
| pH Dissolved | Ranged from 5.1 to 7.2 and 85% of the values were less than 6. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| | |
|---------|---|
| Solids | Detections ranged from 40 to 585 mg/l with over 95% of the samples recording detections less than 250 mg/l. Samples detected above 250 mg/l were the direct result of proximity to the freshwater/saltwater interface as well as high concentrations of chloride and ions associated with seawater. |
| Nitrate | Detections ranged from non-detect to 9.1 mg/l and 85% were below 5 mg/l. Presence of nitrate was attributed to cesspool and septic tank effluent. |

The SCDHS private well database includes sampling for other parameters in addition to nitrogen. Data from 2009 to 2011 for private wells on Shelter Island was obtained from SCDHS and reviewed. As noted above, the data is considered sensitive, and therefore, specific names and addresses were not provided. It should also be noted that the dataset is biased toward elevated concentrations of constituents since those residents that call SCDHS for well sampling, typically expect a problem. Problems may be identified by odors detected in water supply, nearby uses of concern, spills, shallow wells or other issues causing a resident to seek water quality information on their well source. Consequently, the data should be considered in view of these factors. Available data does provide an indicator of local water quality problems related to land use activity. **Table 11** provides a comparison of each contaminant, the concentration of the contaminant, the maximum permissible concentration of the contaminant, and the common use of each contaminant.



Table 11
SCDHS 2009 TO 2011 GROUNDWATER QUALITY DATA

| Contaminant | Concentration Range Above Maximum Allowable Concentration | Maximum Allowable Concentration (NYSDEC TOGS 1.1.1) | Common Contaminant Use |
|------------------------------|---|---|---------------------------------------|
| MTBE | 5.2 to 67 µg/L | 10 µg/L | Fuel additive in motor gasoline |
| Chlordane | 0.56 to 1.8 µg/L | 0.05 µg/L | Pesticide |
| Bis (2-ethylhexyl) phthalate | 11 µg/L | 5 µg/L | Plasticizer used in the making of PVC |
| 1,2,4-Trimethylbenzene | 7.1 µg/L | 5 µg/L | Gasoline additive |
| Benzene | 5.7 µg/L | 1 µg/L | Gasoline component |
| Ethylbenzene | 6.9 to 14 µg/L | 5 µg/L | Solvent |
| Naphthalene | 17 to 34 µg/L | 10 µg/L | SVOC; Chemical intermediate |
| Total Xylenes | 40 to 55 µg/L | 5 µg/L | Gasoline component |
| 2-Butanone (MEK) | 71 to 366 µg/L | 50 µg/L | Solvent |
| Tetrahydrofuran | 35 to 90 µg/L | 50 µg/L | Solvent |
| Chloroform | 5 to 87 µg/L | 7 µg/L | Solvent |

Note: SVOC is, semi-volatile organic compound, typically associated with oils.

Occurrences of gasoline additives and components and oil-related compounds were detected in localized areas based on private well data. The detections are the result of tank storage, spills and discharges. Solvents are used in households and other commercial activities and may be discharged to the ground or potentially through sanitary systems. Chlordane is a pesticide typically applied around foundations to control termites. These detections are localized and based on requests by homeowners for private well sampling by SCDHS. These matters should be addressed on a case-by-case basis to ensure health protection of water supply sources.

The Town of Shelter Island has operated a municipal solid waste landfill since the early 1940's. This landfill has received municipal solid waste as well as construction and demolition debris exclusively from Shelter Island throughout its active life.

On July 1, 1991, the Town entered into a Consent Order with the NYSDEC that required the landfill to cease accepting municipal solid waste by October of 1991; the facility was permitted to continue to accept construction and demolition debris to for grade adjustments and final elevation for landfill closure. In June of 1997, the NYSDEC approved the Closure Plan for the facility which required semi-annual groundwater monitoring of one upgradient (MW-1R) and two downgradient monitoring wells (MW-2SR and MW-2DR). Groundwater samples collected during each monitoring event are analyzed for a variety of field parameters as well as leachate indicators and inorganic (metal) constituents.



Review of available quarterly groundwater monitoring data from December of 2005 to June of 2011 indicate exceedances of groundwater quality standards for several of the monitoring parameters. Specifically, results from the upgradient monitoring well has historically exhibited exceedances for pH (5.19 to 6.9), turbidity (34 to 1,061 NTUs) and total phenolics (0.00232 to 0.004 mg/l). In addition, several inorganic constituents have also been detected in groundwater upgradient of the landfill and consist of iron (0.754 to 191 mg/l), chromium (0.061 to 0.089 mg/l), manganese (0.646 to 26.2 mg/l) and zinc (0.37 mg/l).

Results for groundwater samples collected downgradient of the landfill have also historically exhibited exceedances of groundwater quality standards for several parameters. Review of groundwater sample results obtained from the shallower of the downgradient monitoring well (MW-2SR) revealed exceedances for pH (5.77 to 6.6), turbidity (9.24 to 845 NTUs), ammonia (2.12 to 5.91 mg/l), color (25 to 300 Pt Co Units), total phenolics (0.0028 to 0.264 mg/l) and dissolved solids (510 to 535 mg/l). In addition, several inorganic constituents have also been detected in groundwater downgradient of the landfill and consist of arsenic (0.28 to 0.034 mg/l), iron (0.977 to 240 mg/l), lead (0.055 to 0.11 mg/l), chromium (0.062 to 0.095 mg/l), manganese (0.646 to 53.9 mg/l), sodium (20.7 to 48.0 mg/l) and zinc (0.55 to 1.0 mg/l).

Review of results for groundwater samples collected from the deeper downgradient monitoring well (MW-2DR) have historically revealed exceedances for pH (5.9 to 6.7), turbidity (10.3 to 344 NTUs), ammonia (2.6 to 6.22 mg/l), total phenolics (0.0136 mg/l) and color (60 to 330 Pt Co Units). In addition, several inorganic constituents have also been detected in groundwater downgradient of the landfill and consist of iron (0.4 to 114 mg/l), manganese (8.08 to 47.1 mg/l) and sodium (20.1 to 49.1 mg/l).

Elevated levels of naturally occurring inorganic constituents (iron, manganese, sodium and zinc) are typical in groundwaters of Shelter Island and may be the result of elevated turbidity levels. This may be the case with the downgradient monitoring wells which were replaced in January of 2006 following a landslide that destroyed the original downgradient monitoring wells. However, elevated levels of arsenic, lead and ammonia may indicate potential contamination emanating from the landfill but a clear conclusion to this assumption may be premature.

Many of the exceedances summarized above have been consistent over the monitoring history of the landfill and have exhibited a generally decreasing trend with the respective mean concentration of each constituent.

In summary, chloride is of concern in nearshore areas due to a thin freshwater lens. Equilibrium conditions must be maintained to ensure that the position of the freshwater/saltwater interface is maintained. Nitrogen is present in varying concentrations across Shelter Island, dependent upon development densities.



Historically more dense development in the central and south parts of the Island have experienced nitrate of 7-10+ mg/l. Water quality data from water suppliers reported in 2010 is very good, with nearly all constituents consistently meeting drinking water standards. Minor exceptions were iron and bacteria detections were noted in the West Neck Water District and the Shelter Island Heights Property Owners Corporation Report identified MTBE. Localized elevated contaminant concentrations are noted in review of private well data; however, these samples are typically collected when an issue is suspected. The landfill is also a localized source of contamination that is subject to ongoing monitoring. Groundwater is Shelter Island’s source of water supply, and as a result, water quality needs to be managed with continued monitoring, source control and preventive actions to ensure that the resource is not adversely affected.

Stormwater

In 1982, the Long Island Regional Planning Board prepared the L.I. Segment of the Nationwide Urban Runoff Program (NURP Study).

The NURP Study attempted to address, among other things, the actual proportion of the total pollutant loading that can be attributed to stormwater runoff, given the presence of other point and non-point sources and conditions within the receiving waters;

Based on the sampling program, the NURP Study reached the following relevant findings and conclusions:

Conclusion: In general, with the exception of lead and chloride, the concentrations of inorganic chemicals measured in stormwater runoff do not have the potential to adversely affect groundwater quality.

Conclusion: Coliform and fecal streptococcal indicator bacteria are removed from stormwater as it infiltrates through the soil.

Surface Water Quality

Surface water quality data for Shelter Island is available from three sources: SCDHS, NYSDEC for fecal coliform levels in Dering Harbor and EPA for the STP discharge. SCDHS maintains surface water quality sampling stations in the embayments surrounding Shelter Island. Nine stations are located in the waters surrounding Shelter Island, and one additional station monitors the outfall from Shelter Island Heights STP (**Figure 21**). Stations have been monitored for varying time periods and varying parameters, depending on the sampling year. Generally, each sample was monitored for one or several of the following parameters:

- Secchi disc clarity
- Temperature
- Dissolved Oxygen
- Salinity
- pH
- Total Coliform
- Fecal Coliform
- NH3 (Ammonia)
- NO2 (Nitrite)
- NO3 (Nitrate)



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- NOx (Nitrite + Nitrate)
- Urea
- Total Kjeldahl Nitrogen
- Total dissolved Kjeldahl Nitrogen
- Total Nitrogen
- Total dissolved Nitrogen
- Total Phosphate
- Total dissolved Phosphate
- Ortho-phosphate
- Total Phosphorous
- Total dissolved Phosphorous
- Total Organic Carbon
- Dissolved Organic Carbon
- Dissolved Silicate
- Total Suspended Solids
- Total chlorophyll- α
- Fractionated chlorophyll- α
- Aureococcus anophagefferens (brown tide)

Table 12 below presents a summary of results for each sampling station for which data was collected by the SCDHS. Shaded cells represent values which exceed the threshold for impairment established by the NYSDEC Consolidated Assessment Listing Methodology (CALM) for analysis of waters. Parameters assessed in **Table 12** include those that were sampled for that have established thresholds for water quality standards for Class SA marine waters in which all sampling stations were located. Standards utilized included those outlined in NYSDEC Part 703, the NYS CALM and total nitrogen standards established by the Peconic Estuary Program. **Table 13** below provides the each analyte, the applicable threshold, and the regulations that established the threshold. It is noted that several parameters sampled for do not include regulatory thresholds and as a result, a comparison of these parameters is not possible.



Table 12
SURFACE WATER QUALITY RESULTS

| Station Location | Station Number | Data Collection Data Range | Total Time Period of Data Collection (Years) | Total Number of Samples Collected | Secchi Disc Clarity | | Total Coliform | | Fecal Coliform | | Chlorophyll-a | | Dissolved Oxygen | | Total Nitrogen (and Total Kjeldahl Nitrogen)* | | Ammonia | |
|---------------------------|----------------|----------------------------|--|-----------------------------------|--|--|---|---|---|---|-------------------------------|---------------------------------|--|---|---|------------------------------------|-----------------------------------|-------------------------------------|
| | | | | | Count of Samples Below Clarity Threshold (<6.6 feet) | Percent of Samples Below Clarity Threshold | Count of Samples Above 70 colonies per 100 ml | Percent of Samples Above 70 colonies per 100 ml | Count of Samples Above 49 colonies per 100 ml | Percent of Samples Above 49 colonies per 100 ml | Count of Samples above 8 µg/L | Percent of Samples above 8 µg/L | Count of Samples Below Minimum D.O. Threshold (4.8 mg/L) | Percent of Samples Below D.O. Threshold | Count of Samples Above 0.45 mg/L | Percent of Samples Above 0.45 mg/L | Count of Samples Above 0.035 mg/L | Percent of Samples Above 0.035 mg/L |
| Paradise Point | 060114 | 03/17/1986 - 11/16/2010 | 25.35 | 757 | 207 | 27.34% | 5 | 0.66% | 1 | 0.13% | 59 | 7.79% | 0 | 0.00% | 98 | 12.95% | 30 | 3.96% |
| Gardiner's Bay West | 060116 | 06/02/1987 - 11/16/2010 | 24.68 | 704 | 131 | 18.61% | 6 | 0.85% | 1 | 0.14% | 58 | 8.24% | 0 | 0.00% | 79 | 11.22% | 37 | 5.26% |
| West Neck Bay | 060119 | 07/19/1985 - 11/16/2010 | 23.47 | 728 | 314 | 43.13% | 32 | 4.40% | 24 | 3.30% | 171 | 23.49% | 5 | 0.69% | 175 | 24.04% | 41 | 5.63% |
| Coecles Harbor | 060122 | 08/11/1992 - 11/16/2010 | 18.28 | 468 | 174 | 37.18% | 9 | 1.92% | 4 | 0.85% | 21 | 4.49% | 1 | 0.21% | 88 | 18.80% | 18 | 3.85% |
| West Neck Harbor Entrance | 060123 | 09/17/1995 - 09/20/1995 | 3 days | 9 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| West Neck Harbor | 060124 | 09/28/1994 - 11/16/2010 | 16.15 | 332 | 84 | 25.30% | 3 | 0.90% | 2 | 0.60% | 14 | 4.22% | 0 | 0.00% | 55 | 16.57% | 12 | 3.61% |
| West Neck Creek | 060125 | 09/17/1995 - 09/20/1995 | 3 days | 9 | 8 | 88.89% | 0 | 0.00% | 0 | 0.00% | 4 | 44.44% | 0 | 0.00% | 5 | 55.56% | 0 | 0.00% |
| Major's Harbor | 060143 | 06/05/1997 - 02/10/1999 | 1.68 | 32 | 10 | 31.25% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 1 | 3.13% | 11 | 34.38% | 0 | 0.00% |
| Cornelius Point | 060144 | 06/10/1997 - 02/10/1999 | 4.28 | 62 | 3 | 4.84% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% | 9 | 14.52% | 0 | 0.00% |

*TKN was collected up until 2000, when TN was collected and TKN was no longer utilized.



Table 13
SURFACE WATER QUALITY EVALUATION CRITERIA

| Analyte | Established Threshold | Regulating Authority |
|-----------------------|----------------------------------|--|
| Clarity – Secchi Disc | Visibility is less than 6.6 feet | NYS Section 305(b) CALM Methodology – Public Bathing Use Assessment Criteria |
| Total Coliform | 70 colonies/100ml | 6 NYCRR §703.4 |
| Fecal Coliform | 49 colonies/100ml | 6 NYCRR §703.4 |
| Chlorophyll- α | >8 $\mu\text{g/L}$ | NYS Section 305(b) CALM Methodology – Recreation Use Assessment Criteria |
| Dissolved Oxygen | <4.8 mg/L | 6 NYCRR §703.3 |
| Total Nitrogen | >0.45 mg/L | Peconic Estuary Program |
| Ammonia | >0.035 mg/L | 6 NYCRR §703.5 |

As illustrated, clarity, chlorophyll- α and nitrogen exceeded applicable thresholds more than 25% of the time in various waters. None of the other parameters sampled exceeded applicable thresholds more than 25% of the time; however, chlorophyll- α and nitrogen both are approaching 25% for West Neck Harbor.

Although the data collected illustrates that clarity within the majority of the waters surrounding Shelter Island is frequently reduced. Reduced water clarity may be representative of wind driven storms, fast moving currents and resulting turbidity associated with the open waters surrounding the Island. Other causes of reduced clarity can occur as a result of the presence of algal blooms. As the data do not indicate the apparent cause of reduced clarity, definitive statements regarding the implications of these results cannot be made.

The elevated levels of chlorophyll- α in West Neck Creek and West Neck Bay suggest a problem in the West Neck Creek complex due to algal blooms. Further information regarding known harmful algal blooms is provided in **Section 2.6.3** below; however, anecdotal evidence from Town staff and residents indicate a continuing problem with algal blooms in West Neck Creek, which is supported by the data collected by SCDHS. It is noted that the data for West Neck Creek is biased based on its short collection period; however, the data in West Neck Bay has been collected for over 23 years with elevations of chlorophyll- α occurring almost 25% of the time, providing a more comprehensive dataset for the area.

Similarly, elevated concentrations of total nitrogen within West Neck Creek and West Neck Bay are indicative of a problem with nitrogen inputs to the creek and bay. As with the chlorophyll- α dataset, data for West Neck Creek is biased due to the very short collection period; however, data from West Neck Bay is more representative of the area and indicates that nitrogen is accumulating within the creek, bay and harbor.



The excess in nitrogen may be directly related to algal blooms as further described in **Section 2.6.3** below.

Elevated concentrations of nitrogen also occur in Major’s Harbor, which is located on the southeast side of Mashomack Preserve. This is a State regulated boat anchorage area that is characterized by a U-shaped harbor lined by natural habitat associated with the preserve. As such, no obvious anthropogenic inputs of nitrogen exist within the vicinity of the harbor. Increased nitrogen levels may be related to boat anchorage; however, no data exists to confirm or refute this as a source. As a result, contributing factors to high nitrogen levels in Major’s Harbor are unknown.

SCDHS also collects pathogen data for bathing beaches. Ten sampling stations are located on Shelter Island, which include the following beaches (**Figure 21**):

- Camp Quinipet (ST-1)
- Pridwin Hotel (ST-2)
- Crescent Beach (ST-3)
- Wades Beach (Tuthill Beach) (ST-4)
- Shelter Island Heights Beach Club (ST-6)
- Perlman Music Camp (ST-10)
- Fresh Pond (ST-11)
- Shell Beach (right) (ST-12)
- Shell Beach (left) (ST-12A)
- Menhaden Landing (ST-13)

Data was reviewed from 2001 through August 2012. All stations were sampled for *Enterococci*, with the exception of Fresh Pond, which was also sampled for *E.coli*. Review of the data illustrates few occurrences of pathogen exceedances for the beaches analyzed. No beach had more than three occurrences of exceedances within the eleven year sampling period. The majority of the exceedances do not correlate with significant rain events (rainfall of greater than one inch) suggesting other factors as a cause for increased pathogens. The majority of the exceedances occur along Crescent Beach, with the exception of ST-4, which is located on West Neck Harbor. Sampling protocols and data results are provided in **Appendix D**.

As the STP located in Shelter Island Heights has a direct outfall to Dering Harbor, the NYSDEC maintains three monitoring stations in Dering Harbor to measure fecal coliform. As indicated in **Section 2.6.1**, Dering Harbor is designated SA and as such is considered appropriate for public bathing use. The NYSDEC Consolidated Assessment Listing Methodology (CALM) assessment criteria for surface waters indicates that fecal coliform should not exceed 200 per 100 ml sample per month, on average. Data was provided by the NYSDEC for fecal coliform levels for Dering Harbor for the period of 1/10/2007 to 11/08/2011. Review of the data indicates that Station 5.2 had a fecal coliform exceedance in September 2007 (460 per 100 ml) and Stations 5.1 and 5.2 exhibited fecal coliform exceedances in October 2010 (240 and 1,100 per 100 ml, respectively). As these incidents are isolated occurrences that display no definitive pattern, it can be surmised that the Shelter Island Heights STP is



not generating fecal coliform exceedances in Dering Harbor and is functioning as designed.

Both the EPA and SCDHS collected data from the STP outfall. SCDHS collected data from 2000 to 2005, while the last three years of data (2009-2011) were obtained from the EPA. As the STP discharges to a surface waterbody, no standard for nitrogen removal exists. EPA regulatory standards exist for pH, flow, total suspended solids, settleable solids, chlorine, fecal coliform, total coliform, and BOD (biochemical oxygen demand). The parameter of greatest concern for a surface water STP discharge is total and fecal coliform. EPA standards for coliform require less than 200 colonies/mL for fecal coliform colonies in the discharge and less than 2,400 colonies/mL for total coliform; however, the NYS standard for total coliform in Class SA waters is 70 colonies/mL. As a result, the STP discharge exceeded EPA standards a total of seven times and NYS standards and additional fourteen times during the time period data is available for. Of the days that coliforms exceeded standards, eight of those samples only exceeded standards for total coliform. Coliform exceedances were noted only from March through September; coliform levels did not exceed EPA or State parameters October through February. A copy of the data from both the EPA and SCDHS is provided as **Appendix E**.

2.6.3 Known Impairments

Several known impairments are located within Shelter Island and the coastal waters. These impairments include waterbodies listed on the NYS 303(d) list and shellfish closure areas. It is noted that no Federal or State listed superfund sites occur on Shelter Island. The following details each impairment identified within the watershed.

NYS 303(d) List

The Federal Clean Water Act requires states to periodically assess and report on the quality of waters in their state. Section 303(d) of the Act also requires states to identify impaired waters, where designated uses are not fully supported. For these impaired waters/pollutants, states must consider the development of a Total Maximum Daily Load (TMDL) or other strategy to reduce the input of the specific pollutant(s) restricting water body uses, in order to restore and protect such uses. The water body/pollutant listings in the Section 303(d) List are segmented into a number of categories. The various categories, or Parts, of the list include:

- Part 1 - Individual Waterbodies with Impairment Requiring a TMDL
- Part 2 - Multiple Segment/Categorical Impaired Waterbodies - Includes (a) Acid Rain Waters, (b) Fish Consumption Waters, and (c) Shellfishing Waters
- Part 3 - Waterbodies for which TMDL Development May Be Deferred - Includes (a) Waters Requiring Verification of Impairment, (b) Waters Requiring Verification of Cause/Pollutant, and (c) Waters Where Implementation/Evaluation of Other Restoration Measures is Pending



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



The Draft NYS 2012 Section 303(d) List was issued by the NYSDEC in January 2012. Table 14 identifies the single waterbody within Shelter Island which is included on that list (Fresh Pond).

Not all impaired waters of the state are included on the Section 303(d) List. By definition, the List is limited to impaired waters that require development of a Total Maximum Daily Load (TMDL). A list entitled "Other Impaired Water body Segments Not Listed (on 303(d) List) Because Development of a TMDL is Not Necessary" is also available and was reviewed. The purpose of this supplemental list is to provide a more comprehensive inventory of waters that do not fully support designated uses and that are considered to be impaired. There are three (3) categories of justification for not including an impaired water body on the Section 303(d) List:

- Category 4a Waters – TMDL development is not necessary because a TMDL has already been established for the segment/pollutant.
- Category 4b Waters – A TMDL is not necessary because other required control measures are expected to result in restoration in a reasonable period of time.
- Category 4c Waters – A TMDL is not appropriate because the impairment is the result of pollution, rather than a pollutant that can be allocated through a TMDL.

In addition, 43 state waterbodies fall under the "B" category, which the NYSDEC defines as follows:

"It is widely accepted that morphology and other natural conditions may contribute to periodic dissolved oxygen depletion at lower depths in significant numbers of thermally stratified waters. However bottom water conditions are not necessarily representative of the water body as a whole and aquatic life and other uses are often fully supported in these waters. Although NYS water quality standards may not be met at times in these waters, the USEPA policy of independent applicability allows for resolving differences in assessment results by weighing the higher quality or more representative data set more favorably in the attainment decision."

No waterbodies on Shelter Island were identified as Category 4 or Category B waters.

Table 14
NYSDEC 303(d) LIST

| Part/Category | Inventory Number | Water body Name | WI/WPL Number | Water body Type | Water Quality Classification | Pollutant | Pollutant Source | Year |
|---------------|------------------------------------|-----------------|---------------|-----------------|------------------------------|-------------|--------------------|------|
| 1 | (MW6.3d) GS-SIS-SI- WNH-P458 | Fresh Pond | 1701-0241 | Lake | C | Phosphorous | Urban/Storm Runoff | 2012 |

Data utilized for the inclusion of Fresh Pond on the 2012 303(d) list was obtained from the NYSDEC. Sampling of Fresh Pond was conducted on four occasions in



June, July, August and September of 2009. Both surface and bottom samples were collected on each occasion for each analyte. Results indicated that Fresh Pond was exceeding the State phosphorous guidance value of 20 µg/L, as sampled values ranged from 25 to 41 µg/L for surface samples. Bottom samples had significantly higher values of phosphorous, which ranged from 294 to 457 µg/L. The NYSDEC indicated that the high levels of phosphorous was the likely cause of the high levels of chlorophyll, low levels of clarity and anoxic conditions found within the lake during the sampling period, thus, supporting the inclusion of Fresh Pond on the 303(d) list.

Shellfish Closure Areas

Shellfish Closure Areas are depicted in **Figure 24**. Shellfish Closure Areas are defined by 6 NYCRR Part 41 and regulated by the New York State Department of Environmental Conservation (NYSDEC), which will permanently, seasonally, or temporarily close shellfish harvesting areas due to poor sanitary conditions in the waters surrounding the shellfish beds. State regulations are promulgated through the US FDA's National Shellfish Sanitation Program (NSSP) which provides regulations for the sanitary control of shellfish produced and sold for human consumption. A portion of the NYSDEC regulation is included as **Appendix F** of this document, which defines the closure areas within the Town of Shelter Island. Shellfish harvesting areas are monitored and regulated by the NYSDEC Bureau of Marine Resources. In addition to permanently closed areas, the NYSDEC monitors Conditional Shellfish areas, which are open to shellfish harvesting at certain times of the year dependent upon water quality (which is directly dependent upon the volume of rainfall or snow melts, i.e. stormwater runoff).

Shellfish closure areas within Shelter Island include the entirety of Shelter Island Sound North, which is permanently closed, and the Coecles Harbor Marina and Island Boat Yard and Marina which are seasonally closed (from May 15th to October 31st each year). The closure within Shelter Island Sound North is associated with the discharge from the Shelter Island Heights STP, while the closure for both Coecles Harbor Marina and Island Boat Yard are associated with the seasonal use of boats in these areas. It is noted that the closure associated with Dering Harbor was expanded in area and changed to a permanent closure in 2004, after a dye test performed by the USFDA and the NYSDEC determined that a discharge from the Shelter Island Heights STP could potentially impact a much larger area than previously delineated. As the Dering Harbor closure is considered an administrative closure due to the location of the Shelter Island Heights STP outfall, only the removal of the outfall would result in Dering Harbor's closure status being re-evaluated.

Pathogen Impaired Watersheds

Small Municipal Separate Storm Sewer Systems (MS4s) are defined as all separate storm sewer systems that are "Owned or operated by the United States, a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an



Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States (**40 CFR 122.26(b)(16)**.” MS4s are currently regulated under NYSDEC SPDES General Permit for Stormwater Discharges from Municipal Separate Storm Sewer Systems (GP-0-10-002). The Town of Shelter Island and Village of Dering Harbor are both recognized MS4s. As a result of pathogen impairments in the Peconic Estuary, a TMDL was developed for the pathogen impaired waterbodies, which included Dering Harbor. Data analysis within the TMDL indicated that while pathogen levels did not exceed standards within Dering Harbor, levels were close to the exceedance threshold. As such, a 10% reduction goal in pathogens was set for Dering Harbor. In 2012, the NYSDEC determined that the Village and the Town are not subject to additional pathogen reduction requirements for Dering Harbor as part of their Stormwater Management Programs. While not a regulatory requirement, efforts towards pathogen reduction should continue to be pursued for the overall health of this waterway.

Harmful Algal Blooms

Harmful Algal Blooms (HAB's) are occurrences of large quantities of algae that when present at high concentrations present a threat to humans and shellfish. Two types of HAB's have been noted in the waters off of Shelter Island: Brown Tide (*Aureococcus anophagefferens*) and a type of Red Tide (*Cochlodinium polykrikoides*). Both occurrences of these HAB's were primarily noted in West Neck Bay.

The Harmful Algal Event Database (www.haedat.iode.org) has compiled data regarding HAB events in the United States. The available dataset was reviewed and information regarding the 1985-1987 brown tide bloom in the Peconic Estuary (including West Neck Bay) was included in the dataset. Details provided in the dataset are as follows:

“The bloom was present throughout the entire Peconic system from 1985 through 1987, with densities occasionally exceeding 1,000,000 cells/ml. Cell numbers declined through 1988 and 1989, and were generally undetectable during 1990 with the exception of those from West Neck Bay. During 1991, densities of up to 2,000,000 cells/ml occurred in Flanders Bay and West Neck Bay. During 1992, numbers approached 850,000 cells/ml in Coecles Harbor and 1,000,000 cells/ml in West Neck Bay. It occurred briefly in May of 1994 in Flanders Bay (up to 14,000) cells/ml) and in Great Peconic Bay (11,000 cells/ml). During 1995 concentrations exceeded 1,000,000 cells/ml at 12 of 31 stations sampled, with a peak value of 1,700,000) recorded in July. During 1997, concentrations ranged from 1,600 to 380,000.”

As indicated, West Neck Bay was the most heavily impacted by the brown tide bloom. In 2002, brown tide events began to be replaced with a red tide known as *Cochlodinium polykrikoides*. *C. polykrikoides* has been known to cause fish kills in Asia, impact the growth of oyster larvae, and may eventually cause mortality in both



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



oysters and scallops (**Gobler et. al., 2008**) and as a result is of concern for the waters surrounding Shelter Island. Data suggests that the first bloom in West Neck Bay occurred in 2002 (**Nuzzi,**) but was not fully identified until 2004, when a second bloom occurred in late September through early October. Bloom events also occurred in 2005 and 2006 which extended through Peconic Bay (**Gobler et. al., 2008**) and continued to occur in 2007 and 2008. Research by **Gobler (2010)** indicates that this species thrives on organic forms of nitrogen (i.e., amino acids or more specifically glutamic acid) and that blooms may be limited by high concentrations of ammonium and nitrate. It is important to note that although the species prefers organic forms of nitrogen, it can adapt and thrive on forms of inorganic nitrogen when necessary (**Gobler, 2010**).



Section 3.0

Description and Assessment of Local Laws, Programs & Practices



3.0 DESCRIPTION AND ASSESSMENT OF LOCAL LAWS, PROGRAMS AND PRACTICES AFFECTING WATER QUALITY

Water quality and habitat degradation within the Town's watersheds are regulated through a variety of Federal, State, County and Town legislation. Additionally, the Town has programs and practices designed to reduce pollutants carried by stormwater runoff to surface waters. This report serves to identify existing applicable Federal, State, County and Town legislation aimed at watershed protection, describe existing Town best management programs and practices, and identify any gaps within legislation and practices currently implemented. This assessment will be utilized as a basis to develop recommendations for additional best management practices or legislation that could be implemented to further reduce pollutant runoff.

3.1 Federal and State Regulations and Programs

Non-Point Source Pollution Prevention

Section 312 of the Clean Water Act requires States to develop programs for controlling nonpoint sources of pollution. The NYSDEC has been the lead agency for developing New York's Nonpoint Source Management Program. NYSDEC coordinates funding for the program's implementation and conducts water quality studies to evaluate the program's success. The long-term vision for New York's Nonpoint Source Management Program is for State waters to no longer be impaired by nonpoint source pollution caused by natural or human activities. NYSDEC has developed a Priority Waterbodies List, which identifies waters that are impaired or threatened by point and nonpoint sources of pollution. NYSDEC bases this list on water quality information generated through its monitoring and assessment studies and by reaching out to stakeholders in local communities. The *NYS Section 303(d) List of Impaired/TMDL Waters* identifies those waters that do not support appropriate uses and that may require development of a Total Maximum Daily Load (TMDL). The Section 303(d) List is updated every two years. These Priority Waterbodies Lists assist state, regional and local establish local water quality priorities.

US Environmental Protection Agency

The mission of the EPA is to protect human health and the environment. Developing and enforcing environmental regulations, providing financial assistance, performing environmental research, sponsoring and promoting partnerships and programs, and monitoring hazardous materials and reporting related information to the public are several of the duties of the EPA. The EPA provides funding to be used by the responsible State agencies for enforcement and implementation of policies outlined in the federal laws and regulations.

Natural Resource Conservation Service

The Natural Resource Conservation Service (NRCS) is a U.S. Department of Agriculture (USDA) agency that assists private land owners with conserving soil, water and other natural resources.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Army Corps of Engineers (US Department of Defense)

The US Army Corps of Engineers (USACE) is responsible for flood control, navigation, shore protection, environmental restoration, hazardous, toxic and radiological waste site management, and water resource management and regulation.

Fish and Wildlife Service (US Department of the Interior)

The US Fish and Wildlife Service (USFWS) mission is to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.

United States Geologic Survey

The USGS offers an array of services and data related to hydrologic research and development, wildlife and fisheries management, invasive species, geographic information systems, mapping, coastal management and watershed planning.

National Oceanic and Atmospheric Administration (NOAA)

NOAA has several roles directly related to watershed protection including its role in the stewardship of coastal waters.

Federal No Discharge Zone 67 FR 39720

The Peconic Estuary is a Federal No Discharge Zone in which “adequate facilities for the safe and sanitary removal and treatment of sewage from all vessels are reasonably available for the waters of the Peconic Estuary, County of Suffolk, State of New York.” The regulation further reads “Within the No Discharge Zone discharges from marine toilets are prohibited under Section 33.e.2 of the State Navigation Law, and marine sanitation devices on board vessels operated in a No-Discharge Zone must be secured to prevent discharges. This statute may be enforced by any police officer or peace officer acting pursuant to their special duties.”

State Pollution Discharge Elimination System (SPDES)

The federal Clean Water Act authorizes the development of the National Pollutant Discharge Elimination System (NPDES) to regulate discharges to surface waters. The NYSDEC implements the federal regulations, including discharges to under the State Pollution Discharge Elimination System (SPDES).

Stormwater

Phase I of the stormwater regulations were published in 1990 and require a permit for medium and large Municipal Separate Storm Sewer Systems (MS4) operated by municipalities whose populations are 100,000 or greater. A Municipal Separate Storm Sewer System is a conveyance, or system of conveyances owned by a state, city, town or other public entity that discharges to waters of the U.S. and is used for collecting or conveying stormwater.

Phase II of the regulations extends coverage to small MS4s and construction sites of at least one acre. Under Phase II, municipalities with a population of at least 50,000 or a population density of 1,000 people per square mile are required to develop stormwater management programs. Areas that don't meet the population threshold but discharge into a TMDL waterbody for a



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



pollutant related to storm water also must meet Phase II permitting requirements. The Town of Shelter Island and Village of Dering Harbor are regulated under these requirements.

The NYSDEC Stormwater Phase II Program is administered using two General Permits for stormwater discharges:

1. Construction activity disturbing one (1) acre or greater of land (GP-0-10-001);
2. Certain regulated small municipal separate storm sewer systems (MS4s) (GP-0-10-002).

The General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001) (hereafter "Construction Permit") requires the owner/operator of a proposed construction site with disturbance of 1 acre or greater (and in proximity to surface water or municipal drainage systems that discharge to surface waters), to prepare a Stormwater Pollution Prevention Plan (SWPPP) and obtain permit coverage prior to the initiation of construction activities. The purpose of the Construction Permit is to ensure temporary erosion and sediment controls are utilized throughout the construction period, to ensure that adequate measures are provided to control off-site flow of stormwater runoff, and to reduce sediments/pollutants carried in stormwater from reaching surface waters of the State. The permit requires design of stormwater management practices in accordance with the *2010 Stormwater Design Manual* and includes provisions for regular inspection and maintenance of installed erosion controls and stormwater management practices at construction sites.

The second General Permit (GP-0-10-002, hereafter "MS4 General Permit") regulates stormwater discharges from regulated municipal separate storm sewer systems. The MS4 General Permit is required in order to discharge stormwater conveyed through the municipal storm sewer system (includes road drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) to waterbodies of New York State. In order to obtain coverage for these discharges, regulated municipalities are required to develop a Stormwater Management Program (SWMP) "designed to reduce the discharge of pollutants from small MS4s to the maximum extent practicable". Special requirements apply when stormwater is discharged to a water identified on the New York State 303(d) list or a water covered by an EPA-approved Total Maximum Daily Load (TMDL). TMDL is a numerical limit on the amount of a particular contaminant that can be discharged to a waterbody from all sources. If a TMDL requiring reduction of a pollutant associated with stormwater is approved by the EPA for any waterbody or watershed into which the municipal separate storm sewer system discharges ("MS4"), the program for the six minimum measures must ensure that reduction of the pollutant of concern specified in the TMDL is achieved. The EPA approved the Peconic Bay Pathogens TMDL, which establishes a 10% pathogen load reduction requirement for Dering Harbor. It is noted that the TMDL did not attribute any of the pathogen pollutant load to the municipal storm sewer conveyance system. The 2010 MS4 General Permit lists Dering Harbor as an impaired waterbody; however, therefore, the Town and Village of Dering Harbor SWMPs should include program elements aimed at reducing discharge of pathogens in stormwater.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



The MS4 Stormwater Management Program is required to identify measurable goals and best management practices for six areas, called “minimum control measures.” The six minimum control measures and a general description of the requirements for each are as follows:

1. Public Education and Outreach – provide information to the public regarding stormwater pollution and discharges.
2. Public Involvement and Participation – hold public meetings, sponsor public events, gather public comment on SWMP
3. Illicit Discharge Detection and Elimination – develop and enforce a program to detect and eliminate illicit discharges, develop a mechanism to prohibit illicit discharges into the storm sewer systems, identify, and map all stormwater outfalls and the conveyance system within the MS4’s jurisdiction, develop management practices to ensure reduction of all pollutants of concern.
4. Construction Site Runoff Control - develop and enforce a program to address stormwater discharges from construction activities w/ disturbance greater than 1 acre
5. Post-Construction Runoff Control – develop and enforce a program to address post-construction stormwater discharges from new development and redevelopment areas
6. Pollution Prevention and Good Housekeeping – establish best management practices to limit pollutants entering stormwater and stormwater systems (i.e., street sweeping, leaf collection, road salt storage) and conduct employee training on best management practices

Industrial Discharges

The SPDES permit requirements for stormwater discharges from industrial activities is regulated under a general permit (NYSDEC General Permit GP-0-11-009 for Stormwater Discharges Associated with Industrial Activities). This permit is intended to provide SPDES Permit coverage to facilities with stormwater discharges to surface water from a point source that conduct industrial activities, including a wide range of manufacturing, industrial storage, transportation related, and other uses. Uses on Shelter Island that may require this permit include gasoline stations and fuel storage, maintenance/service stations, marinas and boat yards.

Under this permit, the operator of qualifying industrial uses must develop and implement a Stormwater Pollution Prevention Plan (SWPPP) which identifies specific best management practices (BMPs) to be selected, installed, implemented and maintained at the facility to minimize the presence of pollutants in the stormwater discharges. These include proper storage of materials, precautions for handling and disposing of potential pollutant sources, regular monitoring and training of employees. Stormwater discharges of concern include:

- Any substance that could result in an increase in turbidity that will cause a substantial visible contrast to natural conditions;
- Suspended, colloidal and settleable solids from sewage, industrial wastes or other wastes that will cause deposition or impair the waters for their best usages; and
- Residue from oil and floating substances attributable to sewage, industrial wastes or other wastes, nor visible oil film nor globules or grease.

The permit requires various water quality monitoring, depending on the use. If there is evidence indicating that the stormwater discharges authorized by this permit are “causing, have the reasonable potential to cause, or are contributing to an excursion above an applicable water



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



quality standard” the permittee must take appropriate corrective action with the oversight of the DEC.

New York State Department of State (NYSDOS), Office of Planning and Development

The Office of Planning and Development helps protect and enhance coastal and inland water resources and encourage appropriate land use. The Office also works in partnership with local governments in preparation of Local Waterfront Revitalization Programs, which serve as comprehensive land and water use plans, as well as intermunicipal watershed management plans which identify problems and threats and opportunities for achieving long lasting improvements in water quality and establish priorities for action. Financial assistance for the preparation and implementation of such programs and plans is available through the Environmental Protection Fund (EPF).

New York State Department of Environmental Conservation (NYSDEC)

The Department of Conservation works to reduce water pollution through technical assistance for prevention, education, and monitoring. The NYSDEC also provides financial assistance to local governments for a variety of water quality projects. The Department has extensive regulatory authority through its administration of the New York

New York State Department of Agriculture and Markets

The Department of Agriculture and Markets provides administrative support to the State Soil and Water Conservation Committee (SWCC), which in turn provides guidance to the county Soil and Water Conservation Districts (SWCD). In addition the Department of Agriculture and Markets oversees many aspects of farming that cannot be regulated by municipalities.

New York State Department of Health (NYSDOH)

The Department of Health monitors impacts of nonpoint source pollution through water quality monitoring and reporting programs. New York Public Health Law contains statutes regulating the protection of public water supplies from contamination due to source and nonpoint source pollution.

Safe Drinking Water Act

The Safe Drinking Water Act of 1974 (SDWA) authorized EPA to regulate public water systems to protect the public’s health. The EPA set standards for chemicals that might be found in water that could potentially have adverse effects. EPA has 25 drinking water standards, 10 of which are for synthetic organics. These drinking water protection measures are also written into the state and county regulations. The 1996 amendment of the SDWA places a strong emphasis on the protection of surface and groundwater sources used for public drinking water. As a result of these amendments, states must develop a Source Water Assessment Program (SWAP) and complete assessments of the sources of drinking water used by public water systems. Each source water assessment must include:

- A delineation of the source water assessment areas;
- An inventory of potential significant contaminant sources within the source water assessment area; and



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



- An evaluation of the source water's susceptibility to contamination. The SWAP for Long Island has been performed by the DOH and Nassau and Suffolk County Departments of Health.

Source Water Assessment Program

A mission of the New York State Department of Health (DOH) is to protect and promote the health of the citizens of New York State. Within the DOH, the Bureau of Public Water Supply Protection has the primary responsibility of administering the Public Water System Supervision program (PWSS) and for assuring that safe, potable water, in adequate quantities, is provided throughout the state. This is accomplished through:

- Oversight of local water supply regulatory programs;
- Training and certification of water supply operators;
- Maintenance of a statewide database on individual public water systems;
- Development and initiation of enforcement policies;
- Plan review;
- Maintenance of a water quality surveillance program; and
- Providing technical assistance to both regulatory units and water suppliers.

3.2 County Regulations

Suffolk County Water Quality Protection and Restoration Program

The Suffolk County Water Quality Protection and Restoration Program (WQPRP) was approved by the Suffolk County Legislature in 1987. The WQPRP is funded through a countywide ¼% sales tax, dedicated to water quality protection in Suffolk County. The WQPRP funds implementation projects that result in the restoration or protection of surface water quality. Eligible projects could include the control and abatement of agricultural and other nonpoint pollution sources, aquatic habitat restoration, pollution prevention initiatives, and education and outreach programs that address vessel waste no-discharge zones.

Local Law 41 - 2007

In 2007, the Suffolk County Legislature adopted Local Law 41 – 2007 entitled “A Local Law to Reduce Nitrogen Pollution by Reducing Use of Fertilizer in Suffolk County.” The legislature recognized that over-application and/or misuse of fertilizer products has led to the degradation in the local water quality, and has harmed groundwater, drinking water, and wetlands and surface waters within the County of Suffolk. In addition the recognizing the impacts to groundwater and drinking water, the legislature acknowledged that fertilizers are responsible for approximately 50% of the total nitrogen loads to groundwater in the Peconic Estuary and throughout medium-density residential land uses in Suffolk County. As a result, this law was passed and includes the following regulations:

- Fertilizer is not to be applied to County owned properties.
- Fertilizer shall not be applied to any turf on any non-County owned real property by any person between November 1 and April 1 of every year.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Exceptions to the above include lands utilized in farm operations, golf courses (provided that they use only the minimum amount of slow release fertilizer as necessary), the Suffolk County Farm (provided that the farm works towards overall nitrogen reduction), athletic fields (provided that the fields utilize best management practices) and newly seeded or sodded areas. The law also provides for expansion of educational programs and materials geared towards fertilizer use reduction. Home improvement contractors that apply fertilizers are required to obtain a license for fertilizer application and receive training in turf management.

Suffolk County Sanitary Code Article 6

Article 6 provides standards for new development and subdivisions within Suffolk County. The article establishes a minimum area necessary per dwelling unit for use of conventional sanitary systems. If the minimum area per unit is exceeded, a sewage treatment plant (STP) must be utilized for the development. More specifically, for developments located within Groundwater Management Zones III, V and VI, the minimum lot area per unit is 40,000 SF, while in Zones I, II, IV, VII and VIII, the minimum lot area per unit is 20,000 SF. This is the equivalent of 1-acre residential zoning and is based on a nitrogen loading that is equivalent to 6 mg/l with a drinking water standard of 10 mg/l. If an STP is necessary, the Article also provides minimum sizing standards for the STP. The Article also regulates connection of new developments to community water supply systems where such systems currently exist.

Suffolk County Sanitary Code Article 7

The purpose of Article 7 of the Suffolk County Sanitary Code is to safeguard all the water resources of Suffolk County, especially in deep recharge areas and water supply sensitive areas, from discharges of sewage, industrial and other wastes, toxic or hazardous materials, and stormwater runoff by preventing and controlling such sources. This article regulates the discharge of industrial wastes, sewage, toxic or hazardous materials, or other wastes to surface or groundwater from uses pre-dating the enactment of the law, as well as new sources. These discharges are prohibited in deep recharge or water supply sensitive areas. It also regulates the storage of toxic or hazardous materials.

Suffolk County Sanitary Code Article 12

Suffolk County Department of Health Services Article 12 is intended to "... safeguard the water resources of the County of Suffolk from toxic or hazardous materials pollution by controlling or abating pollution from such sources in existence when this Article is enacted and also by preventing further pollution from new sources..." Article 12 is a model law which is very stringent in the protection of Suffolk County's water resources. Conformance to Article 12 requires that hazardous substances be disposed of properly, and that storage facilities be permitted and installed as per the requirements outlined in the article. Any storage of hazardous materials would be subject to design review under Article 12, ensuring that a proper system will be utilized to prevent contaminants from entering the water supply.



3.3 Town Regulations and Practices

The following sections provide a summary of local regulations outlined by various chapters in Town code. In addition, a review of standardized Town practices is provided in order to provide a complete overview of the Town's current stormwater control measures.

3.3.1 Local Laws and Regulations

Chapter 40: Boats

The dumping of oil, refuse, garbage, sewage or waste from boats is prohibited. The operation of any gasoline-powered engine on the inland freshwaters of the Town is prohibited. No boat on which persons are residing shall be moored within 400 feet of the shore in the inland waters of the Town of Shelter Island or waters bounding the Town, excluding waters lying within the Village of Dering Harbor, where the adjacent beach or land area is occupied by residential buildings or a public bathing beach. Boats moored at docks where landside sanitary facilities are made available to the boat occupants and public marinas are exempt. No boat propelled other than by hand shall cruise or be operated within 100 feet of any lifelines or bathing float or, if there are no lifelines or bathing float, then within 100 feet of any public or semipublic beach regularly used for bathing or swimming, except that such boat may approach or depart perpendicularly to such beach at a rate not to exceed five miles per hour solely for the purpose of commencing or ending the ride. No vessel shall be operated at a speed exceeding five miles per hour within 100 feet of shore, a dock, pier, raft, float, an anchored or moored vessel or in the following creeks: West Neck Creek, Menantic Creek, Congdon's Creek, Gardiner's Creek and Chase Creek.

Chapter 53: Docks

Permits are required for Town owned docks and moorings located in Dering Harbor and Congdon's Creek. Permits are also required for commercial and privately owned docks within Town owned waters. This section of Code provides design standards for commercial and private docks, permit application requirements, and associated fees. Other water control structures, including bulkheads, piles, floats, buildings, piers, wharfs, jetties, groins, dolphins, dikes, dams or other water control devices or other structures are regulated under this section of Code.

Chapter 62: Excavations

This chapter requires permits for any regrading or excavating activities occurring within the Town. No excavation is permitted within 20 feet of any property line or within a required yard as established in the Building Zone Ordinance. The bottom of an excavation is not permitted to be below the established grade at the property boundaries unless the sidewalls have a naturally stabilized slope, but in no case greater than one vertical on two horizontal, or in special cases by retaining structures. Before any excavating of a hole, pit or side hill cut is done, the area to be excavated must be enclosed by a fence or suitable barrier in accordance with plans and specifications approved by the



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Town Board as adequate to safeguard the public in the particular circumstances of the terrain and location of the excavation. Adequate provisions must be made for the prevention of flying dust and other types of air pollution. A plan is required illustrating existing and proposed conditions for all excavations and regrading activities.

This chapter also requires that no stripping or removal of topsoil be made within 10 feet of any property line. Topsoil must be collected and stored on the property of the original topsoil so that it shall not be buried or mixed with material of inferior quality. When topsoil has been stripped, collected and stored or removed from the property, not less than six inches of topsoil must be replaced. Topsoil may not be stripped between the first day of October and the first day of April in the following year. Any areas where topsoil is stripped must be reseeded.

Regrading and excavating activities cannot result in a change to the drainage patterns of the site that would result in the overload of existing drainage systems or create flooding or the need for additional drainage structures on other private properties or public lands.

Grade finishing requires a surface layer of not less than six inches of topsoil of a quality native to the site. Unless the excavation shall be immediately refilled with clean, nonburnable fill containing no garbage, refuse, offal or any deleterious or unwholesome matter, the property shall be finish-graded with appropriate slopes to the level of the adjacent properties and the abutting streets or roads. The finished grade must form an appropriate part of the natural drainage area or some positive drainage system. During the period between August 20 and October 1 inclusive, all finish-graded area shall be prepared into a loose level seed bed, limed, fertilized and seeded in accordance with good landscape practice:

Chapter 73: Garbage, Rubbage & Refuse

All recyclable and reusable materials generated within the Town of Shelter Island for which an economic market exists shall be source separated from all other materials and shall not be mixed with other forms of solid waste. Recyclables can only be placed at designated areas within the Town disposal area or other designated sites within the Town. Household hazardous waste, as defined herein, can be accepted at the household hazardous waste containment facility. Vegetative yard waste can only be accepted at the area of the Town disposal area designated for such material. No person may deposit garbage, rubbish, refuse or waste outside the gates of the disposal area or in any streets, highways, sidewalks, inland waters or public places within the Town of Shelter Island, unless containers for that purpose have been provided and designated. No garbage, brush, lawn clippings, trash, rubbish, debris or other material that does not have its origin within the Town of Shelter Island can be deposited or disposed of in the Town disposal area. Nonrecyclable household waste can only be deposited at designated areas within the Town disposal area.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Chapter 74: Geothermal Systems

The installation of geothermal systems, including both closed-loop and open-loop geothermal systems are prohibited in the Town of Shelter Island due to potential risks of contamination and saltwater intrusion in the aquifer.

Chapter 82: Irrigation Regulations

Due to the shallow water table and thin groundwater reservoir present within the Town of Shelter Island, installation of new or alteration of existing underground irrigation systems are prohibited. All legally permitted underground irrigation systems which obtained a permit prior to March 1, 1996 may continue to be maintained and operate for a 10-year period following the enactment of this chapter (August 18, 1995) to allow owners to amortize their investment of the system, however use and maintenance of any legally permitted underground irrigation system is disallowed and prohibited as of September 1, 2013. Cistern irrigation systems holding a cistern permit may continue indefinitely.

Operation of both aboveground and underground irrigation systems, other than legally permitted cistern systems, are restricted during the period of May 1 through October 31 of every year, prior to September 1, 2013, as follows:

1. No system can operate more frequently than every third day and only during the hours of 5:00 PM and 9:00 AM.
2. Irrigation zones can be watered no more than 20 minutes per zone every third day.
3. For newly seeded lawns, for a period of 90 days after planting, a system can operate daily between the hours of 5:00 PM and 9:00 AM.
4. For new plantings, for a period of 150 days after planting, a system can operate daily between the hours of 5:00 PM and 9:00 AM.

After to September 1, 2013 (recently postponed to May 1, 2014) operation of both aboveground and underground irrigation systems, other than legally permitted cistern systems, shall not be installed, maintained or operated except under the following conditions:

1. For the establishment of newly seeded lawns, for a period of 90 days after planting, a system can operate between the hours of 5:00 PM and 9:00 AM.
2. For the establishment of new plantings, for a period of 150 days after planting, a system can operate between the hours of 5:00 PM and 9:00 AM.
3. For watering vegetable or flower gardens for a period of no more than 20 minutes between the hours of 5:00 PM and 9:00 AM, every third day.

Golf course tees and greens, irrigated fairways; land used in agricultural production and handheld watering systems are exempt from the requirements provided in Chapter 82. It is noted that the Town is currently in the process of reviewing this legislation, and has postponed the ban until May 2014.

Chapter 91: Nature Preserve System

The Town Nature Preserve System was created so that certain Town-owned and privately owned properties can be protected from inappropriate use and development, and to create a nature preserve overlay system for the Town of Shelter Island to supplement but not



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



replace existing Town regulations and procedures. To be considered for inclusion in the Nature Preserve System, a tract of land must include an appropriate management plan and meet at least one of the following criteria:

1. It serves as habitat for endangered, threatened, special concern or rare species.
2. It contains a habitat of significant concentrations of populations of breeding, feeding or nesting wildlife.
3. It contains freshwater or saltwater wetlands or ponds.
4. It contains outstanding examples of natural communities.
5. It contains geological features which are vulnerable to human disturbance.
6. It is particularly suited to and appropriate for environmental education programs or academic research programs.
7. It provides an essential buffer to lands in the Nature Preserve System or to other private, Town, county, state or federal park land or open space.
8. It protects watershed areas critical to recharging precipitation into the Town's sole-source aquifer or maintaining surface water quality.
9. It preserves viewsheds of outstanding character, woodlands along public roadways, or of significant acreage or containing trees of particular species, age, size or character or that are regarded as special places.

Properties designated for inclusion in the Town Nature Preserve System may be used solely as a nature preserve for the protection of natural features, biological resources and environmental quality in the Town. However, it is understood that structures and dwellings which currently exist on these properties are deemed consistent with these purposes.

Chapter 96: Pesticide Control

The use or sale of dieldrin, aldrin or dichlorodiphenyltrichloroethane (DDT) is prohibited.

Chapter 110: Storm Sewers

The Town of Shelter Island regulates nonstormwater discharges to the municipal separate storm sewer system (MS4), as required by federal and state law. The objectives of Chapter 110 include the following:

1. To meet the requirements of the SPDES General Permit for Stormwater Discharge from MS4s, Permit No. GP-02-02, as amended or revised;
2. To regulate the contribution of pollutants to the MS4 since such systems are not designed to accept, process or discharge nonstormwater wastes;
3. To prohibit illicit connections, activities and discharges to the MS4;
4. To establish legal authority to carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance with this article; and
5. to promote public awareness of the hazards involved in the improper discharge of trash, yard waste, lawn chemicals, pet waste, wastewater, grease, oil, petroleum products, cleaning products, paint products, hazardous waste, sediment and other pollutants into the MS4.

Article II, Stormwater Management and Erosion and Sediment Control was adopted in July 2011 to control flooding, erosion and sedimentation within the entire Town and to



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety and welfare of Town residents.

A stormwater pollution prevention plan (SWPPP) is required for all land development or redevelopment activities that are subject to review and approval by the respective Town boards or departments. Land development activities include clearing, grading, soil disturbance or placement of fill that results in land disturbance of equal to or greater than one acre, or activities disturbing less than one acre of total land area that is part of a larger common plan of development.

Chapter 111: Subdivision

Standard subdivisions must conform to the bulk regulations provided in the respective zoning districts outlined in Chapter 133. The standard subdivision design excludes the following areas from consideration as areas contributing to total lot yield:

1. Existing water surfaces.
2. Marshes, bogs, swamps, or other areas of high water table which cannot normally be built upon without excessive fill.
3. Horizontal areas of escarpments, bluffs or other seaward faces of primary dunes.
4. Beaches below mean high water.
5. Horizontal areas of slopes which exceed a grade of 20%.
6. Areas required for park dedication.
7. Areas required for recharge basins or for natural area recharge.
8. Area required for streets.
9. Area required for utilities or public facilities.

Design standards are provided for streets and highways, drainage, preservation and protection of natural environment, fire protection and waterways. Specific standards which may affect water quality include the following:

Drainage

- All stormwaters shall be recharged into the subsurface groundwater reservoir, and no system will be allowed which directly discharges such waters into any subsurface water area or into a fresh or salt marsh.

Preservation and protection of natural environment

- All surface waters are deemed to be important for the physical and mental well-being of its residents and resort visitors and for the perpetuation of desirable animal and plant species and, therefore, shall be protected from siltation caused by construction or regrading or perimeter properties, from the influence of induced nitrification caused by the fertilization of such perimeter properties and from any other form of probably degradation which may be caused by adjacent land development and use.

Waterways

- Man-made waterways, such as canals, marinas and similar constructions which break the fresh groundwater/saline-water interface shall not be permitted.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Chapter 113: Swimming Pools

Any swimming pool constructed on the Island is required to have a permit. Pool water may not be discharged directly to marine or fresh surface waters, tidal or fresh wetlands, the face of a bluff, or onto adjacent property or road surface or may not be drained directly into a sewer or septic system. All pools must be filled and re-filled with water from an off-island water supply.

Chapter 117: Trees

Trees and woodlands stabilize soils, help control runoff and erosion, provide shade and reduce evaporation, all of which enhance the Island's aquifer, creeks, bays and harbors. Under this legislation, the Town Board will keep an initial inventory of not more than 10 protected Town trees or any one species to be nominated as public landmark trees. The list may include up to 100 individual trees as public landmark trees.

Cutting or pruning a tree trunk, branches or roots of a public landmark tree, or removing, destroying or substantially altering any protected Town tree requires a tree permit from the Town Board.

Chapter 128: Waterways

The Town of Shelter Island imposes anchoring prohibitions for residents and nonresidents, including the following:

Residents

1. Between May 15 and September 15, a resident shall not anchor a boat in the inland waters for more than four consecutive days.
2. Between September 15 and May 15, the permitted boat or float may be anchored in inland waters only in a location which is not a hazard to navigation or other boats or properties.

Nonresidents

1. Between May 15 and September 15, nonresidents shall not anchor a boat for more than three consecutive hours in the inland waters, except in the transient anchoring areas in Coecles Harbor and West Neck Harbor.
2. Between May 15 and September 15, nonresidents shall not anchor a boat in any transient anchoring area for more than 48 hours in any 72-hour period.
3. Between September 15 and May 15, nonresidents shall not anchor a boat in any area except a transient anchoring area for a maximum of three consecutive days.

Chapter 129: Wetlands

The Town of Shelter Island regulates several activities on or over a wetland and within 100 feet of the landward boundary of a tidal or freshwater wetland and consists of a 75-foot vegetative buffer plus 25-foot adjacent regulated area. The activities which require a permit include the following:

1. Dredging, disturbing, excavating or mining, either directly or indirectly;
2. Dumping, filling, or depositing, either directly or indirectly;
3. Disturbing, clearing, cutting or removing vegetation;



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



4. Erecting or expanding any buildings or structures including docks, bulkhead, boardwalks, driveways, tennis courts or pools;
5. Constructing or expanding roads;
6. Installing utilities, septic systems, sumps or catchment basins;
7. Driving pilings or placing any obstructions, whether or not changing the ebb and flow of the water;
8. Any form of pollution, including but not limited to installing an on-site sewage disposal system, running sewer outfall, discharging sewage treatment effluent, rainwater runoff, water discharge from a swimming pool, or other liquefied wastes into or so as to drain into a wetland and which occur within the regulated area;
9. Any other activity which impacts any of the functions or benefits of wetlands.

Construction or development on properties within a causeway require additional application items and separate design specifications apply including natural vegetation protection measures, shoreline protection measures, aquifer and water protection measures, septic system protection measures, watershed protection measures and flood protection measures.

No wetland permit shall be issued unless the applicant demonstrates that the proposed action and location will not create a risk of impairing the function and value of the wetland and buffer; that the project will not diminish any wetland size; that there will be no negative impact on the quantity and quality of groundwater; and that there will not be a net increase in the risk of runoff.

Chapter 133: Zoning

The Near Shore and Peninsular Overlay District was created to protect the aquifer in the most sensitive areas of Shelter Island, where depletion of potable water and salt water intrusion are most likely. Generally, this Overlay District applies to the most sensitive areas of the Island where one or more of the following criteria apply:

1. The freshwater table is close to sea level and risk of salt water intrusion exists or has occurred through consumptive use of available potable water.
2. The land surface is close to the level of the freshwater table, increasing the risk of pollution of the aquifer.
3. The land drains toward creek or bay waters, increasing potential pollution from surface or below-ground drainage.
4. Density of development and anticipated future development threaten the ecologically sensitive areas.
5. The land drains toward freshwater ponds which are hydraulically connected to outcroppings of the freshwater table which may result in pollution of the freshwater table.

New subdivisions which are located within the Near Shore and Peninsular Overlay District require a shoreline vegetative buffer, park or recreation area requirement, contiguous area and acreage averaging.

Development requirements for individual or multiple lot developments include the following:



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



1. When natural vegetation exists, a shoreline vegetative buffer of a minimum of 75 feet must be maintained landward of the boundaries of shorelines, wetlands, creeks, estuaries and tidal or freshwater ponds.
2. Buildings and structures are not permitted within the shoreline vegetative buffer with the exception of docks, bulkheads, boardwalks or gazebos.
3. Buildings and structures (including wastewater disposal and sanitary systems) must be located at least 100 feet from the landward edge of a tidal or freshwater wetland.
4. A septic system, cesspool and/or leaching field which lawfully exists on the effective date of this section may continue, except that it should be upgraded if the system requires repairs due to inadequacy or failure or it is determined that the system is substandard in that it will not meet Suffolk County Department of Health Services requirements.
5. Upgraded systems shall have any discharge into the ground in accordance with the regulations of Suffolk County Department of Health Services. Points of discharge shall be placed no less than 100 feet landward of the boundary of tidal or freshwater wetlands.
6. Driveways and parking areas shall be of a permeable material, except where the slope is greater than 15 degrees. Where impermeable material is used do to the degree of slope, drainage of stormwater shall be retained and recharged to the aquifer on-site.
7. During construction, provisions must be made to prevent stormwater drainage from eroding the site or discharging to any wetland or waterbody without appropriate treatment to avoid contamination.
8. Each lot shall have provisions on-site to contain any recharge rainwater to the aquifer.
9. Pipes, culverts, drains or similar structures which discharge stormwater directly or indirectly into surface waters or wetlands are prohibited.
10. Fuel tanks for storage of petroleum products other than propane shall be placed above ground in an area capable of containing the full contents of the fuel tank plus 10% in the event of leakage so that no fuel enters the ground.
11. Irrigation systems are prohibited.

3.4 Land Use Plans

Shelter Island Comprehensive Plan

The Town of Shelter Island completed the Shelter Island Comprehensive Plan in 1993. This document provides fundamental information pertaining to Shelter Island's resources, character and qualities, growth and planning. The Comprehensive Plan was initiated in response to growing concerns about the potential level of adverse impact of development on the rural and aesthetic qualities of the Town.

The Plan expresses an overarching goal of preserving the rural qualities that presently exist in the Town while acknowledging that growth will occur. The Plan seeks to preserve these positive qualities while setting fair limits on growth that would not simultaneously impair those same positive qualities that attract growth in the first place. Thus, the Plan relates preservation of the future quality of life to cognizance of current development controls such as utility capacity and availability, transportation networks, zoning, and aesthetics.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Peconic Estuary Program Comprehensive Conservation and Management Plan (CCMP)

The CCMP was developed in order to provide recommendations for improving known water quality issues within the estuary, including brown tide, nutrient pollution, loss of natural habitat, pathogens and closed shellfish beds, and toxic discharges. An excerpt from Appendix K of the CCMP that summarizes the improvements recommended in the CCMP for which the PEP can utilize as a basis for stormwater improvements is provided in **Appendix M**.

3.5 Watershed Management Plans

Watershed Management Plans are public documents that provide justification for the implementation of improvement projects. Two waterbody specific watershed management plans have been prepared or are in the process of being prepared for Shelter Island: the West Neck Bay Watershed Management Plan (completed) and the Dering Harbor Watershed Management Plan (in progress). Both plans have similar key components, which include characterization of the watershed and waterbody, assessment and recommendations for programmatic practices, assessment and recommendations for stormwater infrastructure, and assessment and recommendations for habitat improvements.

3.6 Town Programs and Municipal Best Management Practices

The Town currently has several programs geared towards stormwater pollution prevention and best management practices in place to ensure compliance with MS4 requirements. A summary of each program is provided in **Table 1** below.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Table 15: MUNICIPAL BEST MANAGEMENT PRACTICES

| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|--|------------------------------------|---------------------------------------|---|---|
| Catch Basin Inspection and Cleaning Program | Highway Department | Highway Department | A program and/or schedule to inspect and clean catch basins and stormwater inlet structures on a regular basis to remove potential pollutants and debris, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly. | <p>The Highway Superintendent has a spreadsheet of all catch basins with information on when they are cleaned. Cleaning is currently not on a regular schedule — cleaning is conducted based on public input, staff observation, and police reports regarding flooding.</p> <p>The workers note information about cleaning in a notebook and the Highway Superintendent has to enter the data himself.</p> |
| Municipal Stormwater Infrastructure Inspection Program | Highway Department | Highway Department | Establish a regular municipal stormwater inspection and maintenance schedule for municipally-owned stormwater infrastructure. Inspection can identify problems in early stages and allow prioritizing repair and maintenance. | <p>Currently the catch basins and outfalls are mapped. The Highway Superintendent notes that there are a number of other types of stormwater storage or control devices, from sumps to culverts. He has agreed to add this information to the map of catch basin locations.</p> <p>In the Fall there are two groups of staff that inspect the storm drains and clear of leaves.</p> <p>There is no regularly scheduled cleaning of the sumps.</p> |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|-------------------------|------------------------------------|---------------------------------------|--|---|
| Street Sweeping Program | Highway Department | Highway Department | A street sweeping program is intended to prevent or reduce the discharge of pollutants from roadways, streets, and parking areas. The program may include provision for: bio-filters and/or infiltration devices; semi-permeable pavements; control of litter; surface cleaning protocols; and/or surface repair procedures. | <p>The whole town is swept in the Spring (Dering Harbor is swept along the 10K route just before the race). The parking areas are cleaned as needed. The sweepings are stockpiled at the Recycling Center.</p> <p>Road repairs are performed through the use of cold patch for smaller problems, and complete resurfacing for larger problems.</p> <p>The drains at the parking lot at Wades Beach contain hydrocarbon filters that collect materials in storm water during the first 15 minutes of a rainstorm (most contaminated water). They are replaced once every one or two years.</p> |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|---------------------------------------|------------------------------------|---------------------------------------|---|--|
| Mowing & Property Maintenance Program | Department of Public Works | Department of Public Works | A property maintenance and mowing program is intended to prevent or reduce the discharge of pollutants from town-maintained properties. The program may include provision for: frequency of mowing; procedures for clearing; provisions for trash removal; frequency of inspections of conditions of properties; disturbance during maintenance activities. | <p>The town mows public property on a periodic basis. The properties are inspected during mowing and any problems are noted and corrected.</p> <p>In 2012, the Town established a Fertilizer Policy for municipally maintained land which prohibits the use pesticides or fertilizers on any of its properties (except newly planted areas). Records of fertilizer use are to be maintained by the Public Works Dept.</p> <p>The Town places trash baskets on its properties. There are over 90 throughout the Town. The trash is picked up 5x/week in the summer and 2x/week in the winter.</p> |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|-------------------------------------|------------------------------------|---------------------------------------|---|--|
| Vehicle & Fleet Maintenance Program | Highway Department | Highway Department | Implementation of a vehicle and fleet maintenance program will help to prevent or reduce the potential discharge of pollutants to stormwater. A vehicle and fleet maintenance program may include activities such as (but not limited to): an inventory of equipment and related service records; designation of specific on-site service areas; designation of indoor wash bays or use of commercial wash facilities; removal of floor drains that may be discharging to stormwater conveyance systems; waste disposal procedures (used oil and fluids); and/or daily equipment inspections focusing on leak detection | There are service records for each town vehicle, which are updated with each service. Great care is used when changing fluids and oils. There are no floor drains in the shop area so as to prevent accidental discharges. Washing of vehicles is done in designated areas; however a truck wash facility designed to treat and recharge stormwater is not yet used. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|---|------------------------------------|---------------------------------------|--|--|
| Roadway & Boat Ramp Maintenance Practices | Highway Department | Highway Department | It is important to implement appropriate management practices during the planning, design, operation, and maintenance of highway and bridge projects undertaken by the regulated MS4. Management practices may relate to: implementing proper erosion and sediment controls; minimizing the use of pesticides, herbicides, fertilizers, and chemicals; review and modification of existing policies and practices; developing pavement repair procedures; improvements to ditching, drainage systems and outlets; and reducing the use and the generation of hazardous materials | The installation of storm drains has been going on for 8-10 years at town landings and road ends. Rip rap is placed to prevent sedimentation of waterways from erosion. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Program | Program Development Responsibility | Program Implementation Responsibility | Program Purpose | Program Description |
|-----------------------------|---|---------------------------------------|---|---|
| Beach Maintenance Practices | Department of Public Works | Department of Public Works | It is important to implement appropriate management practices during the planning, design, operation, and maintenance of beach projects undertaken by the regulated MS4. Management practices may relate to: implementing proper erosion and sediment controls; minimizing the use of pesticides, herbicides, fertilizers, and chemicals; review and modification of existing policies and practices; development and implementation of pet and animal waste reduction practices; waste disposal practices; beach grading/cleaning procedures; improvements to drainage systems and outlets; and reducing the use and the generation of hazardous materials | <p>The Town rakes the beaches (Crescent and Wades) twice a week in the summer. This re-grades as well as removes debris and garbage.</p> <p>The Wades Beach parking lot has been resurfaced to drain water to catch basins and prevent runoff into the bays. Filtration devices are present to collect oil and gas from the parking lot.</p> <p>Fertilizers, herbicides and pesticides are not used per 2012 Fertilizer Policy. (Note: tick control through 4 Poster program).</p> <p>Bags for cleanup of pet waste are kept stocked at Wades and Crescent Beaches, as well as Menhaden Lane.</p> |
| Employee Training Program | Stormwater Coordinator, Highway Superintendent, PERMA | Superintendent | Develop a program that provides training to municipal staff whose work may potentially influence the quality of stormwater. The training program should inform and educate employees on proper pollution prevention and good housekeeping techniques | Key Public Works staff that manages the collection of hazardous materials has DEC Hazardous Materials Training/Certification. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Additionally, the Town Highway yard maintains Good Housekeeping practices in order to prevent pollutant runoff during storm events. Good housekeeping practices include those for highway yard drainage, fueling, salt storage building operations, chemical storage, used oil and fluid storage, hazmat activity and storage, brush and composting activity and drainage, protocols for mixing areas, protocols for washing areas, municipal solid waste disposal, protocols for maintenance of the landfill cap, and protocols for cell tower operations. The following summarizes the good housekeeping procedures utilized within the Highway Department yard and landfill.

- **Drainage:** Drainage for the highway building located at the north end of the property is provided through two catch basins. The collection area for “wet” (non-recyclable) garbage is graded so that it drains to a 2,000 gallon closed catch basin to ensure any materials leaking from the garbage is captured and does not enter the environment. The catch basin is pumped several times a year and disposed of at Bergen Point. The landfill is graded so that stormwater runoff is directed to a retention pond located at the southern end of the property.
- **Fueling:** The fuel depot is located on the west side of the highway building. The depot was constructed in 2009 and is not covered. The fuel pumps are situated on a concrete surface and have a modern fuel containment and leakage prevention system (Top Cat fuel monitoring system) which detects leaks and sounds an alarm in the highway building. This system also monitors fuel usage at the depot. Two 6,000 gallon double walled aerotanks are situated next to the fueling station. The fuel tanks contain #2 diesel fuel and gasoline.
- **Salt Storage:** A salt storage building was constructed in 2005, which is completely roofed and open on one side. The floor of the building is graded towards the back (closed) portion of the building to collect any salt-contaminated runoff. This building can store up to 1,800 yards of salt sand and 150 tons of salt.
- **Chemical Storage:** Typical maintenance chemicals are stored in the highway building, which include oil, bad gas, anti-freeze, hydraulic fluid, radiator fluids, etc. Materials for the maintenance of boats and buoys are also stored in the building, which include bottom paints. Cleaning products such as bleach, soaps, aerosol cleaners, brake cleaners, graffiti cleaners and other solvents are also stored inside the highway building in a ventilated cabinet which vents to the outside. Road maintenance chemicals (such as paint and pitch) are also stored inside the highway building, with the exception of cold patch, which is stored in an open bin in a sunny area to keep the cold patch warm.
- **Used Oil and Fluid Storage:** Used oil from local businesses is recycled at the highway building which utilizes as used-oil burner for heat. Excess used oil is kept in 55 gallon drums which are located next to the building and are kept under a tarp. These drums are located in a County approved containment area.
- **Hazmat Activity and Storage:** The Town collects hazardous materials (acids, alkalis, fertilizer, pesticides, paints, batteries) at the recycling center, which are kept in an enclosed building. Once sufficient chemicals have been collected, they



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN

are removed by a certified hauler. Employees are trained annually in the handling and storage of hazmat materials.

- **Brush and Composting Activity:** Brush, manure and leaves are collected and composted by the Town. This material is kept in piles that are periodically turned and screened to generate sellable compost. As the compost is generated from natural materials on the island which are highly acidic, the area the piles are composted in is graded so that stormwater runoff is directed to the retention pond.
- **Sand and Salt Mixing Areas:** A designated mixing area is located immediately outside of the salt storage building, which is flat to minimize runoff. Once mixing is complete, the area is scraped to eliminate as much remaining salt as possible. Mixing does not occur during rainy weather, however, loading occurs in this area which may be necessary during inclement weather.
- **Washing Areas:** Vehicles and equipment are washed in a designated location. A hydrant within the yard is utilized to wash off salt, and, liquids from garbage and other contaminants from vehicles. Runoff from washing drains to the retention pond, and solids washed off are swept up. No chemicals are utilized during washing.
- **Municipal Solid Waste Disposal:** Municipal solid waste (MSW) is collected in plastic bags which the Town sells. Residents can drop off the bags at the yard which are collected in a metal compacting bin. As previously described, any runoff from the garbage is directed to a closed catch basin which is pumped several times per year and disposed of at Bergen Point.
- **Landfill Cap:** The landfill cap has been designed to collect stormwater from the capped area and direct it to a storm drain which is located in an area that does not have any garbage. The capped area is mowed regularly to prevent plants from establishing that could damage the cap and allow for stormwater intrusion from the landfill.
- **Cell Tower Operations:** A portion of the highway yard is rented to a cell tower company that provides their own servicing and maintenance to equipment within the rented area, which is fenced and located.

3.7 Building Permit and Special Permit Review

The Town building inspectors and Town Board have generalized policies that are followed during permit review that pertain to stormwater best management practices. Town building inspectors will require approval from the SCDHS prior to issuance of a building permit if a proposed addition or expansion is greater than 50% of the existing structure. This policy is followed to ensure that sanitary systems are adequately designed for proposed structures and additions.

The Town Board is responsible for review of special permit applications. In particular, it is the Town's policy to require site designs to minimize the amount of fertilizer dependent vegetation and turf as much as possible. The Town Board requires proposed development to include



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN

landscaping with plants that are on the approved Conservation Advisory Council's indigenous plant list.

3.8 Best Management Practice Gap Analysis

The Genesee/Fingers Lakes Regional Planning Council in cooperation with the NYSDOS developed a Municipal Nonpoint Assessment Form that was designed to identify gaps in laws and practices for municipalities to guide recommendations for improvement. The form divides BMP's into six groups: Development, Forestry and Agriculture, Waterways and Wetlands, Marinas, Roads and Bridges and Onsite Wastewater Treatment Systems. Each BMP is assessed to determine if a local law, program, or practice is in place that enforces the BMP, and to what degree the BMP is enforced by the law, program or practice. The scoring system for each BMP is as follows:

- **Fully (2 points):** The municipality implements the practice or its equivalent across the entire area of the municipality. The practice is a) codified in municipal code; b) included in internal operating procedure guidelines or manuals; c) included in specification manuals, or d) is part of a special municipal initiative.
- **Partially (1 point):** The municipality implements the practice or its equivalent in a specific area of the municipality or implements part of the practice or its equivalent. The practice is a) routinely followed but not codified in municipal code; or b) routinely followed but not included in written internal operating procedure guidelines or manuals which may or may not include specifications.
- **Not at all (0 points):** The municipality does not implement the practice or its equivalent.
- **Not applicable (n/a):** The practice does not appear to be relevant to the municipality.

The completed form, identifying gaps in local laws, programs, and practices, is provided below.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Table 16: REGULATORY GAP ANALYSIS

| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|--------------------------------------|---|--|---------------------------|---|
| Section 1 - Development | | | | |
| <i>Part A - Existing Development</i> | | | | |
| 1-01 | Identify retrofit opportunities | NYS MS4 General Permit Requirement, West Neck Bay WMP (PEP), Dering Harbor WMP (PEP), Shelter Island WMP - indevelopment | 2a & 2b | |
| 1-02 | Identify habitat and natural conveyance system restoration opportunities | Shell Beach Revegetation (PEP), Shelter Island WMP - in development | 1 | Full implementation expected with adoption of Shelter Island Watershed Management Plan |
| 1-03 | Establish retention/detention areas | West Neck Bay WMP (PEP), Dering Harbor WMP (PEP), Shelter Island WMP - in development | 1 | Full implementation expected with adoption of Shelter Island Watershed Management Plan |
| 1-04 | Acquire additional land for locating treatment facilities | | 0 | |
| 1-05 | Encourage homeowners to place compost piles away from waterbodies and roadways | | 0 | |
| 1-06 | Encourage proper use and disposal of lawn and other household chemicals | Town Code Chapter 73 & 129, Homeowner's Handbook, STOP Collection Days | 2a & 1b | |
| 1-07 | Institute turf management practices on golf courses and parks and recreation areas | Suffolk County Fertilizer Reduction Law (Local Law 41 - 2007), Town of Shelter Island Highway Dept. Fertilizer Policy | 1a & b | Policies address fertilizer use only on Town and County owned properties. |
| 1-08 | Undertake storm drain stenciling | Town has labeled some drains | 1 | Not completed Town-wide |
| 1-09 | Encourage volunteer programs, such as adopt-a-highways and adopt-a-stream, etc. | NYSDOT adopt-a-highway program, neighborhood road and beach cleanups. | 1 | |
| 1-10 | Include high percentage of indigenous plants in new landscaping on privately-owned properties (excluding arboretums, horticultural gardens, and sites requiring turf grasses) | Subdivision and Special Permit Review Process, Homeowner's Handbook | 1 | Subdivision and Special Permit review process provides an opportunity to include indigenous vegetation, CAC approved list of native species |
| 1-11 | Encourage water conservation | Town Code Chapters 74, 82 & 113, Homeowner's Handbook | 1 | No specific requirement or limitation for potable water usage. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|---|---|---|---------------------------|--|
| 1-12 | Develop outreach programs targeted at specific problems related to water quality management & resource conservation | Homeowner's Handbook, Environmental Fair, MS4 educational materials | 2d | |
| 1-13 | Encourage proper control of pet wastes | Pet waste educational materials prepared/distributed, pet waste bag stations at parks | 1d | No formal legislation or enforcement procedure established |
| 1-14 | Encourage continued operation of private storm water runoff control structures | NYS GP 0-10-001, Town Code Chapter 110 | 1a | Maintenance provisions required for new development/redevelopment for disturbances 1 acre or greater |
| 1-15 | Discourage feeding of waterfowl | | 0 | |
| 1-16 | Discourage the introduction of exotic aquatic species (Eurasian water milfoil, zebra mussels, water chestnut, etc) | Suffolk County Resolution 614-2007, NYS Bill S06826 (in development) | 1a | Bill in development would regulate specific invasive species state-wide |
| 1-17 | Encourage continued (periodic) operation and maintenance of private septic disposal systems | Homeowner's Handbook | 2d | Identification & regulation of poorly functioning sanitary systems discharging to MS4 by local law is required pursuant to NYSDEC MS4 General Permit |
| 1-18 | Effective and consistent application and enforcement of stormwater regulations & requirements | NYS GP 0-10-001, Town Code Chapter 110 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-19 | Require certification of existing on site septic systems for property transfers or building expansions. | SCDHS Article 6, Special Permit/Building Permit Review Process | 1 | Identification & regulation of poorly functioning sanitary systems discharging to MS4 by local law is required pursuant to NYSDEC MS4 General Permit |
| 1-20 | Require entire property (existing as well as proposed) to be included in stormwater analysis/calculation. | NYS GP 0-10-001, Town Code Chapter 110, 129 & 133 | 1a | Does not apply to construction disturbance less than 1 acre |
| Part B - New Development and Substantial Redevelopment | | | | |
| 1-21 | Minimize the amount of land disturbed and the duration of disturbance | NYS GP 0-10-001, Town Code Chapters 110, 111, 129, 133 | 2a | |
| 1-22 | Preserve natural features and conform substantially with the natural boundaries and alignment of waterbodies | Town Code Chapters 91, 111, 129, 133 | 2a | |
| 1-23 | Retain and protect trees and other natural vegetation on and near disturbed sites | Town Code Chapter 110, 117 & 129. Subdivision/Special Permit/Building Permit Review | 1 | Codes protects trees on Town property, but lacks specific provisions for protection of indigenous species and large caliper trees on private |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|------------|--|---|---------------------------|---|
| 1-24 | Account for topography and soil type in efforts to minimize erosion potential | Town Code Chapter 110, 111, 133, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-25 | Maintain runoff rates similar to pre-construction levels | Town Code Chapter 110 & 133-25, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-26 | Minimize the creation of impervious areas | Town Code Chapter 111, 133 | 2a | |
| 1-27 | Control increased runoff caused by changed surface conditions to minimize the danger of flooding, erosion, sedimentation and pollutants entering waterbodies prior to, during and after construction | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-28 | Use temporary vegetation and mulching to protect exposed and critical areas during development | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-29 | Redistribute topsoil within the boundaries of the disturbed land for seeding and planting | | 0 | see chapter 62 |
| 1-30 | Stabilize disturbed soils as soon as possible | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-31 | Minimize the use of cut and fill operations. Conform such operations to topography and soils to minimize erosion potential and adequately accommodate runoff | Town Code Chapter 111, Special Permit & Building Permit Review Process | 1 | Not explicitly required as part of Special Permit & Building Permit regulations |
| 1-32 | Use appropriate solid and hazardous waste generation and disposal practices including source controls and recycling | Suffolk County Article 7 & 12, Town Code Chapter 73, Homeowner's Handbook | 1 | |
| 1-33 | Encourage construction site management techniques which include the proper handling and disposal of pesticides and petroleum products and containers | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-34 | Ensure proper operation and maintenance of runoff management facilities | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 1-35 | Target training for contractors, inspectors and zoning and planning officials. | State, County and Cornell Cooperative Extension training programs, Town brochure to contractors regarding required stormwater management training | 2a | Ensure contractors have required training prior to issuance of building permits |
| 1-36 | Require tree surveys and/or cutting plans. | | 0 | |
| 1-37 | Develop priority list for BMP's -use of vegetative low areas for retention/infiltration. | NYS Stormwater Design Manual | 1b | Does not apply to construction disturbance less than 1 acre |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|---|---|--|---------------------------|--|
| 1-38 | Encourage cluster development. | Town Code Chapter 111, 133, Special Permit Review Process | 2a | |
| 1-39 | Require connection to and/or extension of existing water & sewer if project is within 500 feet of existing public infrastructure | SCDHS Article 6 | 2a | Applies to properties within sewer districts (no public sewer or water districts in Shelter Island) |
| 1-40 | Enact limits on driveway grades. | Chapter 133-12 | 1a | Applies to Nearshore and Peninsular Overlay District |
| 1-41 | For redevelopment, employ regulations that provide for technologically advanced (on and off) site wastewater treatment systems to optimize efficiencies and address "challenging" sites | | 0 | |
| 1-42 | Implement Federal/State Stormwater (SPDES) Phase II requirements | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| Section 2 - Forestry and Agriculture | | | | |
| Part A - Forestry | | | | |
| 2-01 | Consider potential water quality impacts when selecting silviculture system (yarding system, site preparation, pesticides employment, etc) | N/A | N/A | |
| 2-02 | Consider harvesting practices | N/A | N/A | |
| 2-03 | Seasonal preference for logging operations | N/A | N/A | |
| 2-04 | Have specialists (geologist, soil scientist, geotechnical engineer, wildland hydrologist) review plans in high erosion hazard areas | Town Code Chapter 133, Town Special Permit Review process, SEQRA Process | 1a | Not explicitly required Island-wide |
| 2-05 | Preplan harvest areas, skid trails, and access so as to be on stable soils, avoiding steep gradients, multiple stream crossings, poor drainage areas, etc. | N/A | N/A | |
| 2-06 | Limit grades of access roads. | Town Special Permit Review process, Town Code Chapter 111 | 1a | Roadway design specifications are only provided in Subdivision Regulations. |
| 2-07 | Require stabilization of roads/drives to forestry site. | N/A | N/A | |
| 2-08 | Employ natural topography and contour for design of road network | Town Code Chapter 111 | 2 | Roadway design specifications are limited to roadways constructed pursuant to Subdivision Regulations. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|---|--|--|---------------------------|---|
| 2-09 | Require stormwater controls for increased runoff from ground cover modification | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |
| 2-10 | Consider site restoration | | 0 | |
| Part B - Agriculture | | | | |
| 2-11 | Use Agricultural Environmental Management (AEM) | | 0 | |
| 2-12 | Require farms seeking agricultural value assessment to participate in AEM | | 0 | |
| Section 3 - Waterways and Wetlands | | | | |
| Part A - Modified Waterways | | | | |
| 3-01 | Develop an operation and maintenance program for existing modified streams that includes identification of opportunities and actions to restore habitat and the physical and chemical characteristics of these streams. | N/A - Shelter Island has no freshwater streams | N/A | |
| 3-02 | Improve stream quality by controlling instream sedimentation and selectively clearing debris | N/A - Shelter Island has no freshwater streams | N/A | |
| 3-03 | Establish or reestablish riparian buffers | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 3-04 | Prevent animal wastes from entering waterbodies | | 0 | |
| 3-05 | Attempt vegetative stabilization before undertaking structural measures | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 3-06 | Design and construct shore erosion control facilities, in accordance with an erosion and sedimentation control plan, in areas where marsh creation and soil bioengineering are ineffective or where existing protection methods are being flanked or are failing | NYSDEC Article 24 & 25 Permitting, Town Code Chapter 53 & 110, NYS GP 0-10-001 | 2a | |
| 3-07 | Schedule the periodic maintenance of sediment control measures, and inspect and repair them as needed in conformance with established schedule. | Town Code Chapter 110, NYS GP 0-10-001 | 2a | Does not apply to construction disturbance less than 1 acre |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|---|--|---|---------------------------|---|
| 3-08 | Protect stream banks through direct nonstructural means, such as new vegetation or protection of existing vegetation; direct structural means, such as revetments and bulkheads; indirect nonstructural means, such as regulating irrigation near stream banks or rerouting overbank drainage; or indirect structural means, such as deflecting channel flow away from stream banks with dikes, board fences and gabions | N/A - Shelter Island has no freshwater streams | N/A | |
| 3-09 | Use setbacks to minimize disturbance of land adjacent to stream banks and shorelines | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 3-10 | Prevent discharges to waterbodies in amounts that would adversely affect the taste, color or odor of the waters, or would impair the waters for their best usages | Town Code Chapter 110 & 113, NYS GP 0-10-001 | 2 | |
| Part B - Wetlands and Riparian Area Management and Restoration | | | | |
| 3-11 | Consider wetlands and riparian areas and their non-point source (nps) control potential on a watershed scale | West Neck Bay WMP (PEP), Dering Harbor WMP (PEP), Shelter Island WMP - in development | 1 | Full implementation expected with adoption of Shelter Island Watershed Management Plan |
| 3-12 | Identify existing functions of those wetland and riparian areas with significant nps control potential when implementing nps management practices. Do not alter wetlands or riparian areas to improve their water quality at the expense of their other functions | West Neck Bay WMP (PEP), Dering Harbor WMP (PEP), Shelter Island WMP - in development | 1 | Considered in WMPs recommendations |
| 3-13 | Conduct permitting, licensing, certification and non-regulatory nps pollution activities in a manner that protects wetland functions | NYSDEC SPDES Permitting | 2a | |
| 3-14 | Special zoning considerations to protect wetland areas | Town Code Chapter 129, 133 | 2a | |
| 3-15 | Use appropriate pretreatment practices such as vegetated systems or detention or retention basins to prevent adverse impacts to wetland functions that affect nps pollution abatement from hydrologic changes, sedimentation, or contaminants | Town Code Chapter 110, NYS GP 0-10-001 | 1 | Only applies to development/redevelopment involving disturbance equal to or greater than 1 acre |
| 3-16 | All projects should require wetlands certification. | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2 | |
| Section 4 - Marinas | | | | |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|----------------------------------|--|---|---------------------------|---|
| Part A - Existing Marinas | | | | |
| 4-01 | Clean maintenance areas regularly preferably by vacuuming to remove trash, sandings, paint chips, etc. | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-02 | Prevent residue from being carried into surface waters by performing abrasive blasting within plastic tarp enclosures on windless days or within spray booths | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-03 | Provide proper disposal/recycling facilities to marina patrons, preferably covered receptacles | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-04 | Establish fish cleaning areas, and implement rules governing the conduct of fish cleaning operations | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-05 | Educate boaters on the importance of proper fish cleaning practices | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-06 | Implement fish composting where appropriate | | 0 | |
| 4-07 | Store materials in areas impervious to the type of material stored. Build curbs, berms, or other barriers around the areas to contain spills | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-08 | Use separate, clearly labeled containers for the disposal of oil, gasoline, antifreeze, diesel, kerosene, and mineral spirits | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-09 | Target outreach programs about proper disposal at marina patrons through the use of signs, mailings, and other means | | 0 | |
| 4-10 | Promote the use in bilges of oil-absorbing materials, and replace them as necessary, preferably recycling, or disposing of them in accordance with petroleum disposal regulation | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-11 | Use a container under the air vent while refueling inboard tanks if the tank vents are not equipped with a fuel/air separator | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-12 | Prohibit in-water hull scraping or any underwater process to remove paint from boat hulls | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|-----------------------------|--|--|---------------------------|--|
| 4-13 | Wash the boat hull above the waterline by hand, using only necessary amounts of detergents and cleaning compounds that are phosphate-free and biodegradable | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-14 | Prohibit the use of detergents and cleaning compounds containing ammonia, sodiumhypochloride, chlorinated solvents, petroleum distillates, alcohol, or lye | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-15 | Educate individuals about the importance of trash reduction and recycling through: interpretive and instructional signs placed at marinas and boat-launching sites, pamphlets or flyers, newsletters, inserts in billings, meetings and presentations, workshops, and certification programs | | 0 | |
| 4-16 | Inspect pumpout facilities regularly, and repair them, if practical, under a maintenance contract with a competent contractor | NYS GP 0-11-009 | 2 | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-17 | Add language to slip lease agreements mandating the use of pumpout facilities and specifying penalties for failure to comply | | 0 | |
| 4-18 | Place dye tablets in holding tanks to identify and discourage illegal disposal | Practice employed by the Bay Constable, pursuant to Federal No Discharge Zone requirements - 67 FR 39720 | 2a&b | |
| 4-19 | Prohibit motorized vessels from areas (define areas) that contain important shallow-water habitats | Town Code Chapter 40 | 1 | Law prohibits boat access within 100 feet of shore and bathing areas; however does not specifically regulate shallow water habitats. |
| 4-20 | Establish and enforce no-wake zones to decrease turbidity and reduce erosion potential from boat wakes | Town Code Chapter 40 | 2 | |
| Part B - New Marinas | | | | |
| 4-21 | Design and site marinas to maximize exchange of marina basin water. Limit basins and channels with square corners that tend to trap flotsam, and place dock structures in a manner that promotes circulation | Town Special Permit Review process | 1b | No specific legislation in place. |
| 4-22 | Perform a preconstruction assessment, which includes a water quality monitoring and modeling methodology, to predict post-construction water quality conditions | Town Code Chapter 110, NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during application review |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|------------|--|---|---------------------------|--|
| 4-23 | Monitor water quality during construction to protect ambient water quality to the maximum practicable extent | | 0 | |
| 4-24 | Develop a marina siting policy to discourage development in areas containing important habitat designated by local, State, or federal agencies | Town Code Chapter 133-8, SEQRA Review Process | 1 | Special permit criteria for marinas exist, but specific siting has not been conducted. |
| 4-25 | Conduct surveys and employ rapid bioassessment techniques to assess historic habitat function (e.g. spawning, nursery, and migration pathways) and potential impacts to these and other biological functions and resources | | 0 | |
| 4-26 | Encourage the redevelopment or expansion of existing marina facilities that have demonstrated minimal environmental impacts instead of developing new marina facilities | | 0 | |
| 4-27 | Consider alternative sites with minimal potential environmental impacts when the use of previously disturbed sites is not feasible | SEQRA Process | 1 | Not currently specified in special permit requirements |
| 4-28 | Minimize disturbance of indigenous vegetation in the riparian area | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 4-29 | Use soil bioengineering or plants, wherever conditions allow, to restore damaged habitat along shorelines and streambanks | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 4-30 | Use properly designed and constructed engineering practices that minimize shoreline disturbance in areas where soil bioengineering and plants are ineffective | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 4-31 | Use appropriate shore erosion control methods, such as returns or return walls, in areas where existing protection methods are being flanked or are failing | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 4-32 | Plan and design all steambank, shoreline, and navigation structures so that they do not transfer erosion energy to or otherwise cause visible loss of surrounding streambanks or shorelines | Town Code Chapter 129, NYSDEC Article 24 & 25 Permitting | 2a | |
| 4-33 | Locate and design fuel stations so that spills can be contained in a limited area | Town Special Permit Review process, NYSDEC Article 24 & 25 Permitting | 2a | |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|--|--|---|---------------------------|---|
| 4-34 | Design and install underground fuel storage tanks according to State regulations, including the provision of detection systems and automatic fuel tank and pump leak shut-offs | NYSDEC Article 24 & 25 Permitting, SCDHS Article 7 and 12 Permitting | 2a | |
| 4-35 | Provide aboveground fuel tanks and fueling areas with a curbed or diked storage area to handle containment volumes meeting State (and local) codes and inspect regularly | NYSDEC Article 24 & 25 Permitting, SCDHS Article 7 and 12 Permitting | 2a | |
| 4-36 | Use preferred pumpout systems: fixed-point, portable, dedicated slipside, and pumpout boats | Federal No Discharge Zone requires the use of pump out facilities - 67 FR 39720 | 2 | |
| 4-37 | Design onsite wastewater treatment systems to specifically handle waste from vessels | Special Permit Review Process, SCDHS Article 6 Design and Review Process | 1 | Not currently specified in special permit requirements |
| 4-38 | Post pumpout facility location and regulations at the marina. Charge fees that encourage rather than discourage facility use. Consider offsetting the cost of maintaining pumpout facilities by fuel sales where these facilities are conveniently located in close proximity to one another | | 0 | |
| Part C - All Marinas (Existing and New) | | | | |
| 4-39 | Restrict boat repair and maintenance activities to clearly marked designated areas to prevent debris from falling into the water and preventing invasive species | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-40 | Secure all fueling facilities and storage areas with appropriate shut-off devices and security locks and inspect regularly | NYS GP 0-11-009, SCDHS Article 12 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-41 | Design fueling stations with spill containment equipment that is stored in a clearly marked location, accessible to work and storage areas. Post emergency phone numbers in a prominent location | NYS GP 0-11-009, SCDHS Article 12 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-42 | Design a spill contingency plan | NYS GP 0-11-009, SCDHS Article 12 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-43 | Inspect and maintain all containment berms or devices in accordance with State regulations. Investigate immediately signs of leakage or spillage, and undertake cleanup in accordance with applicable best management practices | NYS GP 0-11-009, SCDHS Article 12 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|--|---|---|---------------------------|---|
| 4-44 | Have a trained operator present and prepared to respond to accidental spills | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-45 | Maintain daily inventory records to identify abnormal loss or gain of liquid | NYS GP 0-11-009, SCDHS Article 12 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-46 | Prohibit the cleaning of hoses, fittings, pumps, and other accessory equipment on piers, docks or adjacent upland to prevent runoff into the marina basin or other surface or groundwater | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| 4-47 | Create and/or maintain a dedicated fund for maintenance in the case of government-owned facilities | | 0 | |
| 4-48 | Restrict the operation of pumpout facilities to trained marina personnel only | NYS GP 0-11-009 | 2a | Ensure marinas have obtained coverage under GP-0-11-009 during any municipal application review |
| Section 5 - Roads and Bridges | | | | |
| <i>Part A - Existing Roads and Bridges</i> | | | | |
| 5-01 | Conduct road and bridge maintenance (deicing material usage and storage, pot-hole repair, bridge washing, scraping and painting, etc) according to best management practices | Highway Department Roadway & Boat Ramp Maintenance Practices | 2b | |
| 5-02 | Conduct right-of-way activities (mowing, brush removal, pesticide and fertilizer use, etc) -according to best management practices | Highway Department Mowing and Property Maintenance Program | 2b | |
| 5-03 | Include high percentage of indigenous plants in new landscaping on public-owned properties (excluding arboretums, horticultural gardens, and site requiring turf grasses) | As a mater of practice | 0 | |
| 5-04 | Implement a regular inspection and maintenance plan of existing structures | Highway Department Catch Basin Inspection & Cleaning Program | 2b | |
| 5-05 | Develop and identify erosion/sediment control areas (examples include steep slopes, easily erodible soils, and nearby sensitive areas) and retrofit opportunities | West Neck Bay WMP (PEP), Dering Harbor WMP (PEP), Shelter Island WMP - in development | 1 | Considered in WMPs recommendations |
| 5-06 | Require percentage of roads to be tested with non-ice and non-sand de-icing. | Town Highway Department is investing the use of beet juice as a road de-icer | 1 | No formal policy established |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|--|---|--|---------------------------|--|
| Part B - New Roads and Bridges | | | | |
| 5-07 | Minimize the amount of land disturbed and the duration of disturbance | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-08 | Preserve natural features and conform substantially with the natural boundaries and alignment of waterbodies | Roadway design process, NYSDOT review, NYSDEC Article 24 & 25 Permitting, Town Code Chapter 111 & 129. | 2a | |
| 5-09 | Retain and protect trees and other natural vegetation on and near disturbed sites | Town Code Chapter 110, 117 & 129. Subdivision/Special Permit Review | 1 | Codes lack specific provisions for protection of indigenous species and large caliper trees |
| 5-10 | Retain additional runoff sites | NYS GP 0-10-001, Town Code Chapters 110 & 111 | 2a | |
| 5-11 | Minimize the creation of impervious areas | General practice of the Town | 1 | Not specifically required in Code |
| 5-12 | Treat increased runoff caused by changed surface conditions to minimize the danger of flooding, erosion and pollutants entering waterbodies prior to, during and after construction | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-13 | Use temporary vegetation and mulching to protect exposed and critical areas during development | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-14 | Redistribute topsoil within the boundaries of the disturbed land for seeding and planting | | 0 | |
| 5-15 | Stabilize disturbed soils as soon as possible | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-16 | Minimize the use of cut and fill operations. Conform such operations to topography and soils to minimize erosion potential and adequately accommodate runoff | Town Special Permit Review process, Town Code Chapters 110 & 111 | 1a | Roadway design specifications are limited to roadways constructed pursuant to Subdivision Regulations. |
| 5-17 | Control erosion and sedimentation prior to, during and after site preparation and construction | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-18 | Require long term stormwater management plan. | Town Code Chapter 110, NYS GP 0-10-001 | 2a | |
| 5-19 | Require long term sedimentation control & maintenance. | Town Code Chapter 110, NYS GP 0-10-001, Town Highway Catch Basin Inspection and Cleaning Program, Town Highway Street Sweeping Program | 2a | |
| Part C - All Roads and Bridges (existing and new) | | | | |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|--|--|---|---------------------------|--|
| 5-20 | Target existing public holdings, such as parks, for removing unnecessary impervious surfaces | Town of Shelter Island Watershed Management Plan - in progress | 1 | Does not apply to construction disturbance less than 1 acre |
| 5-21 | Incorporate New York State Department of Transportation design and guidance documents, standard specifications, and procedural manuals (<i>Highway Design Manual</i> , <i>Environmental Procedures Manual</i> , <i>Maintenance Guidelines</i> , etc) into local laws and operating procedures | Town Code Chapter 111, Town Highway Department Programs | 1 | Conformance review necessary |
| 5-22 | Ensure application of appropriate solid and hazardous waste generation and disposal practices including source controls and recycling | Highway Yard Good housekeeping Practice | 2b | |
| 5-23 | Ensure proper operation and maintenance of runoff management facilities | Highway Yard Good housekeeping Practice, Highway Catch Basin & Inspection Cleaning Program, Highway Street Sweeping Program | 2b | |
| 5-24 | Participate in Cornell Local Roads Program activities and training | | 0 | |
| 5-25 | Target training programs at highway officials, contractors, construction workers, inspectors, zoning and planning officials | Highway Yard Good housekeeping Practice, Highway Department Program | 2b | |
| 5-26 | Target training and outreach programs about the proper handling of materials, leakage and spill prevention and spill response procedures at maintenance staff and workers | Highway Yard Good housekeeping Practice, Highway Department Program | 2b | Town Highway spill prevention plan is needed |
| Section 6 - Onsite Wastewater Treatment Systems | | | | |
| 6-01 | Conduct regular inspections of OWTS at a frequency adequate to determine failure and undertake required maintenance | MS4 General Permit, Homeowner's Handbook | 1b | Identification & regulation of poorly functioning sanitary systems discharging to MS4 by local law is required pursuant to NYSDEC MS4 General Permit |
| 6-02 | Institute setback guidelines | SCDHS Article 6 Regulations, Town Code Chapter 129 | 2a | |
| 6-03 | Promulgate plumbing codes that require practices that are compatible with OWTS | SCDHS Article 6 Regulations, | 2a | |
| 6-04 | Target outreach programs at homeowners, contractors and developers | Homeowner's Handbook, MS4 General Permit | 1 | NYSDEC MS4 General Permit requires pathogen -specific public education/outreach |
| 6-05 | Inspection of all OWTS at property transfer or within 1 year prior to transfer | | 0 | |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| BMP Number | Best Management Practices (BMP) | Existing Means of Implementation (law, regulation, practice, etc) | Degree of Implementation* | Notes |
|------------|---|---|---------------------------|-------|
| 6-06 | Require all properties within 500' of municipal service to connect. | N/A - No municipal OWTS systems exist on Shelter Island | N/A | |
| 6-07 | Set goals for effluent limits (nitrogen, phosphorous, BOD, etc) | SCDHS Article 6 Regulations, NYSDEC Water Quality Regulations (6 NYCRR §703), Pathogen Total Maximum Daily Load, MS4 General Permit | 2a | |

As illustrated above, while several laws, programs and practices are in place that currently provide means for implementation of best management practices, gaps exist for several BMP's.



Section 4.0 Recommendations



4.0 RECOMMENDATIONS

The characterization of water resources on Shelter Island, input from the WAC and the public, and regulatory considerations were all considered and factored into the development of recommendations in support of improvement of water quality. The overall intent of this document is to identify those measures that can be implemented to reduce existing water quality impacts and make meaningful strides toward water quality improvement. The recommendations provided herein will be incorporated into an Implementation Plan which will further evaluate each recommendation as well as specific improvement projects, with respect to priority in scheduling and methods for implementation.

Recommendations are divided into six categories: Waterbody Recommendations, Stormwater Runoff Recommendations, Municipal Facilities Recommendations, Groundwater and Wastewater Recommendations, Regulatory Recommendations, Natural Resource and Invasive Species Management and Stewardship and Public Education. Each recommendation has a designated identification number for ease of reference in the Implementation Plan, following this section; this number is provided prior to the main description of each of the recommendations. For specific improvement projects, an additional identification number is provided to the project to aid in project prioritization; this number is listed at the end of each project description or location.

4.1 Waterbody Recommendations

B-1: Establish a program of regular surface water quality monitoring of West Neck Bay, Creek and Harbor.

West Neck Bay, Creek and Harbor were identified as a priority water body of concern due to the reoccurrence of harmful algal blooms. As indicated in **Section 2.6.2** of the Characterization, data for both the entrance to West Neck Harbor and within West Neck Creek is limited to three days of sampling. As a result, there is insufficient data for a full understanding of the dynamics of this waterbody. There is sufficient data to recognize that water quality issues exist in the West Neck complex, particularly with respect to nitrogen; however, a clearer understanding of waterbody dynamics and processes could be gained from regular water quality monitoring and measurements of tidal flushing within the system. Seeking funding or expansion of volunteer efforts in support of regular water quality monitoring of this waterbody would further assist in



Photo: www.peconicestuary.org



identification of measures to improve water quality and reduce environmental stress on this ecosystem. Water quality testing should be conducted six-eight times/year and include the following parameters: temperature, clarity, salinity, dissolved oxygen (all of which can be done in the field), and total coliform, fecal coliform, Chlorophyll- α and total nitrogen via lab testing. Additionally, counts for brown tide algae and red tide algae would also be beneficial and has been completed in the past by Suffolk County labs (counts for brown tide). See **Figure 27**.

B-2: Seek partners to conduct further study to determine the cause and potential remedial actions for the harmful algal bloom occurrences in West Neck Bay.

Studies have been completed by Dr. Chris Gobler of SUNY Stony Brook regarding the ecology of the algae that has been known to bloom in West Neck Bay, Creek and Harbor. Utilizing current data, only general remedial actions for the waterbody can be made. These studies indicate the harmful algae thrive on organic (and potentially inorganic) forms of nitrogen. Further studies (building upon the information that has already been gathered) examining the primary factors contributing to the cause and frequency of the algal blooms specifically in West Neck Bay, Creek and Harbor would aid in further defining remedial actions to reduce algal blooms. The Town may consider contacting SUNY or the research opportunities through the Peconic Estuary Program to determine if research opportunities and interests are available to pursue joint grant funding towards additional research.



B-3: Explore options and funding sources for tertiary treatment or the removal of surface water discharge from the Shelter Island Heights STP in order to allow for the potential re-opening of shellfishing in Dering Harbor and increase recharge.

Currently, the Shelter Island Heights STP provides primary and secondary treatment of wastewater prior to discharge of treated wastewater to the Peconic Bay (northwest of Dering Harbor). The presence of this outfall places an administrative shellfishing closure on Dering Harbor, as a precaution in the event that the STP operation results in a discharge impacting shellfish beds in the harbor. Additionally, the EPA has established a pathogen Total Maximum Daily Load (TMDL) limitation for watersheds throughout the Peconic Estuary, including Dering Harbor (though pathogen levels did not exceed NYSDEC shellfishing standards within Dering Harbor, the TMDL states that levels were close to the exceedance threshold). Therefore, employing additional (tertiary) treatment of wastewater to improve pollutant removal prior to surface discharge and to allow for



subsurface discharge or recycling of wastewater should be explored for future grant funding and capital improvements.

Subsurface discharge provides additional treatment of wastewater as it recharges through subsurface soils. Recycling of treated effluent is a technique used in many parts of the country (particularly in areas with limited water supply), where treated sanitary effluent is utilized for irrigation. Currently, the Town golf course is not irrigated and lacks the more desirable golf play experience that could be achieved with irrigation. In limited cases, NYSDEC and SCDHS would consider allowing this practice; however, the STP would require upgrades in the treatment process to make this feasible. Irrigation of the golf course with treated effluent or establishment of subsurface discharge of treated wastewater would have the benefit of providing recharge of wastewater to the aquifer rather than discharge to the Peconic Estuary.

The Shelter Island Heights Property Owners Corporation (HPOC), which owns and operates the STP, commissioned an engineering feasibility study in 2003-2004 to evaluate various long term options for tertiary treatment at the STP. The study found several options exist for elimination of the STP outfall, including recharge of treated wastewater near the Town golf course and an alternative to connect to the Greenport STP; however all the options involve considerable capital costs, limiting the ability to implement any of the evaluated options. Given the scale and significant costs associated with these options, implementation of such improvements would require long term financial planning and grant funding.

The removal of the direct discharge to surface water could also remove the need for the administrative shellfishing closure of Dering Harbor. It is noted that the harbor may be conditionally certified as “open” on a daily basis in the winter months if the Town conducts regular water quality testing and institutes a daily “hotline” indicating whether or not the harbor is open for shellfishing. This program requires yearly coordination with the NYSDEC and should be continued.

B-4: Seek funding and volunteer efforts to conduct water quality testing and monitoring of Major’s Harbor (including monitoring of boat usage and waterfowl activity in the harbor).

While existing data is limited, water quality tests from this harbor indicate high levels of nitrogen. However, no apparent anthropogenic input of nitrogen exists within the harbor. Therefore additional water quality testing of the harbor would aid in determining sources of nitrogen. Further monitoring of waterfowl populations and boat moorings within the harbor would provide





additional information regarding potential sources of nitrogen. It is also recommended that DNA analysis of coliforms within the harbor be performed in order to provide further insight as to the source of nitrogen within the harbor (i.e., human, waterfowl, deer, etc). Water quality sampling should be performed at a minimum of 6-8 times/year to establish baseline conditions throughout various seasons and to determine if higher levels are correlated to peaks in boating or waterfowl populations. This information would assist in defining remedial actions to reduce the concentration of nitrogen in this waterbody.

B-5: Investigate the use of various techniques to remove high levels of phosphorus from Fresh Pond and to reduce existing phosphorus inputs.

Water quality tests for Fresh Pond demonstrate high levels of phosphorus within Fresh Pond and associated anoxic conditions. There are no obvious sources of phosphorus that would explain the existing high concentrations and therefore, this recommendation multi-faceted and includes direct control of existing concentrations, continued monitoring, improved pond buffers and education of homeowners and users of the pond.

A. Control of Existing Concentrations: Techniques for phosphorus removal from the system should be explored, in addition to reduction/removal of existing phosphorus inputs. Options for phosphorus removal from the pond include the use of alum (aluminum sulfate) for phosphorus sequestration. As illustrated in **Appendix G**, alum reacts with water, creating a precipitate called floc. The floc then binds with the phosphorus making it biologically unavailable for use by algae and other organisms in the water.

Alum has successfully been used to reduce phosphorus concentrations in upstate New York and Long Island, as well as extensive use in lakes in Wisconsin, particularly in combination with the reduction of large phosphorus inputs via the use of phosphorous removal structures. It is critical to have pond conditions which are compatible with the use of Alum. Phosphorus removal structures utilize phosphorus sorbing materials that can sequester phosphorus from runoff. Once the material is saturated with phosphorus, it is fairly easy to exchange the sorbing material for unsaturated sorbing material.

Both the local NYSDEC regional office and NYSDEC Region 3 representatives have been contacted with respect to use of Alum. While not extensively used on Long Island, experimental use of a product known as Phoslock® has proven to be successful in a pond on the south fork of Long Island. Fresh Pond appears to have favorable conditions for use of Alum in that there are no inlets or outlets, minimal shallow/flat areas or fringe vegetated wetlands and the pond is deep (as much as 60'). Introduction of Alum would be expected to successfully floc free phosphorus in the pond, and settle to the bottom, becoming sequestered with sediments deep in the pond, with reduced potential for liberation or re-suspension. This potential measure should be further examined, coordinated with the regulatory agencies, and implemented if feasible.



B. Addressing Phosphorus Inputs: Stormwater runoff is a key transporter of phosphorus to surface waters. Therefore addressing sources of stormwater flow into the pond should be addressed (see Recommendation IF-5). Other options for reducing phosphorus inputs into Fresh Pond include the use of vegetative buffers in areas near the pond where direct stormwater runoff from lawns or roadways may occur. Vegetative buffers provide opportunity for phosphorus uptake by plants prior to stormwater carrying phosphorus entering Fresh Pond. Outreach and education of homeowners within the contributing area of Fresh Pond is critical to the improved health of the Pond. Alerting homeowners of the issue and informing them how they can help reduce phosphorus inputs to the system will increase awareness and potentially result in positive behavioral changes reducing use/input of phosphorus into the system. Education and outreach material should include providing information to homeowners regarding the sources of phosphorus (i.e., certain detergents, fertilizer, etc.) and the correct use of fertilizers (i.e., not over-applying fertilizer to lawns, ensuring correct soil pH for effective vegetative uptake of fertilizers, correctly applying fertilizers in coordination with weekly precipitation events, and application during the appropriate season). It is expected that the combination of these measures will aid in controlling the inputs of phosphorus to Fresh Pond.

B-6: Manage waterfowl populations.

Waterfowl are a key source of pathogens in surface waters. Therefore managing populations by reducing favorable conditions for waterfowl to congregate near surface water on private and public lands can assist in improving water quality. Methods to control populations include discouraging lawn areas for waterfowl to congregate near surface water on private and public lands; encourage use of fencing, unmowed surface water and wetland vegetated buffer zones, egg oiling and disruptive measures such as border collies and sonic devices where necessary. It is noted that Suffolk County and many east end municipalities are required to conduct goose management under the NYSDEC MS4 Program; therefore teaming with local municipalities, the Peconic Estuary Program and other resources may be possible for training or implementation of goose and waterfowl management programs to assist in reducing the costs for such programs. Additionally, goose/waterfowl management can be accomplished through volunteer efforts. Adoption of local laws prohibiting feeding of waterfowl on public lands (see R-2) and providing educational material and signage regarding the issues associated with feeding of waterfowl can also help the public gather greater understanding of the issue. Educational material could also be developed for local homeowners regarding methods to control goose/waterfowl on their properties and the reasons why control of waterfowl is important to water quality.





4.2 Upland Recommendations

This section details recommendations that would apply to the upland areas that contribute to surface waters, involving: stormwater runoff reduction; municipal facility improvements; upland wastewater management; regulatory guidance; natural resource enhancement and invasive species control; and, stewardship and public education. All recommendations pertain to land surface areas and would aid in improving environmental conditions including groundwater and surface water quality.

4.2.1 Stormwater Runoff

Specific best management practices (BMPs) to help reduce pollutant loads from stormwater runoff at specific locations are described below. Stormwater BMPs may provide pollution source reduction, pollutant removal and flood control. The NYSDEC issued an updated Stormwater Design Manual in August 2010 (hereafter “2010 Design Manual”) which includes new guidance on the use of low impact design (LID) principles (i.e., preservation of open space and clustering development, reduction of impervious surfaces, retention of natural buffers, etc.) to reduce runoff volumes generated from development activities and the use of “green infrastructure” practices (i.e., rain gardens, bioretention areas, vegetated swales, green roofs, etc.) to provide water quality treatment close to the source of the runoff by utilizing natural features, promoting groundwater recharge and emulation of preconstruction hydrology. Where possible, LID and green infrastructure practices are recommended herein. The Center for Watershed Protection’s “Stormwater Retrofit Reconnaissance Inventory” was utilized to identify critical areas for drainage improvement projects. Field worksheets were completed for areas where potential improvements were identified (see **Appendix H**).

Drainage improvement projects were selected based on water quality impairments of the receiving waterbody, land use and impervious cover within the contributing area, proximity of potential pollutant sources to surface waters and availability of publically owned land in proximity of the discharge point(s) for physical placement of drainage improvement projects (see **Section 4.3** below). The identified improvement projects are described below (see **Figure 26**):

S-1: Reconfigure, remove unnecessary asphalt and add drainage to unused road ends to prevent direct stormwater discharge to adjoining surface waters. Where feasible, utilize bioretention areas to increase detention and provide biological uptake and natural filtration for stormwater runoff prior to discharge.

Road ends with unnecessary/unused paved areas and evidence of stormwater flow from immediate upland areas/roadways that presented possible areas





TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



for this treatment include:

- Western terminus of Rocky Point Road (PR-1)
- Western terminus of Bootleggers Alley (PR-2)
- Northwestern terminus of Highberry Lane (PR-3)
- Northeastern terminus of Dawn Lane (PR-4)
- Eastern terminus of Evans Road (PR-5)
- Eastern terminus of Montclair Avenue (PR-6)
- Eastern terminus of Hudson Avenue (BR-1)

Creating landscaped depressions at the terminus of these roadways provides an opportunity for stormwater retention and biological uptake and filtration of stormwater. Hardy, low growing native species are recommended in these depressions to minimize maintenance requirements and maintain water views. These locations also present opportunities for educational signage regarding stormwater pollution of waterways and water quality treatment through bioretention and similar practices.



S-2: Where feasible, add subsurface drainage structures in the form of catch basins or leaching galleys in upland areas at higher elevations to capture and recharge stormwater runoff before it reaches low lying areas and prior to discharge.

The intersection of Prospect Road and Stearns Point Road provides a good opportunity for this type of treatment, as stormwater is currently directed from Stearns Point Road and Prospect Street down Prospect Road where it eventually discharges to the beach and waterway. Stormwater catchment at this location would reduce direct discharge to surface water. This would in turn reduce pollutants reaching the beach and waterbody. It is noted that this beach is periodically closed to bathing after rain events due to high levels of coliform detected in waters proximate to the beach. (LP-1)

S-3: Investigate the stormwater and tide flow pipe connections near the intersection of Brander Parkway, North Brander Parkway and Wheeler Drive to determine the extent of connections, system functions and the most appropriate remedial action to improve environmental conditions.

Stormwater in this location is captured in the roadway via inlets and discharged to an outfall through the bulkhead at the boat docking area near this intersection. Additionally, an antiquated pipe and drainage vault is connected to this system which provides a backflow valve allowing incoming tides to flow westward towards a pond system during high tide and high storm events, directing surface water to the wetland system. A



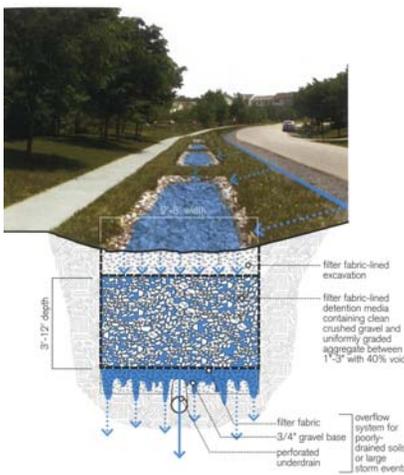
detailed investigation into the connections and flow within this system would aid in identifying the most appropriate remedial actions that would have the least impact on the pond system, improved stormwater handling and the greatest environmental benefit. (PC-1)

S-4: Install drainage control systems in the unused grass “triangle” between Brander Parkway and North Brander Parkway.

Currently, limited drainage exists in this area, and stormwater discharges directly to the boat docking area. A combination of subsurface leaching galleys and surface bioretention swales would provide for increased storage and treatment of stormwater. If containment is sufficient consideration could be given to the removal of the outfall in the docking area bulkhead. These measures would result in improved water quality to West Neck Harbor, which is currently impacted by harmful algal blooms. (IF-1)

S-5: Provide drainage control systems near the base of Serpentine Drive and Sunnyside Drive prior to the intersection with West Neck Road.

A large volume of untreated runoff is directed down these roadways, which is eventually carried west along West Neck Road and discharged into Shelter Island Sound. A combination of infiltration practices and bioretention areas would greatly reduce pollutants being carried along this pathway. It is noted that due to several significant utility lines located beneath West Neck Road, drainage improvements within this roadway between the golf course and the beach area not feasible. As a result, capture and detention of stormwater in the higher elevation areas, prior to reaching this roadway provides the greatest opportunity for stormwater improvement. Adequate area for drainage improvements exists on the Town golf course; this area provides an opportunity for stormwater retention and infiltration through the use of standard leaching pools or leaching pools in combination with bioretention options, prior to overflow to West Neck Road. (IF-3)



S-6: Install an infiltration swale between West Neck Road and the landscaped area along the roadway to capture and treat runoff from lawns on the hillside prior to discharge to West Neck Bay. (IF-2)

As nitrogen is a nutrient of concern in West Neck Bay due to the reoccurrence of algal blooms, limiting nitrogen inputs into the bay is critical. Large expanses of fertilized lawn are known contributors of nitrogen to waterways. Currently, the lawns along the hillside area above West Neck Road are directed towards the roadway, which is pitched towards West Neck Bay. As there is limited horizontal space within the road right-of-way and limited depth to groundwater for in-



roadway improvements, a swale at the base of the hillside would provide an opportunity for catchment and treatment for stormwater from the landscaped hillside. The infiltration swale would consist of perforate pipe set in gravel with invert control through the use of shallow concrete manholes along the length of the pipe. This would aid in ensuring that the pipe has reached its maximum capacity prior to overflow to the next section of pipe, thereby maximizing the infiltration potential of the swale.

S-7: Raise the road elevation near the intersection of West Moreland Drive and West Neck Road and install a culvert beneath the roadway to allow for better flow.

Westmoreland Drive is a road on Shelter Island serving 46 homes and a designated landing field for medical evacuations on Shelter Island. Westmoreland Drive serves as the sole entrance/exit to this residential area. The entry of Westmoreland Drive near West Neck Road, is a low point that floods during extreme high tides and during storms. This problem has existed for over a decade, but has become more serious as flood levels rise. The depth of the water can be several feet and renders the road impassible to most vehicles.

The most effective way determined by the Town to remedy the flooding at this location is to physically elevate the road by four feet and installing a culvert beneath the roadway to allow for better flow (RC-1). It is noted that this project is intended to reduce flooding and will not have measurable water quality benefits, and is therefore not included in the pollutant reduction analysis performed in **Section 4.3**.

S-8: Implement the recommendations contained in the Dering Harbor Subwatershed Management Plan (currently in progress).

The Peconic Estuary Program has funded the development of a Subwatershed Management Plan for the stormwater contributing area to Dering Harbor. This plan will provide recommendations and prioritization of specific stormwater improvement projects surrounding Dering Harbor to address the known water quality issues within the watershed. No additional specific stormwater improvement projects are proposed for the Dering Harbor contributing area as part of this island-wide Watershed Management Plan.

4.2.2 Municipal Facilities Recommendations

M-1: Complete a GIS based mapping of the entire stormwater management system and “sewershed”. Utilize the GIS mapping and a GIS database to effectively track maintenance and inspection of catch basins.

The NYSDEC MS4 Permit requirements include mapping of all outfalls and storm sewershed (or the catchment area that drains into the storm sewer system based on the surface topography in the area served by the stormsewer). While the Town has submitted a waiver request to the NYSDEC from the MS4 General Permit, mapping the overall



system using GIS provides a means to maintain and update information associated with the stormwater infrastructure, including tracking systems for maintenance (i.e., which catch basin has been cleaned out, the frequency of cleanings needed and, establishment of a regular maintenance schedule). This tracking system would also aid in prioritization of catch basin cleanouts, repairs and replacements, as well as help prioritize areas for street sweeping based on the frequency of necessary drainage cleaning. Efforts have been made to begin such a tracking system in recent years by the Town’s Highway Dept.

M-2: Update the Town’s Pollution Prevention and good housekeeping program, including the preparation of Spill Prevention & Response Plan for all facilities where toxic or hazardous materials are stored and/or utilized.



The Town should complete a regular update (minimum of once every three years) of its Pollution Prevention and good housekeeping program to minimize the potential impacts of municipal operations on water quality. Preparation of a Spill Prevention and Response Plan would establish set procedures for control and clean-up of toxic or hazardous material spills to ensure pollutants from such spills do not impact groundwater or enter waterways. This plan would be most applicable to the Town Highway Yard where regular vehicle maintenance is performed and toxic or hazardous materials are stored.

M-3: Provide training for Town/Village maintenance personnel regarding stormwater runoff and water pollution, hazardous materials handling, illicit discharge detection and best management practices.

Continue education of Town maintenance personnel on the need and benefits of regular maintenance of storm drains and how stormwater can carry harmful pollutants to surface waters is a critical component of effective watershed management. Regular maintenance and sediment removal from drains can have a beneficial effect toward water quality improvement. Additionally, understanding of best management practices for hazardous materials storage and handling (for everyday practices such as vehicle fueling and drain cleaning) can significantly reduce pollutants carried in stormwater from municipal operations.

M-4: Provide a designated area in the Town and Village Highway Yards for washing of vehicles with proper filtration and drainage to prevent toxic or hazardous materials from entering the watershed.

Control of vehicle wash areas is in keeping with municipal required stormwater requirements and represents good housekeeping and common sense. Municipal maintenance vehicle wash facilities should be properly controlled to ensure that no toxic



or hazardous materials contained in washwater are released to surface or groundwater. Examples of such washing areas are provided in **Appendix I**. As illustrated, the washing area directs runoff from cleaning of vehicles to a contained area so that pollutants washed from vehicles will not impact surface water or groundwater.

M-5: Complete dry weather monitoring of all outfalls to identify potential illicit connections.

Dry weather monitoring of outfalls allows for ready detection of potential illicit connections (i.e., unauthorized connections or discharges not entirely composed of stormwater such as garbage drain effluent, sanitary systems, vehicle wash water, etc.) to the Town's stormwater management system. Dry weather outfall monitoring of outfalls is recommended once every five years. If discharges are detected, then the discharge must be sampled and investigated to determine the source and eliminate the discharge.

M-6: Complete municipal facility and operations audits.

At a minimum frequency of once every three years, the conduct self-assessments of all municipal facilities to determine the sources of pollutants potentially generated by its operations and facilities (i.e., proper storage of hazardous materials, fueling areas, waste storage areas, etc.); and identify the municipal operations and facilities that need to be addressed by the Town's pollution prevention and good housekeeping program (i.e., roadway maintenance, turf management, etc.).



M-7: Formally adopt and continue to implement the current turf management practices on Town properties.

Town turf management practices currently include regular mowing and no use of fertilizer or irrigation. These practices are beneficial to the watershed as pollutants generated as a result turf maintenance practices are absent. In order to ensure that these practices are continued in the future, a formal Turf Management Plan should be prepared and adopted for use on all Town properties.

4.2.3 Groundwater and Wastewater Recommendations

W-1: Develop a program and update Town and Village Code (see Regulatory Recommendation R-6) to identify and require regular maintenance of septic systems in areas with shallow depth to groundwater (less than 8 feet) and poor integrity or not properly functioning.



Areas with sanitary systems situated in locations with shallow depth to groundwater have the greatest potential to discharge nutrients to the waters surrounding Shelter Island. Sanitary systems without adequate vertical separation between the bottom of the leaching pool and groundwater do not function properly as there is insufficient conversion of ammonia to nitrite and nitrate (the nitrification part of the intended treatment process) and reduced natural attenuation of the sediments separating the system from groundwater. As a result, there is a greater potential for groundwater transport and surface water release of available nitrogen and biological pollutants (bacteria and virus) to waterbodies.



A program of regular sanitary system maintenance could be established to require property owners to provide proof of inspection and certification of sanitary systems once every three to five years. In addition to inspection by a licensed contractor, certification of the system could also be achieved through proof of maintenance (i.e., pumping of the sanitary system) within the three to five year time frame, proof of new system installation compliant with current SCDHS requirements (i.e., systems constructed after 1981), or proof of adequate depth to groundwater through a test boring. If inspection revealed a failing system or a system which could not be certified pursuant to SCDHS requirements (aged system), the system would either have to be pumped or replaced, depending on the severity of the failure. Once property owners demonstrate certification of a SCDHS approved system (updated since 1981), no additional submission/proofs of a compliant systems would be required (which may encourage property owners to replace antiquated systems rather than continually pumping the systems). **Figure 25** illustrates areas which may potentially have shallow depth to groundwater (less than 8 feet)¹, and could be utilized as a basis for target locations to be included in the inspection program.

W-2: Consider a cost-shared pump-out and water conservation kit program to aid in cost reduction for sanitary system maintenance.

It is recognized that sanitary system maintenance may be an economic hardship for some residents on Shelter Island given the cost of transportation and disposal of pumped sanitary waste. As such, a cost-share program would aid in making sanitary system maintenance or replacement more affordable and would facilitate and encourage homeowner compliance. Similar programs have been successful in other communities

¹ This figure was generated utilizing GIS to graphically evaluate data from both Suffolk County LiDAR topographic data and USGS groundwater elevation data.



throughout the country (samples of which are provided in **Appendix J**), including a recent program initiated by the Town of Southampton for a septic system rebate program that allows for rebates associated with the upgrade, repair, or replacement of existing septic systems that comply with the Suffolk County Department of Health Services regulations.

Additionally, the Town could pursue options for partnerships with local sewage treatment plans (e.g., the Greenport STP) to determine if these STPs may be permitted to accept wastewater pumped from sanitary systems on Shelter Island during off peak periods and at bulk/discounted rates in an effort to reduce property owner costs associated with system maintenance.

W-3: Work with other east end municipalities to encourage updates to Suffolk County Sanitary Code in order to allow for the use of alternative sanitary disposal systems that have demonstrated results in other parts of the country.

SCDHS is currently evaluating alternative options for conventional sanitary systems. The evaluation includes the alternative technologies (e.g., systems that separate and reuse grey water, de-nitrification systems for individual systems, etc.) and a variety of brands of septic system filters; such practices have been recommended in other parts of the country. A pilot demonstration project is currently underway in the Village of Southampton involving the use of de-nitrification systems for single family homes and the Town of East Hampton funded a large scale wastewater treatment alternatives study in 2013.

Septic system filters are inexpensive (\$50-100), easy to install, and can increase the life of the sanitary leaching system, leading to less failures and better water quality protection. If approved by SCDHS, a program to encourage use of these filters would be expected to aid in improving the quality of effluent entering surface and groundwater resources of Shelter Island. Filter examples and specification sheets are provided in **Appendix K**.

The Town of Shelter Island is well suited for a pilot project testing the efficiency of alternative systems or technologies due to area groundwater and soil conditions. Such a pilot project could be pursued through a partnership of the SCDHS, the Town and potential other local partners such as the Peconic Estuary Program or non-profit organizations and grant opportunities. Encouraging the approval of alternative systems and technologies which have been demonstrated to be more efficient and reduce the quantity of nitrogen entering groundwater could provide significant water quality improvements, particularly in areas of shallow ground water and close proximity to surface waters.

W-4: Encourage continued groundwater monitoring and periodic (5 year interval) evaluation of available water quality data to assess and track groundwater quality and elevation on Shelter Island.



Periodic review of water quality data provides insight into existing and potential problems within the aquifer. Agencies that currently monitor groundwater at various locations on Shelter Island include SCDHS and USGS. Continued monitoring of USGS wells, as well as other public and private wells would provide data on water quality (and trends in groundwater elevation). SCDHS prepared a groundwater quality presentation for Shelter Island in 2002, specifically regarding nitrogen concentrations in groundwater. This was a beneficial project that assists in educational efforts in understanding the fragile nature of water resources on the island, and promotes further understanding of the dynamics of the aquifer system. Data evaluation on a regular basis would therefore provide updates with respect to changes in nitrogen levels in groundwater (as well as educational value) and changes in water elevations.

4.2.4 Regulatory Recommendations

R-1: Develop a pet waste law requiring pet owners to pick up after their pets on public lands.

Pet waste is a known contributor of pollutants to surface waterbodies. Pet wastes deposited on ground or road surfaces are transported by runoff to low elevations where surface water discharge of stormwater occurs. In order to encourage responsible pet ownership practices, Town and Village Code should be revised to establish a pet waste law requiring pet owners to pick up after their pets on public lands. Inclusion of a fine for violation of the law would encourage greater public participation in appropriate pet waste practices.



R-2: Develop a law and associated signage prohibiting the feeding of waterfowl as they contribute nutrients to surface water and stormwater runoff.

Several studies demonstrate that waterfowl (particularly resident Canada Geese) significantly contribute to nutrient inputs to surface waterbodies from excrement. Feeding of waterfowl encourages long term residence of birds that would otherwise migrate to other areas. As a result, a larger proportion of waterfowl excrement is generated and has potential to enter surface waterbodies directly or during storm events. Prohibition of feeding of waterfowl would discourage long term residence of these birds thus resulting in improved water quality conditions of the surface waters within and surrounding Shelter Island.

R-3: Revise Town and Village Code regulations to require drainage containment on residential properties proposing greater than 1,000 SF of impervious area increase.



It is recommended that a minimum of ½” of storage be required for existing impervious surfaces and 2” of storage be required for newly proposed impervious surfaces.

Current Code does not provide design criteria for redevelopment or expansion of structures on existing residential lots. Capture and detention of stormwater prior to off-site discharge would aid in the prevention of pollutants being carried to surface waterbodies. It is recommended that if an applicant submits for Special Permit, Building Permit, Wetlands Permit, or variance approval for an existing developed residential lot, the design criteria be applied for any increase in impervious surfaces greater than 1,000 SF, excluding swimming pools. This would include building additions, driveways impervious decks/patios, etc. For building structures, gutters, leaders and dry wells are recommended for existing and additional building area, such that a minimum of ½” of storage is provided. Other impervious surfaces should be “pitched” toward surface drainage grates with subsurface leaching pools of the recommended minimum capacity. The recommended stormwater containment will assist in containing runoff on individual sites so that it does not contribute to street runoff thus reducing the volume of stormwater on road systems that can potentially enter waterways. The design of stormwater management systems should account for high groundwater conditions including seasonal variation and tidal influence to ensure that pollutants can be adequately filtered.

R-4: Revise Town and Village Code regulations to provide stormwater containment requirements for commercial, industrial and newly developed residential properties. It is recommended that a minimum of 2” of storage be provided for all proposed impervious surfaces.

Currently, the Town Code does not provide a specific drainage design criteria for new development of residential lots or for commercial and industrial lots. It is recommended that stormwater be contained on individual sites that are subject to development. It is recommended that commercial and/or industrially use of land that involves Special Permit, Wetlands Permit or variance applications, be subject to a minimum 2” storage requirement for stormwater runoff containment, as well as engineering review and/or Stormwater Pollution Prevention Plan (SWPPP) requirements that may apply for one-acre or more of disturbance. For new residential use subject to Building Permit, Special Permit, Wetland Permit or variance applications, it is recommended that a minimum of 2” of storage be provided. These measures will retain stormwater on individual sites and reduce the quantity of runoff that may flow onto public roads and/or contribute to surface water impacts. As noted above, the design of stormwater management systems should account for high groundwater conditions including seasonal variation and tidal influence to ensure that pollutants can be adequately filtered.



R-5: Encourage and incentivize use of green infrastructure in site and drainage design.

If the Code is amended to provide drainage requirements for redevelopment and new development activity as described above, drainage requirements should also encourage cost effective runoff reduction techniques and green infrastructure, such as use of vegetated swales, use of rain gardens in parking lots and on residential properties, biorention infiltration areas and pervious pavement. A wide variety of these practices are provided in the *NYS Stormwater Management Design Manual*. Incentives may be provided to further encourage the installation of green infrastructure techniques rather than conventional drainage systems.



R-6: As described in Recommendation W-1, revise Town Code to require inspection and certification once every five years for sanitary systems located in areas with shallow depth to groundwater. Additionally, as described in W-2, explore the establishment of a cost share program to aid in septic system inspection and certification.

As described in Recommendation W-1 above, implementation of a sanitary inspection and certification program is a method to ensure that sanitary systems in areas with the greatest potential for transport of pollutants to surface waters and groundwater are properly functioning. It is suggested that Town Code be revised to require inspection and certification once every five years in areas identified as potentially having shallow depth (less than eight feet) to groundwater. **Figure 25** provides a map which depicts areas of potential shallow depth to groundwater. In order to ensure the licensed sanitary contractor provides accurate assessments, it is recommended that a fine be incorporated into the Code revision for a contractor providing false information. Certification of the system could also be achieved through proof of maintenance (i.e., pumping of sanitary system) within the five year time frame, proof of a properly designed system (i.e., system meeting SCDHS design requirements), or proof of adequate depth to groundwater through a test boring. Once a system is certified as meeting SCDHS design requirements and having adequate depth to groundwater, no further requirement would apply. If inspection reveals a failing system, the system would either have to be pumped or replaced, depending on the severity of the failure. If system replacement becomes necessary, it would be done so in conformance with SCDHS approved design and oversight as required.

It is recognized that pumping of sanitary systems on Shelter Island can be very costly due to the distance of the approved disposal site for sanitary wastewater. As described in W-



2, a cost share program could be explored to aide in reducing the cost to homeowners, providing further incentive to perform regular maintenance.

R-7: Revise Special Exception criteria of the Town Code to address stormwater runoff and best management practices for marinas, fueling stations, automotive repair centers and other “hot spot” uses in proximity to surface waters or municipal storm sewers that discharge to surface waters. The Special Exception criteria should address on site storage of hazardous materials and other potential pollutants that could be carried by runoff to adjacent surface waters, ensuring best management practices (such as covered storage of hazardous materials, proper fuel storage and handling, adequate drainage, etc.).

NYS requires SPDES Multi-Sector Permits for industrial uses that discharge to surface waters. The requirements include a facility review and incorporation of best management practices for stormwater management and operations to limit the potential for pollutants carried in stormwater to reach surface waters. It is recommended that the Special Permit criteria in the Town Code for commercial and industrial uses including marinas, fueling stations, automotive repair centers, boat building and repair, funeral homes, hospitals, land transportation yards (e.g., car storage/services) and water transportation facilities (e.g., ferry terminals) be amended to include review of stormwater and hazardous materials management to ensure best management practices are in place and reduce the potential for pollutants to enter surface waters.

4.2.5 Natural Resource & Invasive Species Management

N-1: Implement Shell Beach Restoration Plan, when complete.

In 2010, Suffolk County contracted with an environmental consultant to prepare habitat restoration plans for five key locations in the Peconic Estuary. One of the designated restoration areas was Shell Beach, located in the southwest portion of Shelter Island. A habitat restoration plan is currently in preparation for this site, and should be implemented once complete.

N-2: Develop a list of native plant species for use in landscaping.

Suffolk County has a Local Law banning the sale of certain invasive plant species that are used in landscaping. Invasive species are those species that are not native to the area, but have been artificially introduced and are known to out-compete native species, spread in a manner that is difficult to control, and degrade natural habitats. Such species warrant control to promote natural growth of native species which aid in buffering and stormwater filtration. It is recommended that a Town list be developed prohibiting the sale and installation of specific invasive species. It is suggested that the Town review the New York State Office of Invasive Species Coordination’s list of assessed invasive species, and prohibit all species ranked “Very High” and “High” for invasiveness, and



restrict as much as practicable, those species ranked “Moderate” by the Scientific Review Committee. It is further recommended that educational information be prepared and made available to homeowners and residents of Shelter Island, regarding the impact of invasive species, and that information be provided regarding the use of appropriate native species for landscaping, buffering, wetland setback installations and biological stormwater filtration measures.

N-3: Obtain funding for wetland restoration near the intersection of Sudee Glen and Brander Parkway. This site provides an opportunity for both habitat restoration and drainage improvements near the roadway.

There is a Town owned freshwater wetland located on the north side of the Sudee Glen/Brander Parkway intersection, and a tidal wetland located on the west side of Brander Parkway, just north of the Sudee Glen intersection. This wetland area is currently overgrown by invasive species, and as a result, this location provides an opportunity for habitat restoration and improvement for stormwater management purposes. Habitat restoration would improve the quality of this wetland as a natural system, and stormwater improvements could be directed toward providing biological uptake and stormwater pollutant filtration. Restoration opportunities for the tidal wetland are more limited as the marsh in this location is currently in good condition; however, some restoration opportunities exist as a fringe of the invasive species *Phragmites* is located between the low marsh and upland areas. A management plan directed toward native species enhancement and stormwater management would improve habitat and stormwater mitigation for water quality improvement. (IF-4)

N-4: Where feasible, create and restore wetland buffers surrounding West Neck Bay, Creek and Harbor to reduce nitrogen inputs into the system, which contribute to harmful algal blooms.

Encourage the use of vegetated buffers adjacent to surface waters both on public and private lands. Vegetated buffers serve as effective means of stormwater filtration prior to entering the bays, harbors and marine surface waters. Several parcels, particularly in the vicinity of the West Neck complex, have lawn that extends directly to bulkheads or other shoreline stabilization structures. As the lawns are generally pitched toward the waterbody, direct discharge from the lawns, which may be fertilized, is entering the waterway. A minimum 20’ vegetative buffer should be provided in these areas in order to provide filtration of fertilizers and nutrients prior to overland flow to adjoin water bodies. It is noted that these buffer areas could be configured to allow for pathways/walkways to the bulkhead or other dock structures if needed. Educational brochures targeting the benefits of such





buffers could be sent to property owners adjacent to the West Neck complex, as well as required as a part of any Building Permit, Special Permit, Wetland Permit or variance application review.

4.2.6 Stewardship & Public Education Recommendations

V-1: Develop a volunteer based group to assist with water quality monitoring activities.

Water quality monitoring can be a time consuming endeavor for Town government and staff that may have limited resources to contribute to the effort. In order to accomplish regular monitoring, many municipalities have begun “citizen science” volunteer monitoring whereby volunteer are trained in water quality monitoring and reporting methods. Existing groups in Long Island may be able to aid in establishing a dedicated group for monitoring Shelter Island waters. It is recommended that volunteer efforts be tapped for water quality monitoring activities to augment governmental personnel and provide a means of conducting beneficial monitoring and tracking of water quality.

V-2: Develop an “Adopt-a-Road” program to aid in litter maintenance along local roadways.

As the majority of roadways on Shelter Island are Town owned, a significant cost is borne by the Town for roadway maintenance and cleanup. An “Adopt-a-Road” program would aid in litter removal and prevent debris from reaching the bays, harbors and ocean surrounding Shelter Island.



V-3: Develop an “Adopt-a-Beach” program to aid in litter maintenance within public beaches.

As Shelter Island experiences a significant population increase in the summer, litter accumulation occurs on the beaches. An “Adopt-a-Beach” program would aid in litter and storm debris removal from the beaches while providing a cost reduction to the Town for regular maintenance. Additionally, such materials would have a lesser chance of entering the bays, harbors and ocean and further polluting the waterways.

V-4: Obtain funding for a “Septic System Pumpout, Water Conservation and Education program.”

An educational program and/or materials would aid in communicating the importance of sanitary system maintenance and the impacts of failing systems to water quality. Include



information that clearly outlines beneficial maintenance practices for optimal system functioning and educate property owners of common actions that are detrimental to the functioning of the system, such as use of harsh chemicals and certain detergents. Such a program could garner participation in sanitary system maintenance and potentially improve water quality in the long term.

V-5: Utilize existing public information documents available through Long Island Invasive Species Management Area (LIISMA) group and Cornell Cooperative Extension to provide public information regarding the harmful effects of invasive species.

Both LIISMA and Cornell Cooperative Extension have educational materials available regarding the impacts of invasive species and the benefits of native species, as well as literature outlining alternatives to invasive species commonly used in landscaping. Town participation in LIISMA and coordination with Cornell could provide a cost effective means of distributing materials to local residents and business owners to assist with the control of invasive species. Such information could be provided on the Town's website or on public information documents that contain "QR" codes that would direct the public to the Town's website.

V-6: Develop an informational brochure detailing the harmful effects of phosphorus in waterbodies.

As indicated in **Section 2.6.2**, phosphorus is a pollutant currently causing impairments to Fresh Pond. Because phosphorus has no atmospheric component to the cycling process of the element, it is important to communicate the need to limit phosphorus inputs to closed systems. Education regarding this pollutant, the phosphorus nutrient cycle, and preventative and restorative actions could aid in future remediation of Fresh Pond by informing private landowners adjoining this pond of how they can assist with control and management of potential release of phosphorus. Such information could be provided on the Town's website or on public information documents that contain "QR" codes that would direct the public to the Town's website.

V-7: Develop educational materials detailing the benefits of natural buffers along shorelines.

As indicated in Recommendation N-4, vegetative buffers provide for biological and physical filtration of stormwater prior to runoff reaching waterbodies. Encouraging the installation and maintenance of natural buffers could be fostered through educational materials demonstrating the benefits and aesthetic appeal of such buffers. Such information could be provided on the Town's website or on public information documents that contain "QR" codes that would direct the public to the Town's website.



V-8: Continue to acquire parcels for preservation identified as “high priority” in the Town Community Preservation Project Plan.

Vacant land availability is currently limited on Shelter Island and at the time of this report, no vacant lands were identified as high priority for acquisition. As a result, it is recommended that the Town continue to acquire properties identified in the 2008 Town Community Preservation Project Plan. This plan identified parcels most appropriate for acquisition given their size, location and current use. Twenty-one properties are identified in “Schedule 1” of the plan, as being the highest priority for acquisition. Parcel acquisition and prioritization should consider the potential for installation of stormwater improvements on a parcel, as a factor in determining whether or not to acquire a given parcel of land.

4.3 Project Prioritization

As indicated in **Section 4.2.1**, physical projects that will provide an improvement to water quality have been provided with a unique identification number and are illustrated in **Figure 26**. A total of fourteen (14) projects located within ten (10) subwatersheds were identified as potential projects to improve water quality with a focus on the water bodies within and surrounding Shelter Island. The projects were chosen based on the characterization of Shelter Island resources, as well as field inspections of areas within Shelter Island that revealed opportunities for improvement. During field inspections, review of the characterization report and project conception, consideration was given to priority water bodies, land ownership, project necessity and project feasibility. Once potential projects were identified, further project prioritization considered waterbodies with known impairments (West Neck complex, Fresh Pond and Sunset Beach) and the potential pollutant removal of each proposed improvement.

In order to further assist in prioritization of projects, existing pollutant loads and potential project pollutant removal was determined for each of the ten (10) subwatersheds with proposed improvement projects. This analysis was supported using a spreadsheet model designed for this purpose. The model, entitled *Spreadsheet Tool for the Estimation of Pollutant Load (STEPL)* model was developed in USEPA Region 5 for estimation of existing pollutant loads and potential pollutant reductions based on various best management practices. The model considers land use, septic input, livestock (if any), soil type, rainfall and irrigation, and utilizes referenced values for pollutant runoff for nitrogen, phosphorus, 5-day biologic oxygen demand and sediment.

Data was entered into the model for existing conditions in order to establish an existing pollutant load from each watershed. Subsequently, each proposed project was applied into the model for the area the project would treat (i.e., the area draining to the specific improvement project), and a nutrient reduction load was calculated for the subwatershed within which each project is located. Model results are provided in **Table 17** and **Graph 3** below, and inputs and model documentation are provided as **Appendix L**. The model estimates that the greatest inputs of nitrogen and phosphorus from the targeted subwatersheds are generated in subwatershed 64, while subwatershed 44 contributes the least to nitrogen and phosphorus pollution within the



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



waterbodies. It should be noted that while subwatershed 44 is not the smallest watershed, it has the smallest quantity of urban area within the watershed, resulting in the lowest pollutant contribution. Similarly, subwatershed 64 has the greatest quantity of urban area, resulting in the greatest generation of pollutants.

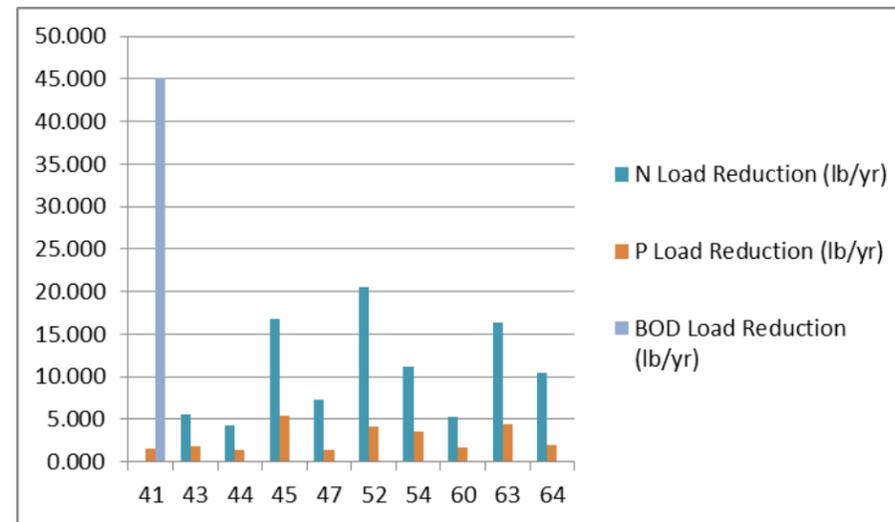
Review of model results indicates that projects within watersheds 45, 52, 54, 63 and 64 would provide the greatest reduction in nitrogen influx to the waterbodies, while the greatest reduction of phosphorus is achieved through implementation of the proposed projects in watersheds 45 and 52. With respect to watershed 63, which includes Fresh Pond, it is noted that if an alum treatment and phosphorus removal structures are utilized, a significant reduction in phosphorus would be realized in this watershed.



Table 17
POLLUTANT LOAD – SUBWATERSHEDS WITH PROPOSED IMPROVEMENTS

| Watershed | N Load (w/o BMP) | P Load (w/o BMP) | BOD Load (w/o BMP) | Sediment Load (w/o BMP) | N Reduction | P Reduction | BOD Reduction | Sediment Reduction | N Load (with BMP) | P Load (with BMP) | BOD (with BMP) | Sediment Load (with BMP) | %N Reduction | %P Reduction | %BOD Reduction | % Sed Reduction |
|-----------|------------------|------------------|--------------------|-------------------------|-------------|-------------|---------------|--------------------|-------------------|-------------------|----------------|--------------------------|--------------|--------------|----------------|-----------------|
| | lb/year | lb/year | lb/year | t/year | lb/year | lb/year | lb/year | t/year | lb/year | lb/year | lb/year | t/year | % | % | % | % |
| 41 | 760.7 | 127.4 | 2937.0 | 16.8 | 0.0 | 1.5 | 45.2 | 0.3 | 760.7 | 125.9 | 2891.9 | 16.5 | 0.0 | 1.2 | 1.5 | 1.7 |
| 43 | 883.8 | 170.2 | 3426.5 | 19.7 | 5.6 | 1.8 | 0.0 | 0.0 | 878.2 | 168.4 | 3426.5 | 19.7 | 0.6 | 1.0 | 0.0 | 0.0 |
| 44 | 564.1 | 113.4 | 2105.9 | 14.1 | 4.3 | 1.4 | 0.0 | 0.0 | 559.8 | 112.0 | 2105.9 | 14.1 | 0.8 | 1.2 | 0.0 | 0.0 |
| 45 | 716.3 | 135.1 | 2802.8 | 16.2 | 16.8 | 5.4 | 0.0 | 0.0 | 699.5 | 129.7 | 2802.8 | 16.2 | 2.3 | 4.0 | 0.0 | 0.0 |
| 47 | 791.3 | 137.4 | 2990.0 | 17.4 | 7.3 | 1.4 | 0.0 | 0.2 | 784.0 | 136.0 | 2990.0 | 17.2 | 0.9 | 1.0 | 0.0 | 1.2 |
| 52 | 916.6 | 180.2 | 3511.5 | 21.2 | 20.5 | 4.1 | 0.0 | 0.6 | 896.1 | 176.2 | 3511.5 | 20.6 | 2.2 | 2.3 | 0.0 | 3.0 |
| 54 | 1167.4 | 230.4 | 4417.8 | 26.5 | 11.2 | 3.5 | 0.0 | 0.0 | 1156.3 | 226.9 | 4417.8 | 26.5 | 1.0 | 1.5 | 0.0 | 0.0 |
| 60 | 866.6 | 153.5 | 3104.9 | 20.3 | 5.2 | 1.6 | 0.0 | 0.0 | 861.4 | 151.9 | 3104.9 | 20.3 | 0.6 | 1.1 | 0.0 | 0.0 |
| 63 | 3270.4 | 588.9 | 12235.4 | 78.4 | 16.4 | 4.4 | 0.0 | 0.1 | 3254.0 | 584.6 | 12235.4 | 78.3 | 0.5 | 0.7 | 0.0 | 0.1 |
| 64 | 3769.8 | 710.2 | 15156.2 | 82.4 | 10.5 | 2.0 | 0.0 | 0.0 | 3759.3 | 708.2 | 15156.2 | 82.4 | 0.3 | 0.3 | 0.0 | 0.0 |
| Total | 13706.9 | 2546.8 | 52687.9 | 312.9 | 79.9 | 24.2 | 45.2 | 1.0 | 13627.0 | 2522.6 | 52642.8 | 311.9 | 0.6 | 0.9 | 0.1 | 0.3 |

Graph 2
POLLUTANT LOAD REDUCTION – SUBWATERSHEDS WITH PROPOSED IMPROVEMENTS





TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Utilizing both the water quality data and the pollutant removal results detailed above, each project was given a “high,” “medium” or “low” priority. Projects located in watersheds with known impairments and that had the greatest potential for pollutant removal were given high priority, while projects located in watersheds with known impairments that provided some pollutant removal were given medium priority, and all other projects were given low priority. **Table 18** below details the projects and the priority of each project. Costs, project responsibility, and means of implementation are provided in the **Section 5.0**.

**Table 18
PROJECT PRIORITIZATION**

| Project Number | Project Type | Project Location | Project Subwatershed | Project Priority |
|----------------|---|---|----------------------|------------------|
| BR-1 | Bioretention | Eastern terminus of Hudson Avenue | 64 | Medium |
| IF-1 | Infiltration Practices and Bioretention | Brander Parkway/North Brander Parkway | 54 | High |
| IF-2 | Infiltration Practices and Bioretention | West Neck Road | 52 | High |
| IF-3 | Infiltration Practices and Bioretention | Southern terminus of Serpentine | 47 | Medium |
| IF-4 | Infiltration Practices and Bioretention | Sudee Glen | 54 | High |
| IF-5 | Infiltration Practices and Bioretention | East side of Fresh Pond | 63 | High |
| LP-1 | Leaching Pools | Prospect Road and Sterns Point Road | 41 | Medium |
| PC-1 | Investigate Pipe Connection | Brander Parkway/North Brander Parkway | 54 | Low |
| PR-1 | Pavement Reduction | Western terminus of Rocky Point Road | 45 | High |
| PR-2 | Pavement Reduction | Western terminus of Bootleggers Alley | 45 | High |
| PR-3 | Pavement Reduction | Northwestern terminus of Highberry Lane | 43 | Low |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Project Number | Project Type | Project Location | Project Subwatershed | Project Priority |
|----------------|---|---|----------------------|------------------|
| PR-4 | Pavement Reduction | Northeastern terminus of Dawn Lane | 60 | Low |
| PR-5 | Pavement Reduction | Eastern terminus of Evans Road | 63 | High |
| PR-6 | Pavement Reduction | Eastern terminus of Montclair Avenue | 44 | High |
| RC-1 | Road Elevation and Culvert Installation | West Moreland Drive near West Neck Road | 51 | High |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Section 5.0 Implementation Strategy



5.0 IMPLEMENTATION STRATEGY

The Shelter Island Watershed Management Plan has been designed to improve water quality of the Island's bays, harbors and ocean by promoting best management practices for future development actions and routine municipal maintenance activities, education, environmental stewardship, and improvements in stormwater collection and treatment. By implementing the pollution preventative and corrective actions outlined in the WMP for general best management practices, public education and outreach, stormwater improvement strategies and priority actions, steps can be taken to improve water quality, restore habitat, reduce water quality impairments to shellfish and other aquatic life, and allow for continued recreational opportunities in the waters surrounding Shelter Island.

5.1 Implementation Actions

The following implementation strategy (see **Table 19**) is meant to address the methods and means by which the Shelter Island WMP will implement the projects and actions outlined in **Section 4.0**. This Section addresses different aspects of implementation including governmental jurisdiction, priority of the actions and potential funding sources to aid the Town and Village in implementing the recommended actions outlined in **Section 4.0**. Specific corrective actions and their priorities are summarized in **Section 4.0**.

Implementation of the Shelter Island Watershed Management Plan involves many agencies, levels of government, civic groups, and citizens. Inter-governmental coordination and cooperation between the Town, County, State, non-profits, and the community is important to the success of the Shelter Island WMP. Groups such as: Suffolk County Cornell Cooperative Extension (CCE), NYSDEC, EPA, Sea Grant, Peconic Estuary Program (PEP) and the Suffolk County Soil and Water Conservation District (SCSWCD) can also provide information on the development of educational, outreach and stewardship materials as well as educational materials at their disposal relating to subjects such as best management practices (BMP), sanitary system maintenance, and lawn care recommendations, etc. Opportunities for collective efforts are noted as applicable.

Cost ranges for implementation of various recommendations are also provided in **Table 19** (\$: \$0-\$50,000; \$\$: \$50,000-\$100,000; \$\$\$:\$100,000-\$300,000; \$\$\$\$: \$300,000+). As funding for stormwater improvements is often limited, the recommendations are also ranged in terms of potential timeframes for completion (Short Term: 1-2 years, Medium Term: 3-10 years, Long Term: 10+ years). Additionally, potential funding sources have been identified for each recommendation (see **Section 5.2, Table 21** below for a description of each funding source).



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Table 19: IMPLEMENTATION STRATEGY

| Recommendation # | Recommendation | Cost ¹ | Potential Funding Sources ² | Project Sponsor | Completion Timeframe |
|----------------------------------|--|-------------------|---|--|----------------------|
| WATERBODY RECOMMENDATIONS | | | | | |
| B-1 | Establish a program of regular surface water quality monitoring of West Neck Bay, Creek and Harbor. | \$ | D-1,D-6, E-3, H-1, H-2, J-1, J-2, L-1, M-1 | Town, Suffolk County | Short term |
| B-2 | Seek partners to conduct further study to determine the cause and potential remedial actions for the harmful algal bloom occurrences in West Neck Bay. | \$\$\$ | C-3, C-4, D-6, E-2, H-1, H-2, L-1, M-1 | Town, with partnerships (SUNY, PEP) | Long term |
| B-3 | Explore options for tertiary treatment or the removal of surface water discharge for the Shelter Island Heights STP in order to allow for the potential re-opening of shellfishing in Dering Harbor and increase recharge. | \$\$ | C-1, C-2, C-4, D-1, L-1, M-1 | SIHPOA, Town & Suffolk County support | Long term |
| B-4 | Seek funding & volunteer efforts to conduct water quality testing and monitoring of Major’s Harbor (including monitoring of boat usage in the harbor and waterfowl activity usage in of the harbor). | \$ | D-1, D-2, D-5, D-6, E-3, H-1, H-2, J-1, J-2, L-1, M-1 | NYS, Town, Suffolk County, Non-profits | Medium term |
| B-5 | Investigate the use of various techniques to remove high levels of phosphorus from Fresh Pond and to reduce existing phosphorus inputs. | \$\$ | C-1, C-4, D-2, D-5, H-1, H-2, L-1, M-1 | NYS, Town, Suffolk County | Long term |
| B-6 | Manage waterfowl populations | \$ | D-1, D-4, D-6, E-5, H-1, J-1 | Town, Suffolk County, PEP, Non-profit partners | Long term |

¹ (\$: \$0-\$50,000; \$\$: \$50,000-\$100,000; \$\$\$:\$100,000-\$300,000; \$\$\$\$: \$300,000+

² See **Table 3** for key and description of funding sources.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost | Potential Funding Sources | Project Sponsor | Completion Timeframe |
|--|---|--------|--|-----------------|----------------------|
| STORMWATER RUNOFF AND WATER QUALITY | | | | | |
| S-1 | Reconfigure, remove unnecessary asphalt and add drainage to unused road ends to prevent direct stormwater discharge to adjoining marine surface waters, the bays, harbors and ocean. Where feasible, utilize bioretention areas to increase detention and to add biological uptake and natural filtration to stormwater prior to discharge. | \$\$ | A-1, C-1, C-2, C-4, D-1, D-2, D-5, F-1A, F-1B, G-1, G-2, H-1, H-2, K-1, K-2, K-3, L-1, M-1 | Town | Short-Medium term |
| S-2 | Where feasible, add subsurface drainage structures in the form of catch basins or leaching galleys in upland areas at higher elevations to capture and recharge stormwater runoff before it reaches low lying areas and prior to discharge. | \$\$ | A-1, C-1, C-4, D-1, D-6, H-1, H-2, K-1, K-2, K-3, L-1, L-2 | Town | Medium term |
| S-3 | Investigate the stormwater and tide flow pipe connections near the intersection of Brander Parkway, North Brander Parkway and Wheeler Drive to determine the most appropriate remediation action to improve environmental conditions. | \$ | C-1, C-2, C-4, H-1, H-2, L-1, M-1 | Town | Medium term |
| S-4 | Install drainage control systems in the unused grass “triangle” between Brander Parkway and North Brander Parkway. | \$\$ | C-1, C-2, C-4, D-1, K-1, K-2, K-3, L-1, M-1 | Town | Short term |
| S-5 | Provide drainage control systems near the base of Serpentine Drive and Sunnyside Drive prior to the intersection with West Neck Road. | \$\$\$ | C-1, C-2, C-4, D-1, H-1, H-2, K-1, K-2, K-3, M-1, L-1 | Town | Medium term |
| S-6 | Install an infiltration swale between West Neck Road and the landscaped area along the roadway to capture and treat runoff from lawns on the hillside prior to discharge to West Neck Bay. | \$\$\$ | C-4, D-1, H-1, H-2, L-1, M-1 | Town | Short term |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost | Potential Funding Sources | Project Sponsor | Completion Timeframe |
|---|---|------------------|--|---------------------------|-----------------------------|
| S-7 | Raise the road elevation near the intersection of West Moreland Drive and West Neck Road and install a culvert beneath the roadway to allow for better flow. | \$\$\$\$ | C-1, C-2, C-4, D-1, H-1, H-2, K-1, K-2, K-3, M-1, L-1 | Town | Short term |
| S-8 | Implement the recommendations contained made in the Dering Harbor Watershed Management Plan which is currently (in progress). | \$ - \$\$\$\$ | C-1, C-2, C-4, D-1, H-1, H-2, K-1, K-2, K-3, M-1, L-1 | Town | Medium-Long term |
| MUNICIPAL FACILITIES RECOMMENDATIONS | | | | | |
| M-1 | Utilize a GIS based database and application to effectively track maintenance and inspection of catch basins. | \$\$ | L-1, M-1 | Town | Medium term |
| M-2 | Prepare a Spill Prevention & Response Plan for all facilities where toxic or hazardous materials are stored and/or utilized. | \$ | Town Staff | Town, Village | Short term |
| M-3 | Provide training for Town/Village maintenance personnel regarding stormwater runoff and water pollution, hazardous materials handling, illicit discharge detection and best management practices | \$ | Town Staff | Town, Suffolk County, PEP | Medium Term |
| M-4 | Provide a designated area in the Town and Village Highway Yards for washing of vehicles with proper filtration and drainage and filtration to prevent toxic or hazardous materials from entering the watershed. | \$\$ | A-1, C-1, C-4, D-1, D-6, H-1, H-2, K-1, K-2, K-3, L-1, L-2, and Town Staff | Town, Village | Medium term |
| M-5 | Complete dry weather monitoring of all outfalls to identify potential illicit connections. | \$ | Town Staff | Town | Short term |
| M-6 | Complete municipal facility and operations audits. | \$ | Town Staff | Town | Short term |
| M-7 | Formally adopt and continue to implement the current turf management practices on Town properties. | \$ | Town Staff | Town | Short term |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost ³ | Potential Funding Sources ⁴ | Project Sponsor | Completion Timeframe |
|-----------------------------------|---|-------------------|---|----------------------|----------------------|
| WASTEWATER RECOMMENDATIONS | | | | | |
| W-1 | Develop a program and update Town and Village Code (see Regulatory Recommendation R-1) to identify and require regular maintenance of septic systems in areas with shallow depth to groundwater (less than 8 feet). | \$\$ | C-3, C-7, D-1, E-1, E-2, L-1, M-1, Town Staff | Town, Village | Medium term |
| W-2 | Consider a cost-shared pump-out and water conservation kit program to aid in cost reduction for sanitary system maintenance. | \$ | H-1, H-2, L-1, M-1, Private Property Owners | Town, Village | Medium term |
| W-3 | Work with other east end municipalities to encourage updates to Suffolk County Sanitary Code in order to allow for the use of alternative sanitary disposal systems that have demonstrated results in other parts of the country. | \$ | C-3, C-7, D-6, E-1, E-2, H-2, Town, SCDHS | Suffolk County | Medium term |
| W-4 | Encourage continued groundwater monitoring and periodic (5 year interval) evaluation of available water quality data to assess and track groundwater quality and elevation on Shelter Island. | \$\$ | D-1, D-2, D-5, D-6, E-3, H-1, H-2, J-1, J-2, L-1, M-1 | USGS, Suffolk County | Medium term |
| REGULATORY RECOMMENDATIONS | | | | | |
| R-1 | Develop a pet waste law requiring pet owners to pick up after their pets and require fines for violations. | \$ | Town Staff - Review laws of other Municipalities | Town, Village | Short term |
| R-2 | Develop a law and associated signage prohibiting the feeding of waterfowl as they contribute nutrients to surface water and stormwater runoff. | \$ | H-1, H-2 and Town Staff | Town, Village | Medium term |

³ (\$: \$0-\$50,000; \$\$: \$50,000-\$100,000; \$\$\$:\$100,000-\$300,000; \$\$\$\$: \$300,000+)

⁴ See **Table 3** for key and description of funding sources.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost ⁵ | Potential Funding Sources ⁶ | Project Sponsor | Completion Timeframe |
|---|--|-------------------|--|-----------------|----------------------|
| R-3 | Revise Town and Village Code regulations to incorporate stormwater containment design requirements on residential properties proposing for greater than 1,000 SF of impervious area increase on existing residentially developed properties. | \$ | Town Staff | Town, Village | Short term |
| R-4 | Revise Town and Village Code regulations to provide stormwater containment drainage storm design requirements for commercial, industrial and newly developed residential properties. | \$ | Town Staff | Town, Village | Short term |
| R-5 | Encourage and incentivize use of green infrastructure in site and drainage design. | \$ | Town Staff | Town/Village | Short term |
| R-6 | As described in Recommendation W-1, revise Town Code to require inspection and certification once every three years for sanitary systems located in areas with shallow depth to groundwater once every three years. | \$ | Town Staff | Town, Village | Medium term |
| R-7 | Revise code regulations for marinas, fueling stations, automotive repair centers and other “hot spot” uses to have a Stormwater Pollution Prevention Plan/BMPs. | \$ | Town Staff | Town, Village | Medium term |
| NATURAL RESOURCE & INVASIVE SPECIES MANAGEMENT | | | | | |
| N-1 | Implement Shell Beach Restoration Plan, when complete. | \$\$\$ | H-1, H-2, J-2, L-1, M-1 | County, Town | Medium term |
| N-2 | Develop a list of native plant species and provide homeowner incentives for utilizing native species in landscaping. | \$ | Town Staff, E-2 | Town | Short term |

⁵ (\$: \$0-\$50,000; \$\$: \$50,000-\$100,000; \$\$\$:\$100,000-\$300,000; \$\$\$\$: \$300,000+

⁶ See **Table 3** for key and description of funding sources.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost ⁷ | Potential Funding Sources ⁸ | Project Sponsor | Completion Timeframe |
|---|--|-------------------|--|------------------------------------|----------------------|
| N-3 | Obtain funding for wetland restoration near the intersection of Sudee Glen and Brander Parkway. This site provides an opportunity for both habitat restoration and drainage improvements near the roadway. | \$\$ | A-1, C-1, C-4, D-1, E-1, E-5, F-2, G-1, G-2, J-1, L-1, M-1 | Town | Medium term |
| N-4 | Where feasible, create and restore wetland buffers surrounding West Neck Bay, Creek and Harbor to reduce nitrogen inputs into the system, which contribute to harmful algal blooms. | \$ | C-4, D-1, H-1, H-2, J-1, L-1, M-1 | Town | Medium term |
| STEWARDSHIP & PUBLIC EDUCATION | | | | | |
| V-1 | Develop a volunteer based group to assist with water quality monitoring activities. | \$ | H-1, H-2, J-1, J-2, L-1, L-2 | Town, Village, Non-Profit Partners | Short term |
| V-2 | Develop an “Adopt-a-Road” program to aid in litter maintenance along local roadways. | \$ | Town Staff, F-2 | Town, Village | Short term |
| V-3 | Develop an “Adopt-a-Beach” program to aid in litter maintenance within public beaches. | \$ | Town Staff, F-2 | Town, Village | Short term |
| V-4 | Obtain funding for a “Septic System Pumpout, Water Conservation and Education program.” | \$ | C-4, D-1, H-1, H-2, L-1, M-1 | Town, Village | Medium term |
| V-5 | Utilize existing public information documents available through Long Island Invasive Species Management Area (LIISMA) group and Cornell Cooperative Extension to provide public information regarding the harmful effects of invasive species. | \$ | Town Staff | Town, Village | Short term |
| V-6 | Develop an informational brochure detailing the harmful effects of phosphorus in waterbodies. | \$ | H-1, H-2, L-1, M-2 | Town | Short term |

⁷ (\$: \$0-\$50,000; \$\$: \$50,000-\$100,000; \$\$\$:\$100,000-\$300,000; \$\$\$\$: \$300,000+

⁸ See **Table 3** for key and description of funding sources.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Cost ⁷ | Potential Funding Sources ⁸ | Project Sponsor | Completion Timeframe |
|------------------|--|-------------------|--|-----------------|----------------------|
| N-3 | Obtain funding for wetland restoration near the intersection of Sudee Glen and Brander Parkway. This site provides an opportunity for both habitat restoration and drainage improvements near the roadway. | \$\$ | A-1, C-1, C-4, D-1, E-1, E-5, F-2, G-1, G-2, J-1, L-1, M-1 | Town | Medium term |
| N-4 | Where feasible, create and restore wetland buffers surrounding West Neck Bay, Creek and Harbor to reduce nitrogen inputs into the system, which contribute to harmful algal blooms. | \$ | C-4, D-1, H-1, H-2, J-1, L-1, M-1 | Town | Medium term |
| V-7 | Develop educational materials detailing the benefits of natural buffers along shorelines. | \$ | H-1, H-2, L-1, M-2 | Town, Village | Short term |
| V-8 | Continue to acquire parcels for preservation identified as “high priority” in the Town Community Preservation Project Plan. | \$ | D-5, I-1, L-1, M-1, M-2 | Town | Long term |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



In addition, measurable objectives are essential in tracking the progress and outcomes of programs or actions implemented. **Table 20** outlines objectives for each recommended action and an outline of the basic steps needed to complete the action.

Table 20: MEASURABLE OBJECTIVES

| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|----------------------------------|--|---|--|
| WATERBODY RECOMMENDATIONS | | | |
| B-1 | Establish a program of regular surface water quality monitoring of West Neck Bay, Creek and Harbor. | <ol style="list-style-type: none"> 1. Establishment of program. 2. Collection and maintenance of water quality data | <ol style="list-style-type: none"> 1. Draft, revise, finalize and approve Water Quality Monitoring Plan 2. Establish designated staff or volunteer group to collect water quality samples 3. Maintain data results in a database |
| B-2 | Seek partners to conduct further study to determine the cause and potential remedial actions for the harmful algal bloom occurrences in West Neck Bay. | <ol style="list-style-type: none"> 1. Study that identifies sources and solutions for red algal blooms in West Neck Bay. | <ol style="list-style-type: none"> 1. Reach out to SUNY, PEP and other potential partners for interest in study. 2. Obtain/designate funding for study. 3. Conduct study and determine implemental remedial actions. |
| B-3 | Explore options for tertiary treatment or the removal of surface water discharge for the Shelter Island Heights STP in order to allow for the potential re-opening of shellfishing in Dering Harbor and increase recharge. | <ol style="list-style-type: none"> 1. Reopening of Dering Harbor to shellfishing. | <ol style="list-style-type: none"> 1. Initiate discussions with SHIPOA regarding potential preferred options for STP upgrades. 2. Identify interested partners and grant opportunities for design & capital improvements. 3. Apply for/secure funding sources & mechanisms. 4. Engineering design & permitting. 5. Bid/Oversight of construction. |
| B-4 | Seek funding & volunteer efforts to conduct water quality testing and monitoring of Major's Harbor (including monitoring of boat usage in the harbor and waterfowl activity usage in of the harbor). | <ol style="list-style-type: none"> 1. Establishment of program. 2. Collection and maintenance of water quality data | <ol style="list-style-type: none"> 1. Draft, revise, finalize and approve Water Quality Monitoring Plan & reach out to municipal labs (Suffolk County, NYSDEC, etc.) to determine if sampling can be conducted through shared resources. 2. Seek lead organization to oversee water |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|------------------|---|---|--|
| | | | quality monitoring. 3. Establish designated staff or volunteer group to collect water quality samples 4. Conduct volunteer training. 5. Maintain data results in a database |
| B-5 | Investigate the use of various techniques to remove high levels of phosphorus from Fresh Pond and to reduce existing phosphorus inputs. | 1. Identification of best technique to remediate high levels of phosphorus in Fresh Pond. | 1. Obtain/designate funding for research on optimal phosphorus removal techniques. 2. Research and provide recommendation on best technique for remediation. 3. Apply for funding sources for implementation. 4. Permitting and project implementation. |
| B-6 | Manage waterfowl populations. | 1. Reduction in waterfowl populations contributing to bacteria and nitrogen contamination of waterbodies. | 1. Obtain/designate funding for known waterfowl control methods (e.g., use of border collies, egg oiling, etc.) 2. Implement selected waterfowl control methods. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|--|---|---|---|
| STORMWATER RUNOFF AND WATER QUALITY | | | |
| S-1 | Reconfigure, remove unnecessary asphalt and add drainage to unused road ends to prevent direct stormwater discharge to adjoining marine surface waters, the bays, harbors and ocean. Where feasible, utilize bioretention areas to increase detention and to add biological uptake and natural filtration to stormwater prior to discharge. | 1. Reduction in stormwater pollutants entering waterbodies from selected road ends. | <ol style="list-style-type: none"> 1. Obtain/designate funding for road end improvement project. 2. Design project to maximize pollutant reduction from stormwater runoff. 3. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 4. Construct project. |
| S-2 | Where feasible, add subsurface drainage structures in the form of catch basins or leaching galleys in upland areas at higher elevations to capture and recharge stormwater runoff before it reaches low lying areas and prior to discharge. | 1. Reduction in stormwater pollutants entering waterbodies through the capture and treatment of stormwater. | <ol style="list-style-type: none"> 1. Obtain/designate funding for drainage improvement project. 2. Design project to maximize pollutant reduction from stormwater runoff. 3. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 4. Construct project. |
| S-3 | Investigate the stormwater and tide flow pipe connections near the intersection of Brander Parkway, North Brander Parkway and Wheeler Drive to determine the most appropriate remediation action to improve environmental conditions. | 1. Detailed information regarding piping. | <ol style="list-style-type: none"> 1. Designate appropriate staff to perform drainage inspection. 2. Inspect system and have staff provide a detailed diagram of existing system. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|------------------|--|---|---|
| S-4 | Install drainage control systems in the unused grass “triangle” between Brander Parkway and North Brander Parkway. | 1. Reduction in stormwater pollutants entering waterbodies through the capture and treatment of stormwater. | <ol style="list-style-type: none"> 1. Obtain/designate funding for drainage improvement project. 2. Design project to maximize pollutant reduction from stormwater runoff. 3. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 4. Construct project. |
| S-5 | Provide drainage control systems near the base of Serpentine Drive and Sunnyside Drive prior to the intersection with West Neck Road. | 1. Reduction in stormwater pollutants entering waterbodies through the capture and treatment of stormwater. | <ol style="list-style-type: none"> 1. Obtain/designate funding for drainage improvement project. 2. Design project to maximize pollutant reduction from stormwater runoff. 3. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 4. Construct project. |
| S-6 | Install an infiltration swale between West Neck Road and the landscaped area along the roadway to capture and treat runoff from lawns on the hillside prior to discharge to West Neck Bay. | 1. Reduction in stormwater pollutants entering waterbodies through the capture and treatment of stormwater. | <ol style="list-style-type: none"> 1. Obtain/designate funding for drainage improvement project. 2. Design project to maximize pollutant reduction from stormwater runoff. 3. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 4. Construct project. |
| S-7 | Raise the road elevation near the intersection of West Moreland Drive and West Neck Road and install a culvert beneath the roadway to allow for better flow. | 1. Relieve periodic flooding that makes the area of West Moreland Drive and West Neck Road impassible. | <ol style="list-style-type: none"> 1. Obtain/designate funding for drainage improvement project. 2. Design project according to current standards. 3. Obtain all necessary permits, including but |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|---|---|---|--|
| | | | <p>not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary.</p> <p>4. Construct project.</p> |
| S-8 | <p>Implement the recommendations contained made in the Dering Harbor Watershed Management Plan which is currently (in progress).</p> | <p>1. Improvement in the water quality of Dering Harbor.</p> | <p>1. Review Dering Harbor Watershed Management Plan.</p> <p>2. Determine high priority recommendations.</p> <p>3. Obtain/designate funding where appropriate.</p> <p>4. Design and permitting process for selected drainage improvement projects.</p> <p>5. Bid and construction oversight.</p> |
| MUNICIPAL FACILITIES RECOMMENDATIONS | | | |
| M-1 | <p>Utilize a GIS based database and application to effectively track maintenance and inspection of catch basins.</p> | <p>1. Create and utilize a geospatial database for drainage infrastructure maintenance.</p> | <p>1. Review geodatabase options and select the most appropriate one for the Town.</p> <p>2. Obtain/designate funding for acquisition of appropriate software and hardware (e.g., computers, GPS, etc.) and purchase necessary items.</p> <p>3. Provide staff training of software and hardware.</p> <p>4. Collect and manage data in geodatabase.</p> |
| M-2 | <p>Prepare a Spill Prevention & Response Plan for all facilities where toxic or hazardous materials are stored and/or utilized.</p> | <p>1. Establish a Spill Prevention and Response Plan in the event of an accidental spill.</p> | <p>1. Review/inventory hazardous materials stored.</p> <p>2. Prepare plan appropriate to materials stored and utilized.</p> <p>3. Train appropriate staff in plan procedures and ensure copy of plan is available at appropriate locations.</p> |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|------------------|---|---|--|
| M-3 | Provide training for Town/Village maintenance personnel on BMPs. | 1. Establish regular training program for highway staff and increase awareness of BMPs and implications of highway activities that can result in pollution to surface waters. | 1. Reach out to Suffolk County, PEP, SeaGrant and other municipalities for existing training opportunities. 2. Participate in regular training opportunities for highway staff. |
| M-4 | Provide a designated area in the Town and Village Highway Yards for washing of vehicles with proper filtration and drainage and filtration to prevent toxic or hazardous materials from entering the watershed. | 1. Minimization of hazardous materials entering the watershed. | 1. Coordinate with other municipalities for design options for catchment systems for vehicle washing areas. 2. Prepare preliminary design of washing area. 3. Obtain/designate funding for proposed improvements. 4. Obtain permits and install/maintain washing area improvements. |
| M-5 | Complete dry weather monitoring of all outfalls to identify potential illicit connections. | 1. Identify and remove illicit connections in to the municipal stormwater system. | 1. Based on mapping of outfalls, identify areas for dry weather survey each year. 2. Train interns or Town highway staff on monitoring methods. 3. Set up and fill out inventory sheets for each outfall surveyed during dry weather events. Track outfalls inventoried. 4. Address any illicit discharges detected through sampling, determining source and enforcement per Town code. |
| M-6 | Complete municipal facility and operations audits | 1. Minimization of hazardous materials entering the watershed. | 1. Coordinate with PEP, SC or other municipalities for example facility audit inventory checklists. 2. Conduct inventory audits for each Town facility (highway yard, golf course). 3. Address any issues detected during audit through Highway Superintendent. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|-----------------------------------|---|--|--|
| M-7 | Formally adopt and continue to implement the current turf management practices on Town properties. | 1. Adoption of turf management practices. | 1. Review current turf management practices and revise as deemed necessary. 2. Memorialize practices in writing and formal approval by Town Board to ensure future continuance of BMP's. |
| WASTEWATER RECOMMENDATIONS | | | |
| W-1 | Develop a program and update Town and Village Code (see Regulatory Recommendation R-1) to identify and require regular maintenance of septic systems in areas with shallow depth to groundwater (less than 8 feet). | 1. Reduction in nitrogen inputs to surface water through better functioning sanitary systems. | 1. Draft, review and finalize a survey and incentive program to obtain baseline data. 2. Obtain/designate funding as necessary to implement program. 3. Conduct survey in designated areas. 4. Store results in a geodatabase for future analysis. |
| W-2 | Consider a cost-shared pump-out and water conservation kit program to aid in cost reduction for sanitary system maintenance. | 1. Establishment of a program to aid in cost of sanitary system pump out | 1. Review other cost share programs and contact municipalities for further detail. 2. Draft program and obtain estimates for cost. 3. Obtain/designate funding for program. 4. Implement program on a trial basis and measure success after designated timeframe (e.g., 3 years). |
| W-3 | Work with other east end municipalities to encourage updates to Suffolk County Sanitary Code in order to allow for the use of alternative sanitary disposal systems that have demonstrated results in other parts of the country. | 1. Options for use of alternative sanitary disposal systems and technologies that improve pollutant removal. | 1. Monitor approved technologies through the SCDHS. 2. Work/support efforts by other LI municipalities evaluating alternative systems. 3. Encourage use of new technologies once approved. |
| W-4 | Encourage continued groundwater monitoring and periodic (5 year interval) evaluation of available water quality data to assess and track groundwater quality and elevation on Shelter Island. | 1. Greater understanding of groundwater quality and quantity | 1. Coordinate with USGS for monitoring of existing groundwater wells. 2. Obtain/designate funding for regular well monitoring. 3. Create a database to store all information collected. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|-----------------------------------|---|--|--|
| REGULATORY RECOMMENDATIONS | | | |
| R-1 | As described in Recommendation W-1, revise Town Code to require inspection and certification of sanitary systems located in areas with shallow depth to groundwater once every three years. | 1. Section of Town Code requiring sanitary system inspection and certification in areas with shallow depth to groundwater. | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |
| R-2 | Develop a pet waste law requiring pet owners to pick up after their pets and require fines for violations. | 1. Reduction in nutrients entering waterbodies through reduction in pet waste. | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |
| R-3 | Develop a law and associated signage prohibiting the feeding of waterfowl as they contribute nutrients to surface water and stormwater runoff. | 1. Reduction in nutrients entering waterbodies through reduction in waterfowl utilizing the area. | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |
| R-4 | Revise Town and Village Code regulations to require provide drainage containment storm design requirements on residential properties proposing for greater than 1,000 SF of impervious area increase on existing residentially developed properties. It is recommended that a minimum of ½” of storage be required for existing impervious surfaces and 1” of storage be required for proposed impervious surfaces. | 1. Establishment of Town code requiring drainage for existing residential properties. | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |
| R-5 | Revise Town and Village Code regulations to provide stormwater containment drainage storm design requirements for commercial, industrial and newly developed residential properties. It is recommended that a minimum of 2” of storage be provided for all proposed impervious surfaces. | 1. Establishment of Town code requiring drainage for industrial, commercial and newly developed residential properties | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|---|---|--|--|
| R-6 | Revise code regulations for marinas, fueling stations, automotive repair centers and other “hot spot” uses to have a Stormwater Pollution Prevention Plan prepared according to the requirements of the most recent multi-sector permit prior to the issuance of any site modification permits. | 1. Establishment of Town code requiring "hot spot" uses to have a Stormwater Pollution Prevention Plan in place. | 1. Draft, revise and finalize code text. 2. Hold public hearing on proposed code revisions. 3. Adopt code. |
| NATURAL RESOURCE & INVASIVE SPECIES MANAGEMENT | | | |
| N-1 | Implement Shell Beach Restoration Plan, when complete. | 1. Restoration of Shell Beach. | 1. Review Shell Beach Restoration Plan. 2. Obtain/designate funding where appropriate. 3. Implement restoration. |
| N-2 | Develop a list of native plant species and provide homeowner incentives for utilizing native species in landscaping. | 1. Use of native plants that provide natural filtration of stormwater runoff. | 1. Review existing resources provided by CCE and other agencies. 2. Develop local native plant list for distribution to residents. |
| N-3 | Obtain funding for wetland restoration near the intersection of Sudee Glen and Brander Parkway. This site provides an opportunity for both habitat restoration and drainage improvements near the roadway. | 1. Restoration of wetland and improvement of local habitat quality. | 1. Obtain/designate funding for wetland restoration. 2. Hire landscape architect/ecologist to design project. 3. Design project to maximize pollutant reduction from stormwater runoff. 4. Obtain all necessary permits, including but not limited to ACOE, NYSDEC, Suffolk County Highway and NYSDOT permits, as necessary. 5. Construct project. |
| N-4 | Where feasible, create and restore wetland buffers surrounding West Neck Bay, Creek and Harbor to reduce nitrogen inputs into the system, which | 1. Reduction of lawn area and creation of buffers along wetland areas. | 1. Establish protocol for buffer width requirement for all wetland permits. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|---|--|--|---|
| | contribute to harmful algal blooms. | | |
| STEWARDSHIP & PUBLIC EDUCATION | | | |
| V-1 | Develop a volunteer based group to assist with water quality monitoring activities. | 1. Establishment of a volunteer group dedicated to water quality monitoring. | 1. Contact other agencies and volunteer groups on establishment of a focused water quality group. 2. Outline volunteer responsibilities. 3. Establish group and maintain dialogue between Town and group. |
| V-2 | Develop an “Adopt-a-Road” program to aid in litter maintenance along local roadways. | 1. Aid in Town litter maintenance along roadways. | 1. Draft program elements. 2. Formally adopt program. 3. Obtain sponsorships from business and other local entities. |
| V-3 | Develop an “Adopt-a-Beach” program to aid in litter maintenance within public beaches. | 1. Reduction of litter accumulation on Town beaches. | 1. Draft program elements. 2. Formally adopt program. 3. Obtain sponsorships from business and other local entities. |
| V-4 | Obtain funding for a “Septic System Pumpout, Water Conservation and Education program.” | 1. Education of homeowners on the impact of septic systems on surface water. | 1. Draft program elements. 2. Identify most appropriate funding source and apply for funding. 3. Once funding is obtained, develop education program and materials and distribute as appropriate. |
| V-5 | Utilize existing public information documents available through Long Island Invasive Species Management Area (LIISMA) group and Cornell Cooperative Extension to provide public information regarding the harmful effects of invasive species. | 1. Education of homeowners on the harmful effects of invasive species. | 1. Review existing resources provided by CCE, LIISMA and other local agencies regarding invasive species. 2. Develop locally specific brochures and other educational materials and distribute as appropriate. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| Recommendation # | Recommendation | Measurable Objectives | Implementation Steps |
|-------------------------|---|---|---|
| V-6 | Develop an informational brochure detailing the harmful effects of phosphorus in waterbodies. | 1. Education of homeowners on the impact of phosphorus inputs to surface waterbodies. | 1. Review existing resources on phosphorus education. 2. Develop locally specific brochures and other educational materials and distribute as appropriate. |
| V-7 | Develop educational materials detailing the benefits of natural buffers along shorelines. | 1. Education of homeowners on the benefits of natural buffers and reduction of pollutants to surface waterbodies. | 1. Review existing resources on the benefit of natural buffer areas to water quality. 2. Develop locally specific brochures and other educational materials and distribute as appropriate. |
| V-8 | Continue to acquire parcels for preservation identified as “high priority” in the Town Community Preservation Project Plan. | 1. Acquisition of key parcels for preservation. | 1. Continue parcel acquisition as appropriate under current procedures and policy. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN

5.2 Funding Sources

The potential funding sources table is keyed to the implementation table for the specified recommendations. With each project recommendation listed, it is recommended that the appropriate Town officials contact agency representatives to discuss funding priorities and specific eligibility requirements. The recommendations that call for public education projects can be funded as a component of other construction type projects.

Many of the recommended projects may be funded under the Environmental Protection Agency's Clean Water Act amendments whose programs are administered in New York State mainly through the New York State Environmental Facilities Corporation. The program offers loans and grants for projects that rate high in overall State rankings. On an annual basis, the agency requests applications for projects to be included in the State's Intended Use Plan (IUP) which is the first step in the funding process. Because the New York State Department of State has funded the current study, implementation projects that are being recommended in this study may rank very high in pursuit of Environmental Protection Fund (EPF) grants. Included is the New York State Member Item Funding as well as Federal Legislative Grant funding for which the Town should contact their New York State and federal representatives to access this funding.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



**Table 21
POTENTIAL FUNDING SOURCES**

| ID No. | Funding Sources | Program | Eligible Activities |
|--------|--|---|--|
| A | U.S Department of Housing & Urban Development | 1. Community Development Block Grant (CDBG) | Drainage, resurfacing, elimination of blight, in designated CD areas serving low and moderate income residents |
| B | New York State Office of Housing & Community Renewal | 1. New York Main Street Program | Construct or improve publically owned infrastructure necessary to accommodate the creation, expansion or retention of businesses. |
| C | New York State Environmental Facilities Corporation | <p>Clean Water State Revolving Fund-</p> <p>1. Green Innovation Grant Program</p> <p>2. Loan Financing</p> <p>3. Section 212- Point Source</p> <p>4. Section 319- Non Point Source</p> <p>5. Clean Vessel Assistance Program (CVAP) Construction Grant Program</p> <p>6. Facility Upgrade Grant Program</p> | <p>Water quality improvement projects - loans and grants for point source projects such as STPs and sewers and nonpoint source projects for stormwater management, land acquisition if related to preserving water quality- projects must be municipally owned-bio-retention, permeable surfaces. Provision for non-municipal projects.</p> <p>Low-interest loans- for green or non-green projects for projects described above/No interest loans for short term financing.</p> <p>STPs Sewers-Design & Construction</p> <p>Stormwater Management, structural & non-structural practices sediment, pesticide and fertilizer control, bio-retention, permeable surfaces. Non-Municipal Non-Point Source, Not-For-Profit Land Acquisition, Highway Deicing Material Storage.</p> <p>75/25 federal funding for the Purchase Pump-Out boats up to \$60,000 finding cap. 75/25 funding for stationary pump-outs purchase and installation</p> <p>75/25 funding for improvements to pump-out boats and/or stationary pump-outs</p> |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| ID No. | Funding Sources | Program | Eligible Activities |
|--------|--|---|---|
| | | 7. Information and Education Grant Program | 75/25 federal funding for education and promotion - \$5,000 maximum funding |
| D | New York State Department of Environmental Conservation (NYSDEC) | 1. Water Quality Improvement Project 2. Urban Forestry Grant Program 3. Environmental Restoration Program 4. Terrestrial Invasive Species Eradication Grant Program 5. Open Space Funding- Title 7 6. Section 106- Water Pollution Control | Municipal wastewater treatment Municipal separate storm sewer systems (MS4s) Nonagricultural nonpoint source abatement and control Aquatic habitat restoration Water quality management (reimbursements up to 85% of project costs) 50/50 cost share for tree planting along streams Investigation and cleanup grants-must have a CBO in partnership with a municipality 50/50 grant program to remove plants and animals as per NYSDEC guidelines Environmental important lands where development pressure exist or are causing pollution Water quality planning & assessments, development of water quality standards, ambient monitoring, development of maximum daily loads, ground water and wetland protection, non-point source control activities, including non-point source controls assessment & management plans Green infrastructure component: tree planting that addresses environmental issues of heat island effect, stormwater management brownfield restoration design, combined sewer overflow (CSO) or energy demand production-50/50 matching grants. |
| E | U.S. Environmental Protection Agency (Note on EPA Water Quality Projects- QAPP-Quality) | 1. Targeted Watersheds Grants Program | 75/25 federal funding for protecting and restoring water uses, forming partnerships using new technologies, market incentives and results-oriented strategies/capacity building grants are available. |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| ID No. | Funding Sources | Program | Eligible Activities |
|--------|---|--|--|
| | Assurance Protection Plan must be EPA adopted at the time that application is submitted) | 2. Surveys, Studies, Investigations, Demonstrations and Training Grants 3. Assessment and Watershed Protection Program Grants 4. Pesticide Environmental Stewardship Regional Grants 5. Section 320- National Estuary Program | Drainage, resurfacing, permeable paving Planning, wetlands protection, coastal and estuarine planning treatment technologies. Examples: development of water protection guides for communities demonstration projects Innovative water quality assessment and modeling techniques, training handbooks Integrated pest management approaches that reduce the risks associated with pesticide use in non-agricultural settings 80/20 grants and revolving loan for CERLA qualified sites Protection of water quality supplies, protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife and habitat restoration. |
| F | FHWA administered by NYS DOT thru Suffolk County DPW- Federal Funding administered by NYS DOT / New York Metropolitan Planning Council (NYMTCC) | MAP-21 1A. Surface Transportation System (STS) 1B. Transportation Enhancements Program | Road reconstruction and drainage/impervious surfaces stormwater outflow devices. road must be designated on Federal Aid Urban system Maps Enhancements to the Transportation System-streetscapes, historic preservation, environmental improvements |
| G | New York State Dept. of Transportation | 1. Consolidated Highway Improvement Program (CHIPS) 2. Multi-Modal Program | Drainage curb, sidewalks, permeable paving Drainage, curb, sidewalks, permeable paving |
| H | New York State Department of State (NYS DOS) | 1. Local Waterfront Revitalization Program (LWRP) | Water quality improvement projects are eligible if part of overall improvement project-planning & implementation e.g. storm drain inserts, various projects that protect harbors, education projects and studies |



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



| ID No. | Funding Sources | Program | Eligible Activities |
|--------|--|--|--|
| | | 2. Environmental Protection Funding (EPF) | Water quality improvement projects are eligible if part of overall improvement project-planning & implementation e.g. storm drain inserts, various projects that protect harbors, education projects and studies |
| I | New York State Office of Parks, Recreation & Historic Preservation | 1. Environmental Protection Fund | Land Acquisition for park purposes |
| J | National Fish and Wildlife Foundation | 1. National Wetland Program Development Grants and Five-Star Restoration Training Grants 2. Native Plan Conservation Initiative | Protect, manage and restore wetlands and streams by: a. Monitoring & Assessment b. Volunteers wetland restoration & protection, and c. Wetland-specific water quality standards partnership with businesses, community & schools projects that benefit multiple species. Achieve a variety of habitat degradation/high priority critical conservation need/Demo projects with a high level of public involvement/leverage funding involving partnerships |
| K | Federal Emergency Management Agency (FEMA) thru NYS Division of Homeland Security & Emergency Services (DHSES) (formally NYS SEMO) | 1. Flood Mitigation Assistance Program 2. Hazard Mitigation Assistance Program 3. Pre-Disaster Mitigation Program 4. Severe Repetitive Loss Program | Various projects to prevent flooding and protecting public and private resources, e.g. road and property elevations, culverts, projects must have a positive benefit-cost ratio, 75/25 funding |
| L | Federal Legislative Grants-Earmarks | 1. Various- thru Congressman and Senators | All initiatives |
| M | NYS Member Item Funding | 1. Various- thru NYS Legislators | All initiatives |



Section 6.0 References



6.0 REFERENCES

- Caniano, Anthony, Teng-Fong Wong and Ronald Paulsen, 1998. Groundwater Modeling of Recharge and Seepage in Coastal Area of Shelter Island West of Coecles Inlet. SUNY Department of Geosciences, Stony Brook, NY and Suffolk County Department of Health Services, Hauppauge, NY.
- Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors), 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.
- Gobler, Christopher, Dianna Berry, O. Roger Anderson, Amanda Burson, Florian Koch, Brook Rodgers, Lindsay Moore, Jennifer Goleski, Bassem Allam, Paul Bowser, Yingzhong Tang and Robert Nuzzi, 2008. "Characterization, dynamics, and ecological impacts of harmful *Cochlodinium polykrikoides* blooms on eastern Long Island, NY, USA." Harmful Algae, Vol. 7, pp. 293 – 307.
- Gobler, Christopher, 2010. "The cause, effects, dynamics, and distribution of *Cochlodinium polykrikoides* blooms and cells in the Peconic Estuary, Suffolk County, NY." Progress Report to the SCDHS.
- Nuzzi, Robert. _____. "*Cochlodinium polykrikoides* in the Peconic Estuary." USA.
- NYSDOS, 2009. "Guidebook: Watershed Plans. Protecting and Restoring Water Quality." New York State Department of State Office of Coastal, Local Government and Community Sustainability. Albany, NY.
- Paulsen, Ronald, Daniel O'Rourke, Christopher Smith and Teng-Fong Wong, 2004. "Tidal Load and Salt Water Influences of Submarine Groundwater Discharge." Groundwater, Vol. 42 No. 7, pp. 990-999.
- Rozell, Daniel, 2007. "Quantifying the Impact of Global Warming on Saltwater Intrusion at Shelter Island, New York Using a Groundwater Flow Model." (Master's Thesis, Stony Brook University, 2007).
- Schubert, C. E., 1998. "Areas Contributing Ground Water to the Peconic Estuary, and Ground-water Budgets for the North and South Forks and Shelter Island, Eastern Suffolk County, New York."_ USGS Water Resource Investigations Report 97-4136.
- Schubert, C. E., 1999. "Ground-Water Flow Paths and Traveltime to Three Small Embayments within the Peconic Estuary, Eastern Suffolk County, New York." USGS Water Resource Investigations Report 98-4181.



TOWN OF SHELTER ISLAND WATERSHED MANAGEMENT PLAN



Shelter Island Draft Comprehensive Plan Generic Environmental Impact Statement (GEIS), Shelter Island, NY.

Simmons, Dale, 1986. "Geohydrology and Ground Water Quality on Shelter Island." USGS Water Resource Investigations Report 85-4165.

Soren, J., 1978. "Hydrogeologic Conditions in the Town of Shelter Island, Suffolk County, Long Island, New York." USGS Water Resource Investigations 77-77.

Suffolk County Comprehensive Water Resource Management Plan, 2011. Sections 3, 4 and 5, Tasks 4.4 and Task 7.6/7.7 of SCCWRMP, Yaphank, NY.