

West Meadow Creek Management Plan

Part 1 Inventory and Analysis

MARCH 2001

**Town of Brookhaven
3233 Route 112
Medford, New York 11763**

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Part 1 - Inventory and Analysis

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Section 1

Introduction

1 INTRODUCTION

1.1 Study Area Overview

West Meadow Creek (WMC) is a tidal creek, lacking a surface source of freshwater input other than episodic discharges of stormwater runoff. WMC is a tributary to Stony Brook Harbor, an embayment of Long Island Sound. WMC is named for its abundant salt marshes, which were historically known as “meadows”, and its location on the west side of the Old Field peninsula, at the westernmost edge of the Town of Brookhaven.

WMC lies between the north side of the Harbor Hills moraine to the east, and West Meadow Beach (a 7,000-foot long barrier spit that is best known for its approximately 98 beachfront cottages that date back to 1917) to the west. WMC comprises one of the largest and most diverse coastal ecosystems on the north shore of Long Island, and has had an interesting history.

WMC is a rather recent addition to the geology of the north shore of Long Island, having been formed only within the past 10,000 to 15,000 years. Approximately 20,000 years ago, the northern hemisphere was covered by extensive glaciers that pushed sand and rocks southward, and deposited these sediments to form Long Island. As the glaciers retreated, their meltwater formed a large lake in what is today Long Island Sound. Eventually, the rise in sea level that accompanied the melting of the glaciers as they retreated northward caused the ocean to flood into the lake.

Following the retreat of the glaciers, wind-driven waves and tides attacked the shoreline of Long Island, eroding the moraine and providing an abundant source of sediments. The sediments eroded from the moraine on the west side of the headland at Crane Neck Point were carried by the prevailing long-shore transport and were deposited to form a spit (i.e., West Meadow Beach) which extends southward from the headland.

The West Meadow Beach spit created a long and narrow embayment that was protected from the waves of Long Island Sound. This protection enabled fine grained sediments to be deposited in the embayment, which provided a platform upon which the salt marsh cordgrass, *Spartina alterniflora*, could colonize. As the *Spartina* meadows spread out through the embayment, they increasingly constricted the tidal flow of water, increasing its velocity and thereby preventing the continued lateral growth of the salt marsh, resulting in a meandering creek. The twice-daily tides import clean, nutrient-rich water and species from Long Island Sound to feed and reproduce in the sheltered environment of WMC. The outgoing tide export contaminants, food, and species from the creek to the Sound.

Fortunately, the salt marshes of WMC have largely been spared from the development and filling that has impaired or destroyed so many of Long Island’s tidal wetlands, although its

watershed has been residentially developed. WMC's rich coastal wetland ecosystems provide a range of habitats that support a variety of species. WMC is one of the most important waterfowl wintering areas in the northern Suffolk County and is used by several species of herons, egrets, and ospreys. The creek also provides habitat for many forage fish species and is inhabited by oysters, ribbed mussels, blue mussels, and hard and soft clams.

In the 1950s, the Marine Conservation Center, which is now operated by the Ward Melville Heritage Organization, was built. This facility offered Long Island's first summer program in marine biology for high school students. In recognition of its ecological values, WMC, together with Stony Brook Harbor, was designated a New York State Significant Coastal Fish and Wildlife Habitat in 1987. WMC (as part of the Port Jefferson-Stony Brook Harbor Complex) was also included as a Significant Coastal Habitat by the U.S. Fish and Wildlife Service in 1991.

In addition to its ecological importance, WMC also has been important in the growth and development of the area. During the colonial period, the salt meadows of WMC were harvested to provide thatch for roofing, bedding, and animal feed. However, by the late 1800s, the harvest of the salt meadows had declined in importance.

The shore of the Creek also was used for shipbuilding for a time. As early as 1750, the Wells Shipyard was constructing small coastal sailing boats. The shipyard operated until the 1960s, when the shipbuilding operation was replaced by the repair of recreational boats. In the 1990s, the shipyard property was converted into a residence.

WMC also figured in residential development of the area. In the 1920s, as part of a plan to develop a residential community at the head of WMC, the northern end of creek was dredged to create a boat basin that was to be connected to Long Island Sound by a cut through West Meadow Beach and to provide fill for the marshland surrounding the basin. About 35 acres of wetlands were destroyed either by dredging or filling. The headwater basin was approximately 1,800 feet long, 328 feet wide and as much as 20 feet in depth. A channel was dredged in the adjacent section of the creek for a length of 820 feet, to a width of 260 feet and a depth of 10 feet. The residential development was never built.

In the 1950s, Aunt Amys Creek and approximately seven acres of wetlands were dredged as part of a subdivision known as Stony Brook Shores. The dredged material was used to provide fill for the housing lots that were constructed.

At the entrance to WMC is the study area's most significant landmark, Shipmans Point. Named after William Shipman, this is the location of what is known as the "Gamecock Cottage". Shipman traveled extensively in Europe in the early 19th century. In about 1864, he built a two-story Victorian structure with gingerbread trim and small balconies, which is

the raising of exotic birds, but Shipman later moved this structure off his estate and barged it to the tip of West Meadow Beach, where it was used to store his rowing sculls. In the late 1930s, the property was acquired by Mrs. Frank Melville, who used it as a rental cottage affiliated with the Three Village Inn. In 1947, the site was sold to the Town of Brookhaven, which leases it to the Ward Melville Heritage Organization.

A name that often is associated with WMC is Ward Melville. A philanthropist, Melville in 1939 founded what was to become the Ward Melville Heritage Organization to preserve historic structures and manage sensitive environmental properties in the WMC area. Melville purchased and either developed or protected several key properties on WMC, including: an 88-acre Nature Preserve; the North Shore Horse Show Grounds, which subsequently was taken over by Suffolk County; and the Old Field Club, a private country club that was built as a gunning lodge.

Overall, WMC has remained largely in its original condition, with the notable exception of the two dredging projects and the residential development within its watershed. The development of the watershed area probably has somewhat modified some of the natural ecological relationships between the water and the land, and also serves as a source of contaminants that enter the creek through stormwater. While the level of impact is not seen as significant, it does makes WMC a little less natural and pristine, and for this reason is still of concern.

1.2 Project Description, Purpose, Scope, Objectives and Goals

This report provides an inventory and analysis of environmental conditions in the WMC drainage basin, including the creek itself and the upland watershed area. The study area is treated as a single environmental and hydrographic unit, one that is influenced by the Stony Brook Harbor system. The development of a management plan containing recommended measures to preserve and enhance the important environmental and recreational resources of the creek and its watershed is **not** included in the present study, but will be undertaken during the next phase of the project.

WMC is located on the Old Field-Stony Brook-Setauket peninsula, in the northwestern corner of the Town of Brookhaven, in Suffolk County, New York. WMC is a meandering tidal creek that is connected to Stony Brook Harbor near its mouth. WMC extends a total linear distance of approximately 9,500 feet from its mouth to its northernmost point adjacent to the West Meadow Road. WMC has a single significant tributary, Aunt Amys Creek, which extends to the east of the main channel of WMC. The WMC system receives drainage from an upland watershed area that encompasses approximately 890 acres.

This study addresses the range of parameters that affect the environmental quality of WMC. These parameters include: bathymetry (Section 2.1.1); hydrography and flushing characteristics (Section 2.1.2); sediment distribution and dredging history (Section 2.1.3); water quality

(Section 2.1.2); sediment distribution and dredging history (Section 2.1.3); water quality (Section 2.1.4); ecological resources (Section 2.2); existing zoning and land use (Section 2.3); existing water uses (Section 2.4); and stormwater drainage characteristics (Section 2.5).

The specific objectives of this first phase of the West Meadow Creek Management Plan are:

- to prepare a descriptive inventory of the pertinent environmental resources and characteristics of the study area;
- to summarize the provisions of existing local laws as they relate to the protection of the environmental resources described in the inventory;
- to identify and describe important issues regarding the preservation and enhancement of those environmental resources in the study area that are included in the inventory; and
- to establish a meaningful basis for the subsequent development of a management plan for the study area, which will include a series of recommendations to preserve and enhance the environmental quality of WMC and its associated natural resources.

The management plan developed during the next phase of this project will be based on the inventory and analysis presented in this report, and will seek to further the following three primary project goals:

- to maintain and, to the extent practicable, enhance water quality in WMC;
- to preserve and protect important ecological resources in the study area; and
- to enhance recreational opportunities, in a manner that is consistent with the two natural resource management goals specified above.

This project is being completed in cooperation with the New York State Department of State (NYS DOS), and has been supported by a matching grant awarded by NYS DOS through the Environmental Protection Fund Program.

1.3 Study Area Boundary and Geographic Context

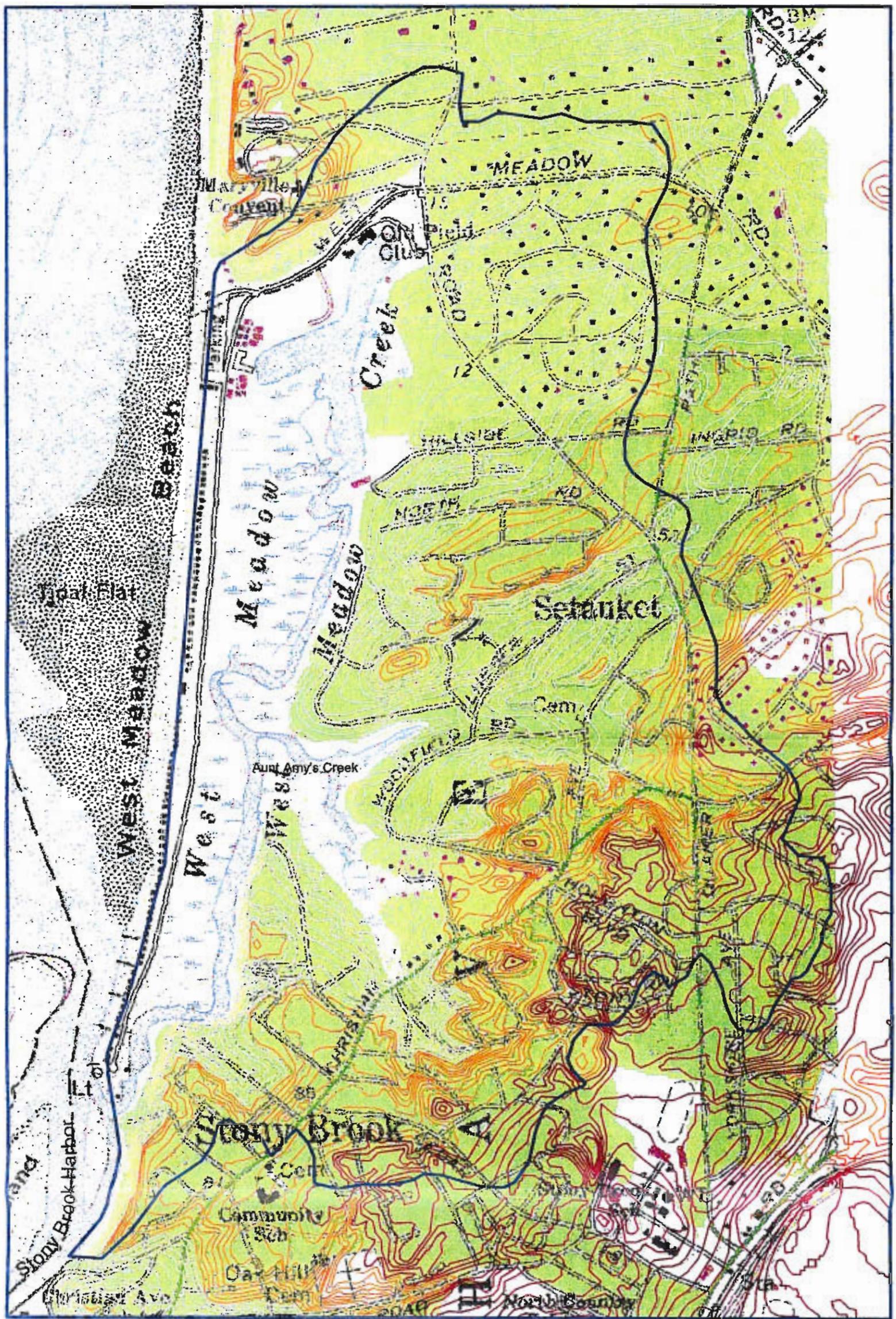
The study area extends to the limits of the watershed that contributes drainage to WMC, and also includes the surface waters and marshlands within the creek itself. The boundary of this area initially was drawn on detailed topographic maps and then was verified based on field observations of apparent drainage patterns.

The WMC watershed boundary follows the surrounding ridge line, which lies to the east of the creek at an average distance of approximately 3,700 to 5,600 feet, and extends approximately 1,500 feet north of the creek's northerly terminus, across West Meadow Road, and into the Incorporated Village of Old Field — see Map 1.

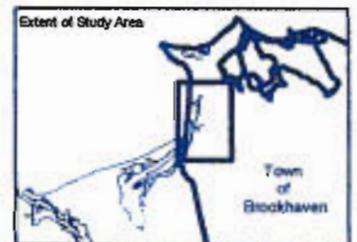
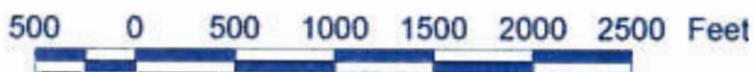
To the west, WMC is enclosed by the West Meadow Beach barrier spit and its associated tidal wetlands. Only the easterly portion of this spit and the back-barrier wetlands actually contribute drainage directly to the creek, with the divide placed just west of Trustees Road. The westerly side of the beach drains to Smithtown Bay and Stony Brook Harbor.

A boundary description based on the street grid is as follows:

- northward on the West Meadow Beach peninsula, from its southerly terminus, along a line lying just to the west of Trustees Road;
- turning northeastward, north of West Meadow Road extension;
- continuing northeastward across Dodge Lane, to a point on Mount Grey Road just north of the Blueberry Ridge Road intersection;
- turning sharply southward, and continuing along the east side of Mount Grey Road, across Blueberry Ridge Road;
- turning sharply eastward, and continuing along a line between Blueberry Ridge Road and West Meadow Road, across The Byway;
- turning southward just to the west of the intersection of West Meadow Road and Crescent Bow;
- continuing southward through the intersection of Highwood Road and Southgate Road, then across Hillside Road to the west of Quaker Path;
- turning southeastward, and crossing Quaker Path, just north of the intersection of Friends Road;
- continuing southeastward, across Friends Road;
- turning southward, and crossing Christian Avenue, just west of the intersection of Woodland Drive;
- continuing southward, across Brandywine Drive;
- turning southeastward, Cumberland Path and Ridgeway Avenue, just east of Tallmadge Gate;
- turning southward, then southwestward, across Huyler Court;
- turning sharply southeastward, then gradually curving to the southwest again, across Huyler Road and William Penn Drive;
- continuing southwestward across Archer Drive, just east of Cooper Court, and across Tudor Drive, east of the intersection of Yorkshore Avenue;
- turning northwestward, to the south of the intersection of Tudor Drive and Yorkshore Avenue;



West Meadow Creek Management Plan
USGS TOPOGRAPHICAL MAP



Map Produced March 14, 2001

MAP 1 - USGS TOPOGRAPHICAL MAP

- continuing northwestward, to the east side of Quakers Path, at the intersection of Houghton Boulevard;
- generally southwestward, across Club Path, just east of Woodbine Avenue;
- turning southward, then southeastward, to the intersection of St. Marks Avenue and Know Avenue;
- southwestward along the north side of Knox Avenue;
- continuing southwestward, across Poplar Avenue, just west of the intersection of Locust Avenue;
- turning westward, through the intersection of Cedar Street and Poplar Avenue;
- continuing generally westward, across Kemswick Drive and Bunker Light Road;
- turning sharply northward, to Christian Avenue, just south of the intersection of Bennett Lane;
- southwestward along Christian Avenue, then turning sharply northwestward at a point east of the intersection of Terrell Lane (Lilac Drive);
- continuing northwestward across Ely Lane, just north of the intersection of Terrell Lane (Lilac Drive);
- turning sharply southwestward and crossing Terrell Lane (Lilac Drive), Shore Oaks Drive, Laurel Drive, and the terminus of Soundview Court;
- continuing southwestward, and then turning sharply westward, to the terminus of Sand Street at the shoreline; and
- crossing the mouth of West Meadow Creek, to the starting point.

As noted above, WMC is a tidal water body that is connected to Stony Brook Harbor. The harbor is located at the southeast corner of Smithtown Bay, which is contiguous with the open waters of Long Island Sound. The WMC study area is situated entirely within the Town of Brookhaven, and lies mostly within the unincorporated communities of Stony Brook and Setauket, but also includes a small area at the southern end of the Incorporated Village of Old Field. The Brookhaven-Smithtown town boundary passes through the mouth of Stony Brook Harbor, just to the west of the study area, about 200 feet off the southerly tip of West Meadow Beach peninsula.

The mouth of Stony Brook Harbor comprises a single channel connected to the open waters of Smithtown Bay. This channel bifurcates just off the southerly tip of the West Meadow Beach peninsula. The northern/western branch is Porpoise Channel, which is the primary navigation route into the interior portion of Stony Brook Harbor. The southern/eastern channel is called the Yacht Club Spur over its northernmost 2,000 feet. Youngs Island lies between these two channels, which merge again at the southern tip of this island. To the east of the Yacht Club Spur, near the northern tip of Youngs Island, is a much smaller island (known as Jens Island), which lies across the mouth of WMC. Jens Island creates two separate channels between WMC and Stony Brook Harbor: one channel extends southward and connects to the Yacht Club Spur; while the second channel curves to the northwest, passing between the southerly tip of the West

Meadow Beach peninsula (which is also known as Shipmans Point) and Jens Island, and intersects the harbor's main entrance channel.

The upland portion of the WMC watershed, to the east of the creek, is situated on the Harbor Hill Terminal Moraine. This is a ridge that was formed along most of the north shore of Long Island by the advancing glacier during the last ice age. West Meadow Beach, which lies to the west of the creek, is a sandy barrier spit that was created by the littoral transport of sand southward from the headland at Crane Neck Point in Old Field.

1.4 Significance of Study Area

WMC and its surrounding tidal wetland and maritime habitats comprise an important ecological resource, as testified by the establishment of special designations covering this area under a number of State and Federal natural resource protection programs. These designations include the following:

- this area is part of the Port Jefferson-Stony Brook Harbor Significant Coastal Fish and Wildlife Habitat (SCFWH), as identified by the Fish and Wildlife Service of the U.S. Department of the Interior
- this area is part of the Stony Brook-Setauket Outstanding Natural Coastal Area (ONCA), as identified by NYSDOS in their draft Long Island Sound Coastal Management Plan
- WMC and its associated salt marshes are part of the Stony Brook Harbor and West Meadow SCFWH, as identified by NYSDOS
- WMC and its associated salt marshes have been mapped as tidal wetlands by the New York State Department of Environmental Conservation (NYSDEC), and are regulated under the New York State tidal wetland regulations promulgated in 6 NYCRR Part 661

According to the *Project Description* written by NYSDOS for the SCFWH, Stony Brook Harbor and West Meadow comprise one of the largest and most diverse coastal wetland ecosystems on the north shore of Long Island, having regional significance. This area is important to many species of fish and wildlife throughout the year. The extensive salt marshes, intertidal flats and shallows in this area, including those surrounding West Meadow Creek, are used extensively as feeding sites for birds nesting within the SCFWH, as well as for many other species during migration (shorebirds in particular). This SCFWH also is characterized as one of the most important waterfowl wintering areas (November through March) in northern Suffolk County, and is a productive area for marine finfish, shellfish and other wildlife. The bay and

creeks in the SCFWH serve as nursery and feeding areas, generally between April and November, for winter flounder, bluefish, blackfish, and forage fish species.

According to the discussion of the Stony Brook-Setauket ONCA in the draft Long Island Sound Coastal Management Program, this area contains diverse natural communities. Among the communities enumerated by NYSDOS that are present in the WMC study area are: hillsides with mixed hardwood forests; barrier spits with beaches and dunes; tributary tidal creeks with marine subtidal areas, tidal flats, and intertidal and high salt marshes; and freshwater wetlands (in the upstream portions of Aunt Amys Creek, which is the branching tributary on the east side and approximately 4,000 feet upstream of the mouth of WMC, in the vicinity of Woodfield Road). The Okeanos Ocean Research Foundation has found the loggerhead sea turtle, a Federally-designated threatened species, in WMC. The diamondback terrapin, a State-designated species of special concern, has been reported to occur in Stony Brook Harbor, and may be present in WMC.

1.5 Relationship to Other Plans

As noted in Section 1.4 above, the present study area has received special attention in a number of State and Federal plans and programs, which highlight the significance of the natural resources in this area and the importance of protecting these resources. The relevant plans, and their relationship to the present management plan for WMC, are discussed below.

1.5.1 Long Island Sound Coastal Management Program

Of particular relevance to the present investigation is NYSDOS's *Long Island Sound Coastal Management Program (LISCMP)*, which establishes 13 policies to provide guidance for the evaluation of actions in the State's coastal area adjacent to the Sound, so as to ensure that an appropriate balance is attained between economic development and environmental preservation. Implementation of these policies will permit beneficial use of the Sound's coastal resources, while ensuring that these resources are protected from adverse impacts. The LISCMP policies serve as the basis for consistency determinations by State and Federal agencies for actions within the boundaries of the Long Island Sound coastal area. The management plan for WMC must be consistent with these policies.

As noted previously, the present report presents only the inventory and analysis of environmental conditions in the WMC study area, with no actions actually being recommended at this time. The next phase of the project will entail the development of a management plan, comprising a series of recommended actions, which will be required to be consistent with LISCMP policies. Although the exact nature of those recommendations is not known at this time, all components of the future action plan will be targeted toward the project goals outlined in Section 1.2 (i.e., to maintain and, to the extent practicable,

enhance water quality in WMC; and to preserve and protect important ecological resources in the study area). These project goals are consistent with the following LISCMP policies:

Policy 1: Foster a pattern of development in the Long Island Sound coastal area that enhances community character, preserves open space, makes efficient use of infrastructure, and minimizes impacts to natural resources — Implementation of both project goals will advance the policy of enhancing community character, preserving open space, and minimizing natural resource impacts

Policy 6: Protect and improve water quality and supply in the Long Island Sound coastal area. — This policy statement encompasses the first project goal.

Policy 7: Minimize environmental degradation in the Long Island Sound coastal area from solid waste and hazardous substances. — This policy statement is one aspect of the first project goal.

Policy 9: Protect and restore the quality and function of ecological systems within the Long Island Sound coastal area. — This policy statement is essentially identical to the second project goal.

Policy 12: Protect and improve visual quality throughout the coastal area. — Visual quality will be protected, and possibly even improved, through actions undertaken to advance the project goals of maintaining/enhancing water quality and preserving important ecological resources.

The remaining eight LISCMP policies do not relate to the goals and objectives of the WMC management plan. Therefore, actions taken in accordance with this plan will not advance those other LISCMP policies, but neither will such actions be inconsistent with those policies. Therefore, a management plan that is developed in accordance with the specified project goals, in accordance with the analysis that is presented in this report, will be fully consistent with the State's current Long Island Sound coastal policies.

The LISCMP places WMC (including its associated wetlands and barrier spit) within one of only three ONCAs delineated in the entire coastal area of New York State bordering on Long Island Sound. The LISCMP describes the natural resources of the ONCA as being at risk due to historic and current human habitation, which has altered the landscape and adversely affected ecosystem functions. Water quality is threatened by a variety of contaminant inputs, especially from non-point sources, primarily stormwater runoff, but also including failing sanitary systems and wildlife fecal wastes. Although the waters of WMC are designated by NYSDEC as "SA", which indicates that the best use is for

shellfish harvesting for market purposes, these waters are permanently uncertified for this use because of chronic bacterial contamination derived mainly from upland sources.

NYSDOS's ONCA analysis also indicates that additional management measures are needed in order to protect the important environmental resources in the Stony Brook-Setauket habitat area. The present report will provide the requisite inventory and analysis that will serve as the basis for a plan to identify appropriate management measures for the WMC portion of this habitat area.

1.5.2 *Long Island Comprehensive Waste Treatment Management Plan*

The *Long Island Comprehensive Waste Treatment Management Plan* (Long Island Regional Planning Board, 1978), which is commonly referred to as the 208 Study because it was prepared pursuant to Section 208 of the Federal Water Pollution Control Act Amendments of 1972, was undertaken to investigate waste disposal options and to identify the best practices for the protection of groundwater and surface waters on Long Island. Among the recommendations of the 208 Plan for the hydrogeologic zone encompassing WMC — which comprises an area of shallow groundwater flow that discharges primarily to streams and marine surface waters — is the following:

- control stormwater runoff to minimize the transport of sediment, nutrients, metals, organic chemicals, and bacteria to surface waters and groundwater.

Actions that are proposed under the next phase of the present plan to achieve the goals of maintaining/enhancing water quality would also advance the above-referenced recommendation of the 208 Plan.

1.5.3 *Nationwide Urban Runoff Program*

The 208 Study focused attention on stormwater runoff as the primary overall source of contaminant loadings to surface waters and groundwater on Long Island. Subsequently, a more detailed investigation was undertaken pursuant to the Federal Water Pollution Control Act Amendments of 1972 in order to address some of the more critical areas of uncertainty remaining from the 208 Study and to identify actions that could be taken by all levels of government to mitigate the impacts of stormwater runoff in the region. That follow-up study was the Long Island Segment of the *Nationwide Urban Runoff Program* (Long Island Regional Planning Board, December 1982), commonly referred to as the NURP Study.

The NURP Study indicates, in general, that significant areas of Long Island's bays and harbors which presently are uncertified potentially could be reopened for shellfish

harvesting if the sources of stormwater runoff discharged to these waters are controlled. Furthermore, it was concluded that the annual value of clams that could be harvested from a given acre of reopened shellfish land may compare favorably with the annual cost associated with reopening that acre. Since WMC (and the adjoining area outside the creek which extends about half-way down the east side of Youngs Island) presently comprises an uncertified shellfishing area, measures to mitigate stormwater runoff that are formulated during the next phase of the present management plan potentially could allow expansion of the area available for the harvesting of shellfish resources.

1.5.4 *Brookhaven Open Space Study*

The *Brookhaven Open Space Study* was conducted by Robert Lambe on behalf of the Town's Conservation Advisory Committee in 1985. That study was prepared in response to the rapid development pressures that were being placed upon the Town and its environment at that time. The Open Space Study included an analysis of important issues based on review of existing literature and the results of resident surveys, and established a number of open space management objectives, among which the following have been carried forward into the present investigation:

- protect open space resources such as farmland, wetlands and "wilderness" areas of the community;
- enhance the communities' special qualities and character;
- maintain tree cover; and
- guard against erosion and water pollution.

The other objectives stated in the Open Space Plan relate to the conservation of renewable natural resources, control of new development, provision of recreational facilities, conservation of historic features, and similar issues that are not directly relevant to the present investigation.

Section 2

Inventory of Existing Conditions

2 INVENTORY OF EXISTING CONDITIONS

2.1 Physical Conditions

2.1.1 Creek Bathymetry

WMC is generally described as a shallow tidal creek. The bathymetry of the main channel of WMC, as well as the main channel and both branches of the Aunt Amys Creek tributary, was altered greatly by dredging between the 1920s and 1950s which was undertaken in association with planned or completed development.

A bathymetric survey using a Raytheon fathometer was conducted as part of the study titled *The Hydrography of West Meadow Creek as It Relates to Management* (1996), which was undertaken cooperatively by the Town of Brookhaven, and the Waste Reduction and Management Institute and the Coast Institute of the Marine Sciences Research Center of the State University of New York (SUNY) at Stony Brook. The thalweg, or line connecting the deepest points along the channel, was determined by running a series of cross-channel transects. The bathymetric data were corrected to compensate for tidal variations, which were recorded concurrently with the survey, in order to establish reference to a common datum.

The average depth of the thalweg, not including the artificially deepened basin at the head of WMC, was measured at approximately 2.6 feet below the mean low water level in Stony Brook Harbor (MLW/SBH). The depth of the headwater basin in WMC extends down to a maximum of approximately 15.5 feet and averages greater than 10 feet below MLW/SBH. At the mouth of WMC, the thalweg depth is approximately 6.5 feet below MLW/SBH. In general, within the main length of WMC between the deepened section at the mouth and the southerly limit of the headwater basin, the thalweg depth varies between 2 and 4 feet below MLW/SBH, although some of the shallower sections of the creek are exposed at low water and some sections reach depths of 6 feet. The bed of the main channel of WMC, outside the thalweg, lies above MLW/SBH for most of its length. Mean tide level in WMC is approximately 3.3 feet above MLW/SBH.

Aunt Amy' Creek (AAC) intersects the main channel of WMC at a shoal over which the water depth is approximately 2 feet below the average of the high and low tide levels for the day that the survey was conducted. The channel floor of AAC deepens to approximately 4 feet below mean MLW at a distance between 490 and 900 feet from its mouth. Upstream of that segment, AAC bifurcates and becomes shallower to the head of each branch.

2.1.2 Hydrography and Flushing Characteristics

WMC is flushed by the tides in Long Island Sound that propagate into Stony Brook Harbor. Each tidal cycle is completed in 12.42 hours. Thus, almost two full tidal cycles are completed each day.

As noted in Section 1.2, WMC is connected to Stony Brook Harbor via two distinct channels. One channel extends southward between the Stony Brook mainland to the east and Jens Island to the west. The second channel curves to the northwest around the southerly tip of the West Meadow Beach peninsula, and to the north of Jens Island. It is estimated, based on measurements of cross-sectional areas, that magnitude of tidal exchange is similar for these two channels, with a slightly greater flow occurring through the branch to the north of Jens Island. Both branches presently are clogged due to ongoing sediment deposition. The cross-sectional area at low tide is only about 100 square feet in the channel to the east of Jens Island and only about 17 square feet in the northerly channel.

In principle, the cross-sectional area of a stable inlet depends on the tidal prism¹. One simplified, generalized estimate is that the cross-sectional area (in square feet) is approximately 1,000 times the volume of the tidal prism (in square mile-feet) to the 0.85 power. In 1991, the Marine Sciences Research Center of SUNY at Stony Brook measured cross sectional areas at 20 locations along the length of WMC. The cross-sectional area was measured to be approximately 581 square feet at the mouth of WMC, and 377 square feet at the mouth of AAC. Preliminary calculations indicated that the existing tidal prism was not sufficient to maintain the observed cross-sectional area at either of these locations. This suggests that the existing tidal exchange is not likely to reverse shoaling at the mouth of either creek naturally.

The tidal flushing and pollution susceptibility of WMC were analyzed in *The Hydrography of West Meadow Creek as It Relates to Management* (1996). Hydrographic observations were made at seven stations along the creek. Tidal elevations were measured directly using a tidal staff placed vertically into the water at three locations: Gamecock Cottage, just inside the mouth of WMC; AAC; and the Marine Conservation Center, on the west shore of WMC, approximately 4,700 feet upstream from the mouth. Tidal elevations at the other stations were determined using a Polaroid Accutape II, Model MS-32 ultrasonic distance measuring device that was calibrated using a steel tape.

¹ Tidal prism is defined as the difference in the volume of water in an embayment during low tide versus high tide. This is the amount of water that enters the embayment during the flood tide and which flows back out of the embayment during the ebb tide.

For the 1996 report, current velocity data were recorded using a Marsh-McBirney Model #511 electromagnetic current meter at four stations: Gamecock Cottage; the Marine Conservation Center; the former Wells Boat Yard site, located about 1,500 feet upstream of the mouth of WMC; and Koppelman's Dock, located about 1,300 feet south of the northerly end of WMC. At three other stations, current speeds were estimated by measuring the speed of drifting objects traveling over a measured course.

The frictional resistance caused by the channel bottom and sides retards the movement of water up WMC, resulting in tidal characteristics that are typical of a progressive wave in shallow water, including the following:

- the mean tidal range at the Stony Brook Yacht Club (which is located just outside the mouth of WMC) is 6.1 feet, but diminishes to about 4.5 feet near the Old Field Club (at the head of WMC);
- the tidal current in WMC continues to ebb for a period of time after the tidal level starts to rise again following low water in Stony Brook Harbor (this occurs because the creek does not drain completely before the rising tide commences in harbor); and, conversely, WMC is still flooding for a period of time following high water in the harbor;
- high water travels up the creek from its mouth to its head in approximately one-half hour, but it takes low water more than two hours to travel the same distance; and
- most of the difference in the time of occurrence of high or low water along the length of WMC is accounted for by the passage of the tidal wave between the mouth of the creek and the Marine Conservation Center (located near the midpoint of the creek); both high water and low water travel relatively rapidly between the Marine Conservation Center and the head of the creek at the Old Field Club.

Although possessing many characteristics of a progressive wave, tidal flow in WMC also exhibits a number of attributes of a standing wave. Typical of a standing wave, slack water generally occurs throughout most of WMC near the times of high and low tide, and the maximum tidal current speed decreases as one proceeds from the creek's mouth to its head. Maximum ebb flow exceeds 2.4 feet/second near the mouth of the WMC, but is reduced to 0.15 foot/second at Koppelman's Dock (about 1,300 feet south of the head of WMC). The slowest velocities occur at the Old Field Club and at the extreme upper ends of the branches of AAC. The average current speed over any particular flood or ebb current would be between 1.0 and 1.6 feet/second. Mean current speeds probably do not exceed 0.7 foot/second in AAC.

There is considerable imbalance in the duration of flood tide relative to ebb in WMC. The rising tide occurs over approximately 5.2 hours near the head of creek, while the duration of the falling tide at this location is approximately 7.2 hours. Since the same volume of water flows up the creek during the flood portion of the cycle as is discharged back to Stony Brook Harbor during the ebb portion of the cycle, the average flood velocity is greater than the average ebb velocity. This results in a flood current that is relative strong for a shorter period of time, compared to a somewhat weaker but longer lasting ebb current. Such a “flood dominated” condition is common in the embayments on Long Island’s north shore.

Over the course of a lunar month, the tidal range increases to about 6.9 feet in Stony Brook Harbor during spring tides at the new and full lunar phases, and decreases to about 5.3 feet during neap tides at the first and last quarter phases, compared to a mean range of 6.1 feet at this location. Superimposed on this cyclical variation in water elevation are the episodic effects of weather. In Long Island Sound, storm tides (i.e., storm surges) with a range of about three feet might be expected on an annual basis. Because of shallow water depths in WMC, moderately strong winds can increase or decrease water elevations, shift the times of high and low tide, and alter the speed and direction of the current.

The mean tidal excursion is the average distance that a particle of water moves upstream during the flood portion of the tidal cycle. Within AAC, the tidal excursion is relatively small compared to the rest of the WMC system, but still exceeds the entire length of AAC. The tidal excursion at Sound View Beach, located approximately 2,000 feet from the northerly end of WMC, also is relatively small, but still exceeds the distance to the mouth of WMC. However, since the velocity of the current at the head of WMC (i.e., at the Old Field Club) and at the head of AAC is very small, the tidal excursion at these points would approach zero. Overall, water entering WMC can theoretically travel up almost the entire length of the creek during the flood tide, to be flushed back out into Stony Brook Harbor during the next ebb tide if the water stays in the main channel and is free to move with the current.

2.1.3 Benthic Sediment Distribution and Dredging History

The distribution of sediments in aquatic systems is determined primarily by the sources of sediment inputs and current velocities. In general, coarser sediments are found in areas of strong currents, while finer sediments tend to be found in areas with lower energy currents.

As part of field survey conducted for *The Hydrography of West Meadow Creek as It Relates to Management* (1996), a series of 38 grab samples was collected along the axis of WMC. These samples were wet-sieved to separate gravel from sand, and pipette analysis was conducted to determine the content of silt and clay. At the mouth of WMC,

and extending upstream for a distance of about 2,000 feet, the bottom sediment was comprised entirely of coarse-grained material, including a large fraction of gravel and a significant amount of cobbles. The sediment samples collected in the middle reaches of WMC contained 1 to 2 percent gravel, 97 to 98 percent sand, and 1 percent silt-clay. At the two stations in the deep headwater basin, the samples contained no gravel, 59 percent sand and 41 percent silt-clay. Sediments in AAC also had a high silt clay content: comprising 20 to 30 percent of the samples taken from the main stem and north branch, and fully 100 percent of the sample taken from the south branch.

The currents in WMC have sufficient velocity during portions of the tidal cycle to transport sand, except at the extreme northerly end of WMC and in AAC. At several locations along the channel of WMC, sand waves can be seen in the bathymetric record. The asymmetric shape of these sand waves indicates that sand is being transported in an upstream direction. This is consistent with the flood dominance of the tidal flows in WMC, and indicates that sand is being transported into the creek from Stony Brook Harbor.

Some of the sand being deposited in WMC could be derived from the erosion of the shoreline, especially from beach nourishment projects. For example, sand was imported by private residents and placed along much of the eastern shore of the creek, between the former Wells Boat Yard site and the end of Erland Road (i.e., between approximately 1,500 feet and 3,000 feet upstream from the mouth). Sediments are also being introduced via storm drains that discharge into WMC and AAC. Stormwater sediments in this area are believed to be mostly sand, some of which could have originated from street sanding during winter storms.

The accumulation of fine-grained sediments in WMC is a natural process which, to some extent, has been accelerated by previous dredging and excess inputs from storm drains. Within the intertidal marsh areas, the spreading tidal waters are slowed by the vegetation, which creates quiescent conditions that are necessary for the settlement of fine suspended particles. The thickness of the marsh sediments surrounding WMC have not been measured, but in other areas on Long Island these deposits range from 1.3 to 6.6 feet in thickness and usually sit upon a sandy substrate. It is believed that the deposition rate in the WMC marshes is keeping pace with the long-term rise in sea level, which currently is estimated to be approximately 0.1 inch per year.

Deeply dredged areas, like the artificial basin at the head of WMC, are not in equilibrium with the local sedimentary system, and fine-grained sediment tends to accumulate in such areas at a very rapid rate. The mud layer in this basin is approximately 33 inches thick, corresponding to an average sedimentation rate of about 0.4 inches per year since this area was dredged in the early 1920s (i.e., four times greater than the rate that is believed to apply to the marshes in WMC), which is consistent with the sedimentation rate calculated

from geochemical studies of sediment cores taken from this area. Although particulates delivered to WMC through storm drains and stormwater runoff may contribute to the infilling of the subject basin, the gradual settlement of suspended sediment conveyed into WMC on each flood tide is capable of sustaining a high rate of deposition in such areas of sedimentary disequilibrium. Consequently, the accumulation of fine-grained sediment, and associated organic material and contaminants, could only be partially reduced by controlling storm drain discharges.

The shoaling and dredging history of WMC and neighboring waterways is discussed in *The Hydrography of West Meadow Creek as It Relates to Management* (1996), with supplemental information obtained from the *Three Village Hamlet Study* (1997), and is summarized as follows:

In the early 1920s, a development known as "Old Field South" was proposed at the north end of WMC. The plans for the development included a residential subdivision and a marina, as well as a channel through WMC to provide access to the marina from Stony Brook Harbor. The only component of the plan that was actually implemented was the dredging of the north end of WMC and adjoining wetlands to create a basin approximately 2,000 feet long by 300 feet wide and the dredging of channel approximately 260 feet wide and 20 feet long. The basin originally was dredged to a depth of up to 20 feet, while the channel was up to 10 feet in depth. The dredge spoil, totaling approximately 440,000 cubic yards, was spread on the adjacent wetlands and uplands. According to the *Three Village Hamlet Study* (1997), this disposal operation destroyed approximately 35 acres of wetlands.

In the 1950s, both branches and the main channel of AAC were dredged as part of a development known as "Stony Brook Shores". The dredging was undertaken so as to create waterfront lots and to provide fill needed for construction. Prior to this dredging project, the north branch of AAC was predominantly comprised of wetlands, and both the south branch and the main channel had meandering courses. All of the existing wetlands on the north branch were removed by the dredging, which created a channel with widths of up to 160 feet and a depth of six feet, or by the deposition of the resulting spoils. Approximately 400 feet of the south branch was dredged, starting at a distance of approximately 600 feet from the confluence of the two branches. The total volume of material removed during this dredging project was approximately 60,000 cubic yards.

The entrance to WMC is situated in the inlet to Stony Brook Harbor. The configuration of the channel system at this location was significantly modified by a series of dredging projects that occurred during the 1950s and 1960s. Prior to the 1950s, Youngs Island did not extend as far to the north as it presently does, and another

small island, Harts Island, was situated between Youngs Island and Jens Island. Over the subsequent years, the dredging of a channel to connect to the Brookhaven Town dock on Sand Street resulted in the removal of much of Harts Island. The placement of spoil generated by extensive dredging activities in 1965, when the present Yacht Club Spur was first created, spanned the gap between Youngs Island and Harts Island, thereby eliminating the latter as a separate island.

The configuration of the channel system in the vicinity of WMC has remained essentially unchanged since 1965. However, periodic dredging has been undertaken in the Yacht Club Spur to remove shoals that impaired navigation in this channel. Shoaling tends to occur along the northwestern side of Jens Island, at the confluence of Porpoise Channel and the Yacht Club Spur. As discussed in Section 2.1.2, this shoal has impacted WMC due to its effect in progressively reducing the cross-sectional area of the main channel into WMC which passes between Jens Island and the southern tip of West Meadow Beach. Shoaling also tends to occur in the channel that runs along the east side of Jens Island.

A sediment budget analysis that was performed for Stony Brook Harbor indicated that the erosion of West Meadow Beach has contributed some sand to the entrance of WMC. For the most part, however, erosion of the beach does not appear to be a substantial contributor to the shoaling in this area. The evidence shows that since 1965, when the Yacht Club Spur was created, the rate of shoaling in this area has increased. This increased shoaling has been attributed to the continuous erosion of dredged spoil deposits on Youngs Island. Additionally, artificial sand deposits on Jens Island also may be mobilized during severe storms, such as Hurricane Gloria in 1985.

2.1.4 Surface Water Quality

WMC is classified by the New York State Department of Environmental Conservation (NYSDEC) as "SA" waters, whereby the best designated use is "shellfishing for market purposes and primary and secondary contact recreation". There are three criteria that serve as the basis for maintaining SA waters:

- 1) the level of coliform bacteria in shellfish growing areas shall not exceed 70 MPN/100 ml (most probable number of organisms per 100 milliliters of water) for any series of samples;
- 2) dissolved oxygen shall not be less than 5.0 milligram/liter (mg/l) at any time; and
- 3) the amount of toxic and deleterious substances shall not interfere with the use for primary contact recreation, or be injurious to edible shellfish or their culture or propagation; nor shall such substances adversely affect the flavor, color, odor or sanitary condition or impair the waters for any other best usage.

NYSDEC began testing the waters of Stony Brook Harbor and WMC for coliform levels in March 1985. Additional samples were collected in WMC by the Marine Sciences Research Center of SUNY at Stony Brook between the spring of 1990 and August 1991. The Suffolk County Department of Health Services tested the waters of WMC in December 1997. More than half of the samples tested from WMC between 1985 and 1991 exceeded the 70 MPN/100 ml shellfish harvesting standard. Due to these elevated coliform concentrations, WMC is uncertified for shellfishing on a year-round basis. In fact, the closure encompasses an area well beyond WMC, extending about half-way down the east side of Youngs Island, a distance of approximately three-quarters of a mile south of the mouth of WMC.

Although not currently suitable for shellfishing due to chronically elevated coliform bacteria concentrations, WMC is still used for primary contact recreational activities, such as swimming and snorkeling. AAC, however, occasionally exceeds the criteria for bathing, which is based on the following thresholds:

- 1) The log mean (or geometric mean) for five or more samples in a 30-day period shall not exceed 5,000 MPN/100 ml total coliform;
- 2) the log mean for five or more samples in a 30-day period shall not exceed 200 MPN/100 ml fecal coliform; and
- 3) the log mean for any single sample shall not exceed 1,000 MP/100 ml fecal coliform.

Water quality is determined by the relationship between the rate at which a contaminant is added to a system and the rate at which it is removed or flushed from the system. Within WMC, there is concern that the creek's flushing characteristics may not be sufficient for the level of contaminant loading, as evidenced by the chronically high levels of pathogenic contamination (i.e., high levels of coliform bacteria and other microorganisms, which have resulted in the year-round closure of this area to shellfish harvesting). Additionally, many types of contaminants are commonly associated with fine-grained sediment particles, and these types of sediments appear to be accumulating at several locations in WMC and AAC.

Any pollutant discharged into an embayment, if properly mixed, is diluted by a volume of water equivalent to the tidal prism, plus the volume of water present in the embayment during low tide, plus the volume of water added by streams, groundwater, runoff and precipitation. Subsequently, a volume of water equal to the tidal prism is removed during the ebb tide, along with the fraction of the total amount of pollutant that is carried by that water volume. This simple concept can be used to estimate how effectively WMC is flushed.

If the volume of freshwater entering a water body is small compared to the tidal prism, as is the case in WMC, then the fraction (r) of a pollutant that can be removed during each ebb tide can be estimated as:

$$r = P/(P+V),$$

where P is the tidal prism volume (= 233,000 cubic yards) and V is the volume of water present in WMC during low tide (= 288,000 cubic yards). Based on these data, approximately 45 percent of the pollutant is expected to be removed with each ebb tide. The number of ebb cycles that would be expected to remove 90 percent of the pollutant can be estimated as $0.1/(100\% - 45\%)$, which works out to be 3.85 ebb cycles, or about 48 hours².

The deposition of sediment within the channel of WMC increases the friction exerted on tidal current, and tends to cause the tidal range within the creek to diverge from that of Stony Brook Harbor. Removing shoals and deepening WMC (i.e., dredging) would have the opposite effect, reducing the tidal friction and bringing the tidal range within the creek closer to that of the harbor. However, the maximum tidal range in WMC, no matter how much dredging is performed, cannot exceed the range in the adjoining harbor. If, WMC could be modified to achieve the tidal range in the harbor, this would increase the creek's tidal range by approximately 30 percent and reduce the flushing time to about 75 percent of its current value.

“Pollution susceptibility” (PS) is an index that describes the relative degree of flushing experienced by a water body. The PS was calculated for four reaches of WMC, based on the same assumptions as were applied to the forgoing calculation of pollutant removal efficiency during each ebb cycle (refer to footnote #2). In both calculations, the assumption of a conservative pollutant appear to be reasonable because many of the pollutants (e.g., metals) indeed are conservative, other common pollutants (e.g., pesticides) are destroyed very slowly in an environment like the creek, and even indicator organisms for pathogens (i.e., coliform bacteria) are thought to survive longer than one tidal period. These calculations show the high pollution vulnerability of AAC and the headwater basin in WMC due to poor flushing rates in both areas, and indicate that the lower reaches of WMC are relatively well-flushed, based on the calculated PS values.

² This calculation provides only a first approximation of the flushing rate, since it assumes that the pollutant is conservative (i.e., is neither created nor destroyed within the creek itself and remains in the water column after being introduced into the creek), that the pollutant is completely mixed in the WMC, and that the pollutant is not re-introduced into the WMC system from the harbor during subsequent flood tides.

The tide and current data that were collected as part of the 1996 study were used to estimate the creek's existing flushing characteristics and to determine whether selective dredging could help to reduce pollution levels in WMC. A number of different dredging scenarios were modeled, including:

- 1) existing cross-sectional areas
- 2) doubling of the cross-sectional area at the entrance to AAC
- 3) doubling the cross-sectional area of WMC channel at Sound View Beach
- 4) increasing the cross-sectional area at the mouth of WMC by 28 percent, corresponding to a depth increase of 2.3 feet
- 5) doubling the cross-sectional area of WMC channel at Sound View Beach, doubling the cross-sectional area at the entrance to AAC, and increasing the cross-sectional area at the mouth of WMC by 28 percent

Under the scenarios outlined above, the cumulative tidal prism over 24 hours, and hence PS, can be recalculated using tidal current velocities and cross-sectional areas to replace tidal ranges and surface areas. Based on these estimates, it was concluded that spot dredging would increase the flushing of WMC, but that AAC is particularly prone to high levels of pollutants given the existing loading and configuration. However, it does not appear the dredging in itself would provide sufficient abatement of pollutant concentrations to attain New York State water quality standards for shellfishing. Dredging may reduce concentrations by as much as 50 percent, but reductions in the range of several orders of magnitude are required to meet State standards.

The Marine Sciences Research Center of SUNY at Stony Brook also measured dissolved oxygen (DO) levels in WMC in the fall of 1991. DO readings varied from about 9 mg/l near the mouth of WMC to 7.4 mg/l in the northern reaches of the creek. Levels between 4 and 5.5 mg/l were recorded near a storm drain at the northern end of the headwater basin in WMC, and levels as low as 6 mg/l were found in the vicinity of a storm drain discharging to AAC. These data indicate general compliance with the 5.0-mg/l minimum standard for SA waters throughout most of WMC, although there is evidence that DO declines below this level in the vicinity of the deep basin at the head of WMC, and could potentially drop to less than 5.0 mg/l near storm drains in other areas of restricted circulation.

2.1.5 Watershed Topography

The WMC watershed contains two discrete topographic regions, divided by the main channel of the creek. The distinction between these two areas owes to their creation by very different geologic processes.

The area to the east of the main channel of WMC rises rapidly up an irregular and rolling hillside. The topography of this area is typical of the Harbor Hill terminal moraine, which marks the southerly limit of the most recent advance of the continental glacier along the entire north shore of Suffolk County. The hillside is dissected by natural drainage ways which form a series of small valleys in the land surface. From south to north, the primary drainage ways on the east side of WMC are identified as follows: along Bennet Lane; at the north and south branches of AAC; in the Southgate Road area, near the northern end of WMC; and along Glenwater Lane, at the head of WMC. The maximum elevation of approximately 150 above sea level (National Geodetic Vertical Datum) occurs in the southeast corner of the watershed, at the terminus of Cooper Court.

In contrast, the barrier spit and associated tidal marshland to the west of the main channel of WMC exhibit generally low relief and gentle gradients. These topographic characteristics arise from the formation of these features due to deposition of coarse-grained sediments carried from the north via littoral drift, to form the barrier spit, and the deposition of fine-grained sediments in the back-barrier marsh area during lulls in the tidal flow in WMC. Maximum elevations on the West Meadow peninsula barely exceed ten feet.

2.1.6 Soils

According to the *Soil Survey of Suffolk County, New York* (U.S. Department of Agriculture, Soil Conservation Service, April 1975), the entire WMC watershed is situated within a belt stretching along most of the north shore of Suffolk County which contains Carver-Plymouth-Riverhead Association soils. These are morainal soils which generally are deep, rolling, excessively drained and well-drained, with a coarse-textured and moderately coarse-textured surface layer. The primary soil types in the study area are summarized as follows:

Carver and Plymouth Sand — This is the most common soil type in the WMC watershed, especially in the northern half of this area. These soils have very low available moisture capacity and very low natural fertility. Permeability is rapid throughout the soil profile. Slopes vary from 0 to 35 percent in the study area, with limitations to all types of development generally increasing as the gradient steepens.

Plymouth Loamy Sand — This soil type is present in some areas in the southern half of the portion of the WMC watershed lying to the east of the creek channel, and is interspersed with areas of Carver and Plymouth Sand, and Riverhead and Haven Soils. Plymouth Loamy Sand has very low available moisture capacity and very low natural fertility. Permeability is rapid throughout the soil profile, except where a silt substratum is present. Slopes vary from 3 to 15 percent in the study area, with

limitations for home site development increasing from slight to moderate as the gradient steepens.

Riverhead Sandy Loam, and Riverhead and Haven Soils — This soil type is present in the southeast corner of the WMC watershed. These soils have moderate to high available moisture capacity and low natural fertility. Permeability is moderately rapid in the surface layer and in the subsoil, and very rapid in the substratum. Slopes vary from 3 to 8 percent in the study area, with limitations for the development of home sites, streets and parking lots being slight to moderate.

Tidal Marsh — This soil type is present in the immediate vicinity of WMC channel. These poorly drained soils are not suited to any type of development.

2.1.7 Groundwater

The entire WMC watershed lies within hydrogeologic Zone VIII, as designated by the *Long Island Comprehensive Waste Treatment Management Plan* (Long Island 208 Plan, Long Island Regional Planning Board, 1978). Zone VIII is characterized by generally shallow groundwater flows, which discharges to adjacent streams and saltwater bays. Based on these conditions, the 208 Plan recommended that stormwater runoff in this zone be controlled to minimize the transport of sediments, nutrients, metals, organic chemicals, bacteria, and other contaminants to surface waters and groundwater. Provision of routine maintenance of on-site sewage disposal systems (i.e., septic systems and cesspools) is also recommended.

Localized subsurface clay lenses of various thickness and extent often are found in morainal deposits, such as the WMC watershed. These lenses pose constraints for site development, since they must be penetrated in order for on-site sanitary systems to drain properly. The proper functioning of such systems also is often impaired in areas of high groundwater, as occurs on lowland areas in close proximity to surface water bodies, which applies to the Old Field Club at the head of WMC.

All of the Three Village Hamlet area, including the WMC study area but excluding the Village of Old Field, is served by public water supplied by the Suffolk County Water Authority. This water is pumped by a series of eight interconnected public well fields, most of which tap into the Magothy Aquifer to depths as great as 724 feet. None of these wells are located inside the WMC study area.

2.2 Ecological Resources

As discussed briefly in Section 1.3, WMC supports important ecological resources and, as a result, has received special designation under a number of State and Federal natural resource protection programs. These resources are described more specifically in the following subsections. A summary of the description provided by various New York State and federal agencies regarding the overall ecological importance of WMC and vicinity — including State and federal designation as a Significant Coastal Fish and Wildlife Habitat, State designation as an Outstanding Natural Coastal Area, and State designation as mapped as tidal wetlands — is presented in Section 1.4.

2.2.1 Habitats

There are a number of distinct habitats in the study area, which are defined by the flora and fauna present. Most of this area, comprising the hillside on the east side of the creek, generally is covered by a deciduous hardwood forest that has been altered substantially by the construction of roadways and development of home sites, including associated clearing and grading and the establishment of extensive landscape plantings. As is true for most of the area of the Harbor Hill terminal moraine, the native woodland species present on the subject hillside represent second-growth which has re-colonized land that previously was cleared for firewood or use as cropland or pastureland. Over time, the plant community has reverted back to climax oak forest, dominated by red, white and scarlet oak, intermixed with various hickory species and a thick understory of mountain laurel. This woodland provides habitat for a diversity of wildlife, including a wide range of birds (especially for songbirds), small mammals (especially rodents), opossums, racoons, certain bat species, and, occasionally, red fox.

The vegetative communities in the immediate vicinity of WMC are described in the *Master Plan and Draft Environmental Impact Statement for West Meadow Beach* (Cramer, Voorhis & Associates, March 1992), which was prepared to address the proposed removal of the beach cottages on land owned by the Town of Brookhaven on the West Meadow barrier spit. That DEIS identified a variety of different habitats within the WMC area, including the following (refer to the original report for lists of scientific species names):

- 1) Marine Intertidal Mudflat — This is an area of quiet waters, with substrates composed of silt or sand that is rich in organic matter, and which is poorly drained at low tide. At low tide, this area may become exposed or may retain a shallow depth of water. In the study area, the substrate in intertidal mudflat areas was observed to be covered with various types of macroalgae (e.g., *Fucus vesiculosus*, *Enteromorpha* spp., *Chondrus crispus*, *Ulva lactuca*) and rooted aquatic plants (e.g., eelgrass), although some areas lack significant vegetation. Rooted plants generally are

restricted to areas that are submerged during the entire tidal cycle. Characteristic organisms include marine worms, mud snails, soft shell clams, and mussels. This community, which is found along the edges of WMC, is an important feeding ground for wading birds and shorebirds.

- 2) Low Salt Marsh — This community occurs in sheltered areas of the sea coast, in a zone extending from mean sea level up to the mean high tide line, which is flooded regularly by semi-diurnal tides. The vegetation of the low salt marsh comprises nearly mono-specific stands of cordgrass. A few species of marine macroalgae (e.g., *Fucus vesiculosus* and *Ulva lactuca*) can form dense mats on the sediment surface between the cordgrass stems. Other plants that are present in very low numbers include glasswort, saltmarsh sand spurry, and lesser sea blite. Characteristic animals include clapper rail, willet, marsh wren, seaside sparrow, fiddler crabs (nesting along the banks); and, at high tide, various small fishes which retreat to the tidal creeks during low water. Low salt marsh grades into high marsh at higher elevations and intertidal flats at lower elevations. Within the study area, low salt marsh community is found in swaths of varying widths extending outward from the tidal creek channels.
- 3) High Salt Marsh — This zone extends from the mean high tide line up to the limit of spring tides. This area periodically is flooded by spring tides and flood tides. High salt marsh typically consists of a mosaic of patches that are mostly dominated by salt meadow grass and a dwarf form of cordgrass, either alone or mixed. Also common are spike grass and black grass. Characteristic species at the upper edge of the high marsh are black grass, switch grass, sea lavender, and slender saltmarsh aster. Characteristic animals include salt marsh mosquito, greenhead fly, coffeebean snail, sharp-tailed sparrow, marsh wren, eastern meadowlark, clapper rail, and American black duck. Within the study area, this community is found in a wide band to the east side of Trustees Road, between the salt shrub along the roadside and low tidal marsh communities adjacent to WMC. Observed plant species within this area include: black grass, marsh elder, saltmeadow grass, saltwort, sea lavender, soft-stemmed bulrush, water hemp, spike grass, spike-rush, and brown and green macroalgae (*Fucus* spp. and *Enteromorpha* spp., respectively).
- 4) Salt Panne — This is a shallow, poorly drained depression in a salt marsh, which can be found either in low or high marsh areas. Pannes in low marshes usually lack vegetation, and the substrate is soft, silty mud. Pannes in high marsh are irregularly flooded by spring tides and storm surge, but do not drain or drain very slowly during periods of lower water. The physical conditions in pannes are harsh, since evaporation causes hyper-salinity and solar heating results in elevated temperatures. Characteristic plants in this area include the dwarf form of cordgrass, glassworts,

marsh fleabane, salt marsh plantain, arrowgrass, and salt marsh sand spurry. Wigeon grass may be present in pond holes. Fishes that may be permanent residents include mummichog and sheepshead minnow. This community is present in scattered small areas throughout the marshes bordering WMC.

- 5) Tidal Creek — This area comprises a natural channel that drains the tidal waters of a coastal salt marsh. The water in the creek is brackish to saline (0.5 to 30.0 parts per thousand), and the water level fluctuates with the tide. Although the creek bottom is continuously flooded, the banks are exposed at low tide (similar to intertidal mudflats). Most tidal creeks, including the main channel of WMC itself, flow in a sinuous path through the salt marsh. Characteristic plants are similar to those described above with respect to marine intertidal mudflats; wigeon grass and cyanobacteria may also be present. Several species of fish (e.g., Atlantic silverside, mummichog, striped killifish, sheepshead minnow, threespine and fourspine sticklebacks, and American eel) that are resident in tidal creeks during low tide use the adjacent areas of low salt marsh when it is flooded at high tide. Tidal creeks also are used as nursery areas by several important species of marine fish, including winter flounder, black seabass, bluefish, and striped bass. This type of community is found within WMC proper and the AAC tributary.

The tidal creek habitat can be divided into three distinct benthic sub-habitats, based on sediment type: intertidal banks, sandy main stem of the creek, and gravelly channel floor at the mouth of WMC. Gastropods tend to dominate in the coarser-grained sediments at the mouth of the creek. Bivalves are more prevalent in the sandy, middle reach of WMC. The sandy muds of the intertidal banks are dominated by polychaete assemblages.

- 6) Estuarine Channel — This is defined as an artificial estuarine deepwater area that usually is created by dredging operations. Various sections of the WMC system have been dredged at some time in the past. However, many of these areas have reverted to natural community structure due to subsequent sedimentation. There are some locations in the study area that still retain characteristics of estuarine deepwater channels, the largest of which (at approximately 18 acres in size) comprises the dredged basin near the head of WMC. Another small area (approximately 6,000 square feet) is located just off the Marine Conservation Center, which is located near the midpoint of WMC.
- 7) Estuarine Ditch — This is a narrow, typically linear channel that has been excavated through the marsh for the intent of improving drainage in order to control mosquito populations. These ditches generally were established at a regular spacing interval, without regard for the subtle variations in topography that typically exist on salt

marshes. While relatively easy to implement, grid ditching often has failed to achieve the stated objective of draining areas of mosquito larvae concentrations, since depressions in the marsh surface were just as likely to be located between the ditches as along the paths of the ditches. In addition, the maintenance of the grid ditches frequently was given a relatively low priority by municipal agencies charged with this responsibility and, ironically, neglected ditches that became fully or partially clogged tended to develop into prime mosquito nurseries. Approximately 32 ditches were excavated in the study area, all of which are located in the northern half and on the west side of WMC, south of the previously described dredged basin at the head of the creek. These ditches total approximately 13,000 linear feet in length and range in width from 1 to 10 feet.

- 8) Marine Intertidal Gravel/Sand Beach — This area is washed by high-energy waves, with sand or gravel substrates that are well-drained at low tide. These areas are subject to high fluctuations in salinity and moisture. This is a relatively low diversity community, with little, if any, vegetation. It is, perhaps, best characterized by benthic invertebrate fauna including marine worms and amphipods, and provides feeding grounds for migrant shorebirds (e.g., sanderling and semipalmated plover) and breeding shorebirds (e.g., piping plover). Within the study area, this type of community is found at the southern tip of the West Meadow Beach barrier spit.
- 9) Backshore Beach Habitat — This area comprises the unvegetated face of the shoreline that extends from the seaward edge to the dune to the high tide line. The backshore contains an unstable substrate of sand, gravel or cobbles which is highly subject to transport and deposition due to the action of wind, storm waves and surge. The vegetative community is sparse. Within the study area, this habitat occupies the west side of the West Meadow peninsula, and is vegetated with American beachgrass, beach pea, cocklebur, common saltwort, dusty miller, goldenrod, sand bur, and seaside goldenrod. In general, this community is an important nesting ground for a number of threatened and endangered avian species, such as piping plover, least tern, common tern, and roseate tern; although nesting by these species does not currently occur in the study area due to disturbances caused by the presence of a Town beach facility and a series of cottages along the entire length of the barrier spit.
- 10) Salt Shrub — This is a transition zone between salt marsh and upland vegetation. Salinity levels generally are lower here and the elevation is higher than in the salt marsh. Periodic disturbance associated with storms causes die-back of shrubs. Characteristic plant species include groundsel, marsh elder, beach rose, saltmeadow grass and switchgrass. A characteristic animal is the marsh wren. This community usually is present as a linear feature at the upper edge of the salt marsh; where local

topography is nearly level, an extensive shrubland or meadow sometimes occurs. Within the study area, this community is found to the east of Trustees Road, between the uplands and the high salt marsh. Observed plant species in this area include: common reed, groundsel, northern bayberry, red maple, beach rose, saltmarsh bulrush, seaside goldenrod, slough grass, swamp rose-mallow, and switchgrass.

- 11) Estuarine, Dredged Sediment Shore — This is an area along the shoreline that is artificially modified by the deposition of dredge spoil. The community contains minimal vegetative cover, with low species diversity. The largest spoil deposit in the study area comprises the North Shore Horse Show Stables, located on the western shore near the northern end of WMC, which was filled with material dredged from the adjacent headwater basin. Two smaller spoil areas are located at the Marine Conservation Center (at about the midpoint on the west shore of the creek) and an area approximately 700 feet south of that site. The southernmost spoil area is the access way to a bridge that was constructed across WMC in 1892 but was removed about 1910.
- 12) Maritime Duneland — This area is dominated by grasses and low shrubs that occur on active and stabilized dunes along the Atlantic coast. This community consists of a mosaic of vegetation patches that reflect past disturbances such as sand deposition, erosion, and dune migration. Dunelands are highly susceptible to storm damage, and the vegetation in this area is adapted to the shifting sands of this mobile environment. The composition and structure of the vegetation in this community is variable, and depends upon the stability of the dunes, the rates of sand deposition and erosion, and the distance from the ocean. Characteristic species of active dunes, where the rate of sand movement is relatively high, include beach grass, dusty miller, beach pea, sedge, seaside goldenrod, and beach rose. Characteristic species of stabilized dunes include beach heather, bearberry, beachgrass, seaside goldenrod, beach pinweed, jointweed, beach rose, bayberry, beach-plus, poison ivy, and lichens. Scattered stunted pitch pines or post oaks also may be present. Characteristic birds are gadwall and short-eared owl. The duneland habitat found in the study area is atypical in structure and formation, as there are no defined primary and secondary dune features. However, the vegetative cover generally is typical — beach grass occurs in almost pure stands closest to the water, while the diversity and density of the vegetation increases further up the beach (i.e., in the area between the cottages along the west side of Trustees Road and in the southern portion of the peninsula). The development of the cottages has resulted in alteration of the floral assemblage, due to regrading, the placement of loamy fill, and the introduction of ornamental species.
- 13) Maritime Shrubland — This community occurs on dry seaside bluffs and headlands that are exposed to onshore winds and salt spray. This area usually contains a low

floral diversity, dominated by one or more species of shrubs or stunted trees. Characteristic species include beach-plus, beach rose, wild rose, bayberry, eastern red cedar, shiny sumac, poison ivy, black cherry, highbush blueberry, American holly, and shadbush. Characteristic birds include great egret and black-crowned night heron. In the study area, this community primarily is found immediately to the east of Trustees Road, and includes a diverse assemblage of species, including beach grass, beach pea, beach heather, beach plum, beach rose, black cherry, black locust, broom sedge, cat brier, common milkweed, common mullein, common nightshade, dusty miller, eastern red cedar, goldenrod, northern bayberry, beach rose, sand bur, seaside goldenrod, short dune grass, poison ivy, prickly pear, and winged sumac.

- 14) Altered Upland Habitat — This label describes an area that is not considered to comprise natural habitat due to significant modification by human activities. Within the WMC area, this classification applies to a central band down the spine of the West Meadow peninsula, which is occupied by the cottages and the Town park facility, to the immediate west of Trustees Road. The natural habitat that previously existed in this area was maritime duneland and shrubland, remnants of which can be found around the cottages. In some locations, the dune communities have been allowed to recolonize into the original area of clearing around the cottages, resulting in the residential structures being nestled in a natural habitat setting — 73 of the 110 cottage lots are described in the March 1992 DEIS as containing natural vegetation. In other areas, particularly in the southern portion of the peninsula, the natural vegetation remains only as small patches between the cottages. It is evident that the substrate in this area has been extensively modified by the addition of loamy fill and topsoil to improve conditions for non-native, ornamental landscaping species which would not normally be found in this type of setting — of the 110 cottage lots, the March 1992 DEIS classifies 3 as containing ornamental vegetation, 24 with a combination of natural and ornamental vegetation, and 10 as being devoid of vegetation. Areas occupied by impervious surfaces (buildings and other structures, roads, driveways, parking areas, etc.) are also considered to be part of this habitat. The Town park facility at the north end of the peninsula represents a significantly altered habitat, which virtually lacks vegetation, except for small areas of landscaping in planted islands.

2.2.2 Wildlife

The abundance and diversity of wildlife in a given area is determined by the type of habitat available. As discussed in Section 2.2.1 above, the area surrounding WMC contains a wide variety of distinct plant communities that range from open water areas to upland habitats.

The marine habitats within WMC itself and the adjacent intertidal wetland areas support a diverse fauna of marine invertebrates and fishes which, in turn, sustains numerous species of gulls, terns, shorebirds and wading birds. Waterfowl also are abundant in this rich marine habitat. The adjacent upland vegetative communities of the West Meadow barrier spit (e.g., maritime duneland and shrubland) provide habitat for a variety of animals, primarily birds and mammals.

The wildlife on the hillside to the east of WMC has not been inventoried as part of this plan or prior studies. This area, although disturbed by past development activities, provides habitat for various terrestrial species that are tolerant of human presence. This includes a wide range of birds (especially for songbirds), small mammals (especially rodents), opossums, racoons, certain bat species, and, occasionally, red fox.

Except as otherwise noted, the information presented below is taken from the March 1992 *Master Plan and Draft Environmental Impact Statement for West Meadow Beach*, which also served as the basis of the discussion of plant communities summarized in Section 2.2.1 (refer to the original report for lists of scientific species names):

- 1) Birds — The largest group of terrestrial animal species found in the WMC study area are birds. This group can be further divided into: waterfowl (ducks, geese and similar birds); gulls and terns; shorebirds and wading birds; birds of prey; and songbirds and other birds.

Waterfowl — The population of waterfowl in WMC area varies throughout the year, since many species either winter or make migratory stopovers in this area and reside in other regions during the rest of the year. Common year-round residents include Canada goose and mute swan, both of which feed on grains, grass sprouts and some marine vegetation. Mallard and American black duck also are common year-round residents, which feed at the water surface without diving. Duck species that winter in the WMC area and which also were observed during the referenced investigation include American wigeon (a surface feeder) and gadwall (a surface feeder that dives regularly), as well as a number of diving species of bay ducks (e.g., bufflehead, canvasback, redhead, and greater and lesser scaup). Additionally, observations were made of two species of fish-eating ducks, hooded and red-breasted merganser, which winter in this area.

Gulls and Terns — Gulls are large, heavy birds with webbed feet, which naturally are scavengers, but also are opportunists that will take advantage of food sources generated by humans. Terns are slender birds with webbed feet that dive from the air to catch small fish in their bills. All of these birds are colonial nesters, breeding on coastal islands and beaches. Because of dramatic decline in populations, due

to a combination of factors — e.g., loss of breeding habitat (which generally comprises isolated beaches), disturbance by humans and domestic animals, natural predation, and competition with gulls for nesting habitat — many tern species have been classified as threatened or endangered. Although it is believed that the habitats present on the West Meadow Creek barrier spit would provide a suitable environment to meet the nesting requirements of terns, the proximity of human development and activities currently precludes the use of this area for that purpose. Gulls are more tolerant of human presence, and have thrived even with the development of coastal areas.

The least tern is a State-listed endangered species and a Federally-listed threatened species, which has established nesting colonies on islands in the entrance to Stony Brook Harbor (Porpoise Channel). The common tern is a State-listed threatened species, which also has established nesting colonies in Stony Brook Harbor. Both of these nesting areas are a short distance away from WMC, which contains abundant populations of small fish, the preferred food items for least and common terns.

Shorebirds and Wading Birds — This group covers a wide range of species that use the edges of WMC and the edges of the adjacent tidal wetlands for feeding. Herons and bitterns cover a diverse group of long-legged birds that primarily feed on small fish and crustaceans which are plucked from shallow water using a quick strike of the bill. Many of these species establish nesting colonies in coastal trees and bushes. A major wading bird rookery is located on the east end of Long Beach, just across the Stony Brook Harbor entrance channel from West Meadow Beach. Common species that were directly observed during the DEIS study include one year-round resident (i.e., great blue heron) and a number of seasonal residents that winter further to the south (e.g., great egret, snowy egret, and black-crowned night heron). Seasonal species that also may occur in WMC include tricolored heron, green-backed heron, and glossy ibis.

Although no species of shorebirds were recorded during the surveys conducted for the March 1992 DEIS, these birds are fairly common in the region in the types of shoreline habitats that are found around WMC. Generally, these birds feed on abundant prey amidst the saltmarsh grasses and salt pannes, as well as within the wrack line along the shore. Their diet mainly consists of insects, worms, small crustaceans and molluscs. Species that could be present in the study area include sanderling, spotted sandpiper, greater yellowlegs, lesser yellowlegs, willet, long-billed dowitcher, dunlin, clapper rail, and Virginia rail.

The piping plover is on the State and Federal endangered species lists, and is considered to be one of the most endangered species in the world. The causes of its decline are similar to those pertaining to terns. Piping plover colonies have been established to the west (in Stony Brook Harbor) and to the east (Old Field and the barrier beaches at the mouth of Port Jefferson Harbor), and the shoreline area around WMC probably is used for feeding during the breeding season at the present time.

Birds of Prey — The osprey is a large bird of prey, and is the primary representative of this avian family in coastal settings on Long Island. Ospreys feed almost exclusively on live fish, and are capable of catching fairly large prey using their sharp talons. They almost always nest within a few kilometers of the shoreline in a range that includes Long Island; this population winters in Latin America. During the 1950s and 1960s, many of the East Coast osprey populations were severely impacted and, consequently, this bird was added to the State list of threatened species, due to the adverse effects of pesticides (primarily DDT) on egg viability. However, a ban on these deleterious substances has allowed the osprey to recover. Artificial nesting platforms, placed on utility poles in the vicinity of coastal wetlands, have aided in the species' recent reproductive success. Other birds of prey that may be found in the vicinity of WMC include the northern harrier and American kestrel

Songbirds and Other Birds — Songbirds comprise a diverse order of birds (Passeriformes) that includes over 20 different families, such as swallows, jays, blackbirds, finches, warblers, and sparrows. Numerous species of songbirds were observed during the surveys conducted for the March 1992 DEIS, including tree swallow, American crow, fish crow, black-capped chickadee, American robin, northern mockingbird, European starling, northern cardinal, song sparrow, red-winged blackbird, common grackle, and house finch. The hillside to the east of WMC, which was not included in the DEIS investigation, would be expected to support numerous additional songbird species, since many members of this order prefer the types of woodland habitats present in that area.

Other birds that were observed in the vicinity of WMC during the avian survey for the March 1992 DEIS included rock dove, mourning dove, and belted kingfisher. Woodpeckers, which were not observed in the maritime habitats surrounding WMC, would be expected to utilize the woodlands on the hillside to the east of the creek.

The double-breasted cormorant is a species that is not closely related to the other types of birds listed above. Cormorants are capable of diving underwater and

staying submerged for an extended period of time, which allows them to hunt with great efficiency for fish, their primary food source. On Long Island, cormorants nest on undisturbed coastal beaches and islands. This species experienced a precipitous decline through the 1970s, which is believed to have been caused by toxic chemical pollution, particularly with respect to DDT and its derivative compounds, and PCBs. Recently, however, populations of these birds have been on the rise due to improved environmental conditions.

- 2) Mammals — The area around WMC provides good habitat for a number of species of mammals. This includes:

Rodents — Rodents comprise the most abundant group of mammals present in the vicinity of WMC. The most common species include the grey squirrel, eastern cottontail, house mouse, Norway rat, meadow vole, muskrat, and masked shrew.

Grey squirrels probably inhabit the wooded hillside to the east of WMC in great numbers, but are less abundant in the immediate vicinity of the creek due to the relative lack of trees that are suitable to serve the nesting and cover requirements of this arboreal species. The eastern cottontail prefers areas where shrubby and herbaceous plants are present on which to feed, possibly including the upland portions of the study area and the vegetative zone along the upland edge of the WMC salt marsh. The house mouse is expected to be common in the grassy patches around the buildings in the study area, as well as in the structures themselves. Norway rats also are prevalent in areas of human development, especially at the waterfront, and likely are present in proximity to WMC. Meadow voles are numerous in the salt marshes of the north shore of Long Island, and are especially fond of low grass, such as is found in the high marsh areas surrounding WMC, but also may inhabit grassy dune areas on the West Meadow barrier spit. The tidal marshes adjoining WMC may harbor muskrats.

The masked shrew is the most common mammal on Long Island, although it is rarely seen. This species has been trapped in almost every type of habitat on the Island, including salt marshes. Its main habitat requirement is sufficient ground cover, which can be found throughout the study area.

Opossum — This species of marsupial thrives in close proximity to human development. Opossums are frequently seen in sandy and marsh-edge habitats.

Raccoon — This nocturnal mammal is almost ubiquitous on Long Island, and occurs in a range of vegetative communities, including woods near marshlands and dune

areas, which habitats are available around WMC. Raccoons have adapted well to life in developed areas.

Red Fox — Red foxes prefer edge habitat (i.e., the zone between two distinct vegetative communities), which occurs throughout the study area. This carnivorous species passes across dunes, thickets, marshes, beaches and other types of habitats on regular patrols. They take a wide variety of food items, including frogs, birds, small mammals, reptile eggs, crabs, waterfowl, and even blueberries.

Bats — The study area probably is home to a few species of bats. For the most part, the big brown bat is a year-round resident of Long Island. These bats prefer to colonize and hibernate in the attics of buildings. Just before dark, the bats of a colony will leave their roost and head for their feeding grounds.

The red bat is a migratory species that spends summers on Long Island. This species feeds on insects in areas where water bodies are present, such as occur at WMC.

- 3) Reptiles and Amphibians — As a rule, amphibians require an immediate source of freshwater (e.g., freshwater ponds, freshwater wetlands, etc.), or moist woodlands to breed. Since these types of habitats generally are absent from the vicinity of WMC, amphibians are believed to be relatively scarce in this area.

Many species of reptiles are not so closely linked to freshwater conditions and, therefore, may be present in the vicinity of WMC. This includes: eastern box turtle, which is essentially a terrestrial species that can be found in disturbed areas around human development; snapping turtles, which prefer freshwater areas as a general rule, but may occur in brackish conditions; eastern mud turtle (State-listed as threatened), which has a strong tolerance for brackish waters, and often is abundant at the inner edges of tidal marshes; northern diamondback terrapin (State-designated species of special concern), which has been observed in other areas of Long Island containing similar habitats to those present at WMC, reportedly including the adjacent waters of Stony Brook Harbor. A diamondback terrapin was directly observed in the lower reach of WMC during a transect survey of benthic animals conducted as part of the inventory phase of the present planning study.

Based on the high frequency of sightings along the north shore of Long Island, it is believed that some species of sea turtles potentially may visit the WMC area. These include the green, Kemp's Ridley, loggerhead, and leatherback sea turtles, all of which are Federally-listed endangered species. The Kemp's Ridley and leatherback sea turtles also are State-listed as endangered, while the green and loggerhead sea turtles are State-

listed as threatened. As noted in Section 1.3, the loggerhead sea turtle has been found in WMC by the Okeanos Ocean Research Foundation.

- 4) Marine Fauna — The March 1992 *Master Plan and Draft Environmental Impact Statement for West Meadow Beach* focuses on the avian, mammalian and herpetological fauna of the WMC area, and does not include a discussion of marine fauna. Information on the aquatic animals that occur in this area is available from a number of other sources, as identified below.

Marine Invertebrates — A transect survey of benthic invertebrates was conducted as part of the inventory phase of this planning study for the WMC watershed. Observations were made along 16 transects across WMC and the adjacent marshland to the west. Two additional transects were run across AAC. All of the species discussed below, which were directly observed during the benthic invertebrate survey, are important food items for animals further up the food chain, including numerous species of birds and finfish.

Ribbed mussel (*Modiolus demissus*) was the dominant species along all 18 transects. This bivalve is a filter feeder that is commonly found attached to the roots and lower portion of the stems of low marsh grass. The mutualistic relationship between the mussel and the grass provides benefits for both species. The grass provides the mussels with the required fixed points of attachment, while the mussels further stabilize the marsh mat, prevent erosion, and provide nutrients in their feces.

The marsh periwinkle (*Littorina littorea*) was observed along all of the transects, and was considered co-dominant with the ribbed mussel along four transects. Three of the transects at which this species was observed to be co-dominant lie along the main channel of WMC, south of the confluence of AAC, while the fourth transect was in the middle segment of AAC. Marsh periwinkle is a small snail that is widely distributed in salt marshes and marine tidal flats. This species grazes on a wide range of microalgae and macroalgae, and ranges from the high water line down to a water depth of approximately 130 feet on a variety of substrates.

Fiddler crabs (*Uca* spp.) were observed along 13 of the 18 transects, and were co-dominant with ribbed mussels along one transect, located just south of the Marine Conservation Center (at about the midpoint of WMC). This is a genus of small crabs, in which the male has one greatly enlarged claw, relative to the body size; the females have two small claws. These crabs range from brackish to saline waters, and are active at day, feeding mainly on detritus.

The salt-marsh snail (*Melampus bidentatus*) was observed along 17 of the 18 transects, but was not considered co-dominant at any location. This species scavenges algae and detritus from the mud surface at low tide, and retreats back up the stalks of the low marsh grasses when the tide returns.

The eastern oyster (*Crassostrea virginica*) occurred along four transects, all of which were south of the confluence of AAC. This is a filter-feeding bivalve that can form massive reefs under suitable conditions (as can be found in Chesapeake Bay), but generally tends to occur as single specimens or a few co-joined individuals on Long Island at the present time.

Blue mussels (*Mytilus edulis*) and soft-shelled clam (*Mya arenaria*) each occurred along two transects, all of which were in the southernmost 2,000-foot segment of WMC, near the mouth of the creek. Both of these species are filter-feeders. Blue mussels tend to form dense mats that cover the substrate. Soft-shelled clams are burrowers.

Japanese shore crabs (*Hemigrapsus* spp.) were found along the two southernmost transects. These are exotic crabs from the Pacific, which recently were introduced to the Eastern Coast of the United States, probably via the release of ballast water. *Hemigrapsus* crabs have an omnivorous diet that is similar to that of native crabs, thereby raising concern that native crab populations are being displaced.

Marine Finfish — Site-specific information regarding the finfish fauna in WMC is not known to be available. However, the marine habitats present in the study area are typical of conditions found throughout the tidal creek systems on Long Island's north shore. The most abundant fish in such water bodies are baitfish, including the following: common mummichog (*Fundulus heteroclitus*), which has a diet that includes detritus, algae, amphipods, isopods, copepods, and insects; striped killifish (or striped mummichog, *Fundulus majalis*), which has a diet similar to that of the common mummichog; sheepshead minnow (*Cyprinodon variegatus*), which primarily is a herbivore, feeding mostly on detritus and living plant material; and Atlantic silverside (*Mendia menidia*), which feed on copepods, shrimp, annelid worms, plant material, and small fish, among other things.

The abundant community of small fish in tidal creek systems such as WMC provides food for a large number of predatory species, including wading birds and terns (which are discussed earlier in this section of the report), as well as larger predatory fish species (e.g., bluefish, fluke, and striped bass), which forage in the shallow waters. Larger fish species that may be present in WMC at some time during their life cycles are described below — much of this information is taken

from *Fish Distribution* by M.D. Grosslein and T.R. Azarovitz (MESA New York Bight Atlas Monograph #15, December 1982).

Winter Flounder (*Pseudopleuronectes americanus*) is a predatory, bottom-dwelling flatfish that is known to be abundant in upper estuaries (including tidal creeks) during early larval stages, and gradually move into the lower estuary as they grow. The juveniles eventually leave the estuary to follow the adults. Larval and juvenile winter flounders likely are abundant in WMC. In fact, the State's project description for the Stony Brook Harbor and West Meadow Significant Coastal Fish and Wildlife Habitat (SCFWH) specifically identifies this area as a nursery for this particular fish species. Adults may also be present in this area, but to a somewhat lesser degree than larvae and juveniles. The entire population shifts shoreward after the autumnal cooling commences, with the greatest concentrations in estuaries occurring during the winter. Winter flounder move back offshore as the water temperature rises again in the spring.

Bluefish (*Pomatomus saltatrix*) is a migratory pelagic species that tends to move to the north in the spring and summer, and to the south in the autumn and winter. Bluefish typically school in groups of like-sized fish that can be quite large. Both juvenile and adult bluefish likely are common in WMC, since this predatory species often hunts for a wide variety of fish and invertebrates in shallow saline waters. This fish species also is specifically identified in the State's SCFWH project description as utilizing the bays and creeks of WMC and Stony Brook Harbor for nursery habitat.

Striped bass (*Morone saxatilis*) is a migratory species of predatory fish that spawns in freshwater rivers in the winter and spring. In mid to late summer they return downstream, where they remain until the following spawning season. The lower salinity portions of bays and sounds serve as nursery areas for juveniles. Smaller striped bass tend to congregate in schools, but large fish usually are found alone or in small groups except during mating. Adults inhabit saline estuaries, except during the spawning run, and are voracious feeders that consume a wide variety of fishes and invertebrates.

Summer flounder (*Paralichthys dentatus*) is another species of predatory, bottom-dwelling flatfish. This species spawns as the fish migrate offshore during the autumn. Juvenile summer flounders are capable swimmers that migrate toward the shore and enter the estuaries; they are well-adapted for estuarine life, since they are able to withstand a wide range of temperatures and salinities. Juveniles apparently remain in the estuaries until they are of sufficient size to join an offshore migration with the adult population of summer flounders.

Scup (*Stenotomus chrysops*) spawn in local estuaries, including Long Island Sound and its tributaries. The eggs are buoyant and the larvae are pelagic; both of these stages can drift with the ebb and flow of the tides, and potentially could be present in WMC. Juveniles and adults of this species are bottom dwellers, which also may occur in the creek. Juvenile scup are found in local estuaries during the spring and summer. Adults winter offshore between late fall and mid-spring.

Juvenile black sea bass (*Centropristus striata*) are found in local estuaries in the spring and summer, in association with rough bottom, shellfish and eelgrass beds, and man-made structures in sandy-shelly areas. The mussel beds that are present in WMC may provide suitable habitat for juvenile black sea bass.

Weakfish (*Cynoscion regalis*) is a migratory species that inhabits inshore areas and estuaries during the summer, and move generally offshore and southward in the winter. Juveniles feed on a wide range of invertebrates and small fish, while adults primarily depend on other fish. Spawning occurs in nearshore and estuarine zones from mid-spring through mid-autumn.

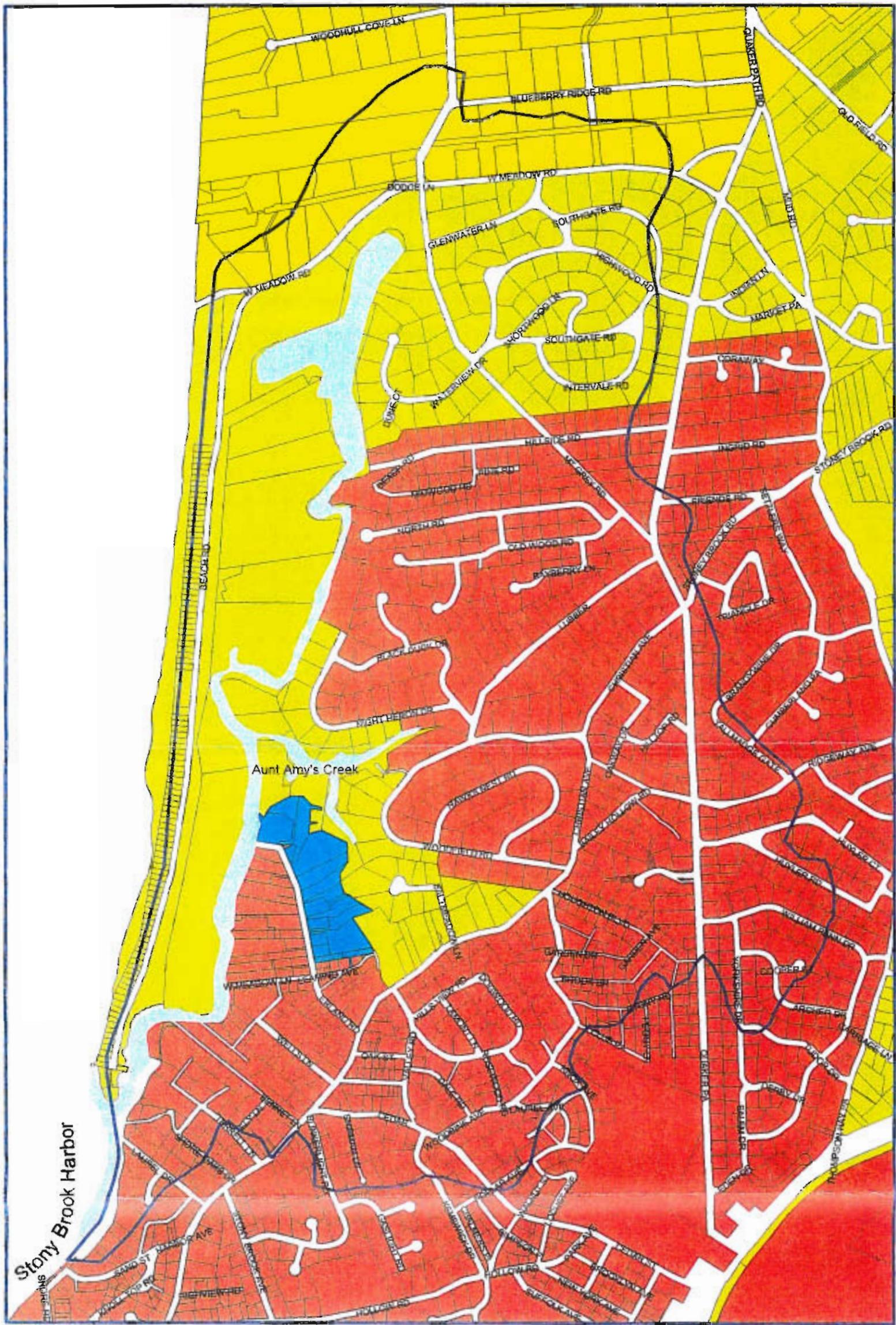
Blackfish (or tautog, *Tautoga onitis*) feeds primarily on mussels and barnacles, but also will eat a wide variety of other invertebrates (e.g., crabs, shrimp, amphipods, isopods, and lobsters). This species is a year-round resident of the New York area, but tends to spend the winter relatively inactive in deeper inshore waters. Spawning occurs in local bays, and juveniles seek protection in vegetated shallow waters, such as are present in WMC.

Atlantic menhaden (or bunker, *Brevoortia tyrannus*) are preyed upon by nearly all of the marine carnivores. Larval menhaden eat individual planktonic animals, but after metamorphosis into adults they subsist mainly on phytoplankton. The juveniles generally are restricted to streams, bays, and sounds associated with major estuaries. Adults are found offshore in the Atlantic Ocean.

2.3 Existing Zoning and Land Use

2.3.1 Existing Zoning

The existing zoning of the WMC watershed is illustrated in Map 2. The entire area is zoned residential, with variable minimum lot area requirements. The majority of this area, comprising a total of 966 lots covering approximately 440 acres (or 54 percent of the entire watershed area, excluding roadways), comprises a B-1 Residence District, in which the minimum lot area requirement is 22,500 square feet. A-1 Residence District, with a minimum lot area requirement of one acre, comprises 291 lots covering approximately 303



West Meadow Creek Management Plan
TOWN OF BROOKHAVEN ZONING



Legend	
	A1 - 1 acre residential
	A2 - 2 acre residential
	B1 - 5 acre residential
	SP - parcel with split zoning
	Creek
	Watershed boundary

Map Produced: March 12, 2001

MAP 2 - EXISTING ZONING MAP

acres (37 percent of the non-roadway area in the watershed), including most of the northern and eastern edges of the WMC watershed (i.e., east of Thompson's Hay Path and Mud Road, and generally north of Hillside Road and Coraway Road), as well as the area around Aunt Amys Creek (southeastward to Christian Avenue). The extreme northern reaches of the watershed, within the Village of Old Field (north of West Meadow Road), comprising 53 acres (6 percent of the non-roadway area in the watershed), is located in an A-2 Residence District, where the minimum lot area requirement is two acres. Seventeen lots, comprising 16 acres (2 percent of the non-roadway area in the watershed) are split between the B-1 and A-1 districts.

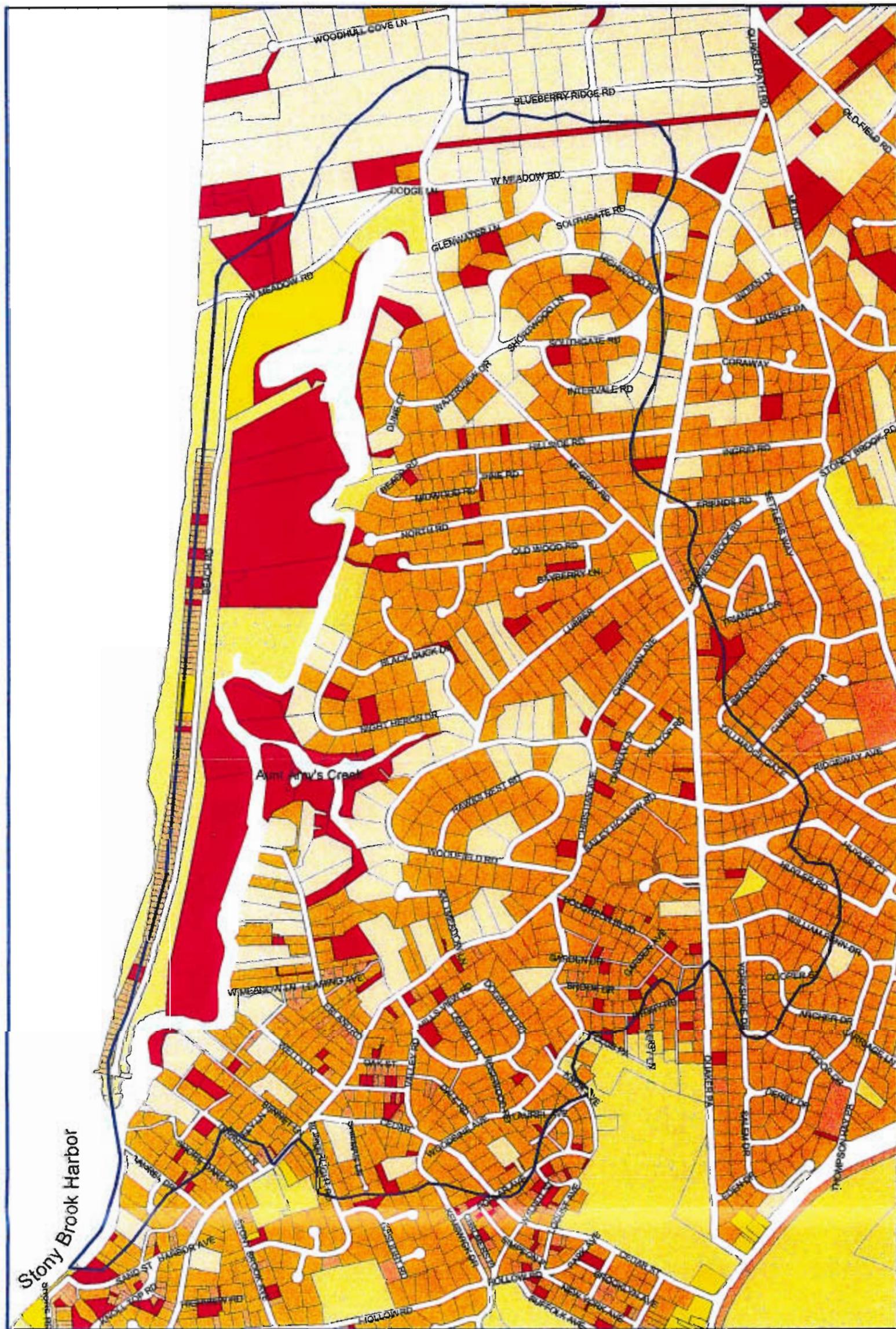
2.3.2 Existing Land Use

The predominant land use in the WMC watershed is single-family residence. There are a total of approximately 1,127 developed residential lots in the WMC drainage area (as delineated on Map 3), which are distributed among different density categories as follows:

- Low density (lot size greater than 1 acre) - 120 lots, or 10 percent of the total number of developed residential lots, covering a total of 166 acres
- Medium density (lot size between 0.2 acre and 1 acre) - 864 lots, or 77 percent of the total number of developed residential lots, covering a total of 415 acres
- High density (lot size less than 0.2 acre) - 143 lots, or 13 percent of the total number of developed residential lots, covering a total of 15 acres

There are a limited number of non-residential uses within the WMC watershed. These include the following two private community recreational facilities, both of which restrict access to their respective members:

- The Sound View Association consists of 65 homeowners, which share a common recreational facility on a half-acre parcel of land at the end of Hillside Road, in the northern portion of WMC. This site includes a seasonal beach (with roped swimming area and swim float), volleyball court, softball field, pavilion, boat ramp, bulkheaded area, and parking area.
- The Stony Brook Shores Association owns a four-acre property at the end of Night Heron Drive, in the central portion of WMC. This site includes an open field area (used for sporting activities and parking), toilet and shower facility, beach area for swimming, volleyball court, small pier used for fishing and swimming, rack for canoes, and picnic area with benches and tables.



Stony Brook Harbor

Aunt Ann's Creek



West Meadow Creek Management Plan.
TOWN OF BROOKHAVEN LAND USE



- Legend**
- AGRICULTURAL
 - COMMERCIAL
 - COMMUNITY SERVICES
 - HIGH DENSITY RESIDENTIAL
 - LOW DENSITY RESIDENTIAL
 - MEDIUM DENSITY RESIDENTIAL
 - PUBLIC LANDS
 - RECREATIONAL
 - UTILITIES
 - VACANT
 - Creek
 - Watershed boundary

Map Produced: March 14, 2001

MAP 3 - EXISTING LAND USE MAP

The Old Field Club, at the north end of WMC, is a private recreational club, which contains a hall that is operated as a catering facility available to the public for wedding receptions and similar functions. The Stony Brook School, a private educational facility, is located on the northwest side of Route 25A, between Cedar Street and Quaker Path. A small portion of this latter site extends into the southeast corner of the WMC watershed.

There is one, small cemetery within the WMC watershed area. This property, the Bethel Cemetery, is located on the northwest corner of the intersection of Christian Avenue at Woodfield Road.

Extensive areas in the immediate vicinity of WMC are classified as vacant open space, comprising mostly salt marsh and other areas of tidal wetlands. This includes approximately 100 acres of marshland owned by the Ward Melville Heritage Organization.

The WMC watershed contains a number of scattered vacant parcels that are privately owned, as shown in Map 3. All of these properties are zoned for residential use, and many potentially could be developed with one or more home sites. Section 3.3 presents a build-out analysis for these lands.

The existing population of the WMC watershed was estimated at 3,370 persons, based on the total number of existing dwelling units (1,127) multiplied by the average family size for the Town of Brookhaven (estimated at 2.99 persons, according to the *LIPA Population Survey 2000*).

2.3.3 Locations of Special Concern

There are a number of locations in the WMC watershed, especially along the shoreline of the creek, which are of special concern with respect to advancing the management goals of this plan (i.e., maintaining and enhancing water quality, preserving and protecting important ecological resources, and enhancing recreational opportunities). The primary sites of special concern are summarized as follows:

North Shore Horse Show Stables — This approximately 13-acre property, which is owned by the County of Suffolk, is located at the southeast corner of the intersection of West Meadow Road and Trustees Road. The site is used for horse shows under a license agreement between the County and Old Field Ltd., a not-for-profit organization. This agreement sets a limit of six horse shows per year, which each can extend a maximum duration of five days. Presently, only one or two horse shows occur each year, as well as a few non-equestrian events (e.g., last year there was a dog show and an art auction). Old Field Ltd. is in the process of renovating the facilities at the site, which would make it more attractive to horse show sponsors. In particular, the current

turf conditions are considered to be substandard, which causes difficulties in drawing high caliber events due to considerations of the safety of expensive show horses. It likely will be at least a few years before the improvements are completed to the point that the level of activity at the site approaches the contract maximum of 30 days.

Facilities on the subject property include one show ring and one practice ring, a grandstand at the show ring, stables, and a number of other buildings. During shows, all horse trailers are parked on-site. As needed, overflow parking of cars occurs at the Town's West Meadow Beach property, which is located directly across Trustees Road.

The County's agreement of Old Field Ltd. specifies provisions for manure management. Under these terms, Old Field Ltd. is responsible for collecting horse wastes on a continuous basis during the course of each event and placing this material in a bin that can be placed no nearer than 25 feet from the tidal wetland boundary. The bin must be removed at the conclusion of the event to a suitable off-site disposal facility. Given the relatively low degree of usage at present, only minor quantities of manure are generated. The fact that the horses are in their trailers during much of the time between competition activities also limits the amount of cleanup of the grounds that currently is needed. However, the County anticipates that once the ongoing improvements have been completed and the use of the site approaches the contractual maximum of 30 days per year, the level of effort required to implement the manure management program will increase.

The County inspects the Horse Show site periodically to ensure that Old Field Ltd. is complying with the requirements of the license agreement. Currently, there are no significant problems which are known to the County, either by direct observation or in the way of complaints from local residents.

Old Field Club — This approximately 4.5-acre property is located on the southwest corner of the intersection of West Meadow Road and Mount Grey Road. The site presently is developed with tennis courts and other recreational facilities that are used by club members. There also is a catering hall that is rented for private affairs (e.g., wedding receptions and the like). Concerns regarding this property include:

- The site contains significant areas of impervious surface, which contribute uncontrolled and untreated stormwater runoff directly to the adjoining headwater section of WMC, thereby adversely impacting water quality in this poorly flushed portion of the creek.
- The adjacent tidal wetlands have been degraded by activities on the Old Field Club property, due to both direct encroachment into wetland areas and indirect impacts such as stormwater runoff.

- Sewage is conveyed to an on-site, subsurface sanitary system. Such systems often malfunction under the physical conditions that occur at the subject location (i.e., close proximity to the creek, poor on-site soils and high groundwater levels). These circumstances can result in poorly treated sanitary wastewater being discharged to the creek, along with significant loads of pathogens and nutrients.
- Although the Old Field Club has been a functional use for many years, the potential exists for the property to be the subject of future redevelopment pressure, especially considering the recent upward trend in real estate values. Being located in an A-1 zoning district, this 4.5-acre site could yield as many as four single-family homes, posing the potential for various environmental impacts to WMC.
- This property is situated in the 100-year flood plain and, therefore, is susceptible to flood damage during severe storms.

Former Wells Boat Yard Site — This property, located on the north side of the terminus of Bennett Lane, previously was the site of an active boat yard facility, but was closed in the mid 1990s and subsequently was redeveloped with a single-family residential dwelling. There is concern regarding the possible release into the adjoining creek of toxic pollutants that accumulated during prior boat yard operations. The current owner recently submitted an application to the Town for permits to reconstruct the failing bulkhead at the site. Completion of this action would largely address the contaminant issue by re-stabilizing the shoreline at the subject location, thereby arresting active erosion of the on-site soils. In addition, public access along the shoreline in this area is hindered by the presence of fencing in the intertidal area.

Marine Conservation Center — This property is located on the west shore of WMC, approximately 4,700 feet upstream from the mouth. Erosion is an ongoing problem at this site, due mostly to uncontrolled stormwater runoff flows from Trustees Road and pedestrian traffic.

Deep Basin at Head of West Meadow Creek — This basin was created artificially by dredging in the early 1920s, and has been infilling with fine-grained sediment at a rapid rate since then. The depth of the mud layer at this location indicates an average sedimentation rate that is four times greater than the rate that is believed to apply to the marshes in WMC. The fine-grained sediment deposit in this basin is high in organic content. As this material decays, oxygen is consumed in the lower portion of the water column which, when combined with the poor circulation that occurs in this area, results in depressed concentrations of dissolved oxygen. These conditions diminish the suitability of the headwater basin area as habitat for marine animals, particularly less mobile benthic species such as bivalves. Besides being susceptible to depressed levels

of dissolved oxygen, calculations indicate that the subject basin also is characterized by a high pollution vulnerability due to poor flushing. These deteriorated water quality conditions in the deep basin may adversely impact the adjacent segments of WMC.

Sound View Beach — This approximately 12-acre property at the end of Hillside Road supports a variety of private recreational uses for the Sound View Association, including a seasonal beach with roped swimming area and swim float. However, the site is suffering from ongoing shoreline erosion, and the usability of the swimming area is being impaired by progressive shoaling in the creek.

North Branch of Aunt Amys Creek — The upper reach of the north branch of AAC contains a large shoal due to sediment deposits from stormwater discharges through a pair of two-foot diameter outfall pipes at this location. As discussed in Section 2.5.3, the flow volume from these two pipes was calculated to be the largest single stormwater point source, by far, along the entire WMC shoreline. The shoaling at the head of the creek has damaged the wetlands and reduced the effectiveness of tidal flushing in this area, thereby diminishing habitat value, and causing deteriorated water quality and an odor problem.

Shipman's Point — The end of Trustees Road, on the west side of the creek, has been identified as a problem area for the launching of personal watercraft (commonly referred to by the trade name "Jetski"), even though parking is not permitted in this area.

Bluff to the East of West Meadow Creek — This hillside is susceptible to potential erosion, due to the presence of steep gradients and sandy soils. The indigenous mature woodland vegetation provides effective slope stabilization. However, a number of the residential property owners in this area, particularly in the vicinity of Shipman's Point, have removed trees to improve views, thereby magnifying the risk of slope erosion and consequent increase in the discharge of sediment-laden stormwater to WMC.

2.4 Existing Water Uses

The primary human use of the water area in WMC is boating. The area is used largely for the operation of hand-powered vessels, such as canoes and kayaks. However, it is reported that operations of motorized vessels has increased in recent years, as has the incidence of such vessels exceeding the six-mile-per-hour speed limit. Local residents have indicated that this problem relates mostly to personal watercraft (commonly referred to by the trade name "jetski").

Vessel use of WMC is facilitated by the presence of 21 docking structures in this water body, which range from 10 feet to 60 feet in length. Most of these structures are accessory to private residential properties, and provide dockage for small motorboats and other small craft (canoes, kayaks, etc.). As shown in Map 4, nine of these structures are located in the -upper reach of the main channel of WMC, while nine more are located in AAC. There also is a docking structure at the Ward Melville Heritage Organization's Marine Conservation Center on the west shore of the creek, approximately 4,700 feet upstream from the mouth. This structure provides dockage for the Center's "Discovery" pontoon boat, which offers guided wildlife cruises in the local area. The remaining two structures are near the mouth of WMC, south of the former Wells Boat Yard property.

In addition to the shorefront docking structures discussed above, a small number of vessels are kept on seasonal moorings in WMC. These moored vessels are accessed via small boats from adjacent, private shorefront properties.

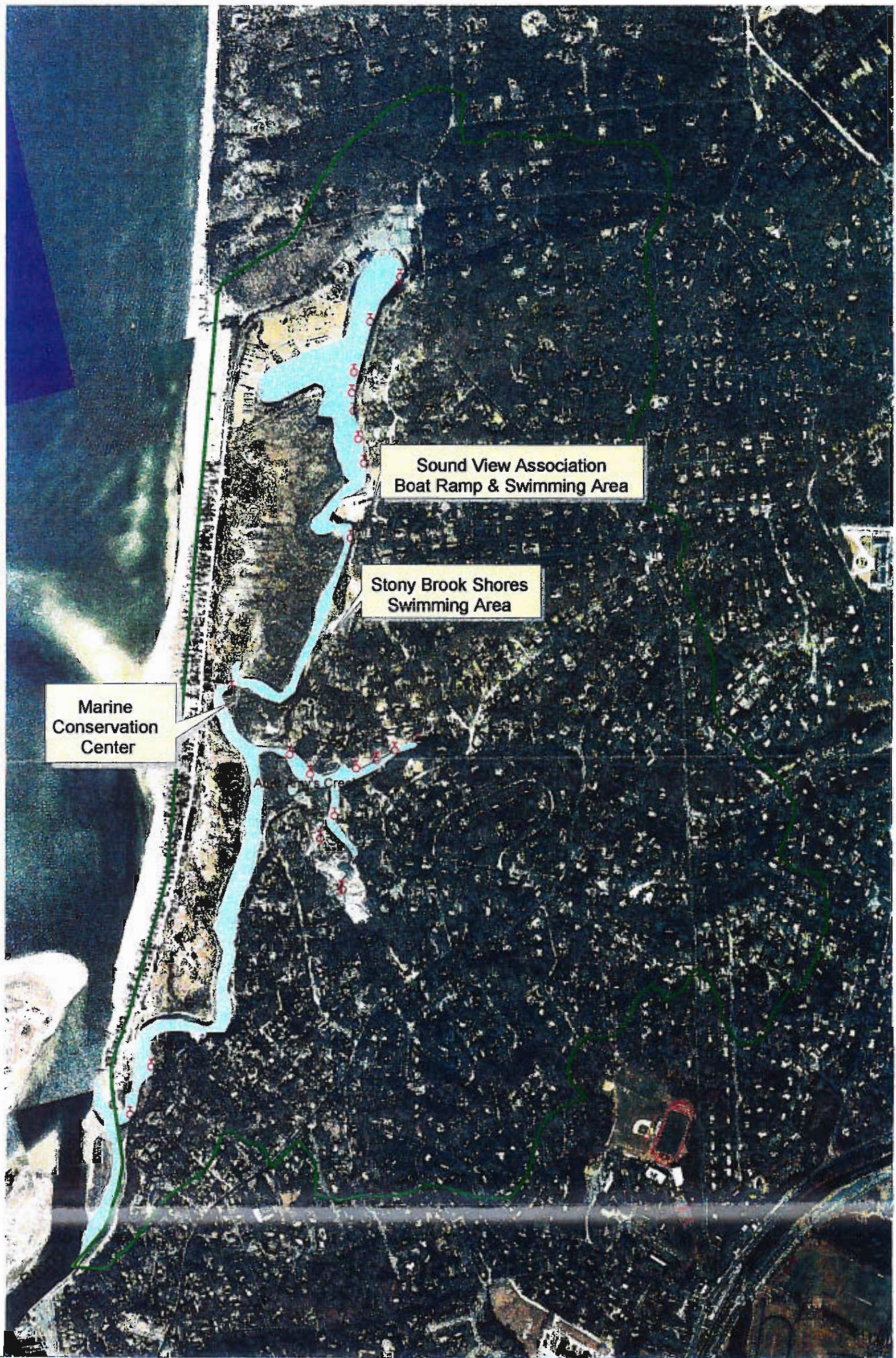
Vessel access to the waters of WMC also is gained from a number of boat ramps along the creek's shoreline. The Sound View Association has a steel ramp on its property at the end of Hillside Road, which is available for small boat launching to its members only, and is not usable during lower stages of the tide. Several road ends occasionally are used informally as boat ramps, primarily for the launching of canoes and kayaks. A number of other boat ramps are located on private land and are used by the respective property owners. However, no public access in WMC presently is available for launching such boats.

As noted in Section 2.3.3, swimming in WMC occurs formally at two locations, the Sound View Association facility at the end of Hillside Road and the Stony Brook Shores Association facility at the end of Night Heron Drive (see Map 4). Access to these sites is restricted to members of the respective associations. Swimming also occurs informally at other locations in the creek, with access from adjacent private properties on the waterfront.

The entire extent of underwater lands in WMC is uncertified on a year-round basis. Therefore, although this area contains abundant shellfish populations — including eastern oyster, blue mussels and soft-shelled clam (see Section 2.2.2) — these resources are not available for legal harvesting. However, there are anecdotal reports that the illegal taking of shellfish is occurring in this area.

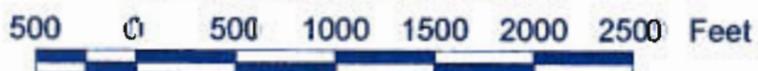
2.5 Underwater Land Ownership

The ownership of underwater lands in WMC is discussed in the 1996 report *The Hydrography of West Meadow Creek as It Relates to Management*. The information presented here is derived from that report, which was based on a review of tax maps and associated data bases on file



West Meadow Creek Management Plan

1999 AERIAL PHOTO WITH
SURFACE WATER FEATURES



Legend

-  Denotes approximate location of dock
-  Watershed boundary

Map Produced: March 22, 2001

with the Brookhaven Town Tax Assessor's Office. Since such data are not always a reliable indicator of real estate ownership, this information should be considered to represent a preliminary account of the pattern of ownership of the bottom lands in the WMC study area. A review of deeds and other legal documents would be required to ascertain ownership; however, such an analysis was beyond the scope of the present investigation.

The tax map data base indicates that most of the underwater lands in WMC and AAC are owned by the Ward Melville Heritage Organization (WMHO, formerly the Stony Brook Community Fund), including the dredged basin at the head of WMC. In the rest of WMC, the WMHO owns either the western side to the midline of the creek or full width of the creek. There are three parcels in WMC that are not identified by the Brookhaven Town Tax Assessor as being owned by the WMHO, and for which ownership is unclear: one parcel on the west side of WMC near the end of West Meadow Beach; one parcel in the eastern half of WMC, south of West Meadow Lane; and one parcel in the western half of WMC, opposite the Marine Conservation Center.

The Town of Brookhaven has title to three parcels in WMC. The Town owns all of the underwater land in the entrance to WMC, to a distance of approximately 900 feet north of Shipman's Point. The second parcel is an extension of the Erland Road right-of-way into WMC, on the east side of the creek. The third parcel is a small fringe along the shoreline on the west side of WMC, south of the Marine Conservation Center.

Three parcels of underwater land in WMC are owned by property owner associations. The Forty Acres Corporation owns a 1.2-acre parcel, including a small area of underwater land, at the end of Old Wood Road. Stony Brook Shores is located in the eastern half of WMC, directly adjacent to the Forty Acres Corporation parcel. The third parcel is a small right-of-way extending from Bennett Lane.

There are 29 parcels of privately-owned underwater land in WMC that are extensions of residential lots. All of these properties are located on the east side of the creek.

Nearly all of the underwater land in AAC is owned by the WMHO. A fringe of underwater land on the north side of the creek is part of the respective upland lots. The headwater segment of the south branch is split between the residential lots on the opposite shores.

2.6 Stormwater Drainage

A separate stormwater outfall investigation was undertaken as part of this planning study for WMC. The inventory information compiled during that investigation, as presented in a February 2000 report titled *Stormwater Outfall Inventory for West Meadow Creek* (Nelson, Pope & Voorhis), is summarized and discussed below.

2.6.1 General Stormwater Drainage Patterns

As noted previously, the upland watershed for WMC is approximately 890 acres in area. This drainage area corresponds to the present study's geographic boundaries, as delineated in Map 1 and described in terms of the street grid in Section 1.2.

WMC receives most of its drainage from the hillside to the east, with the watershed extending beyond Quaker Path over much of its easterly boundary. Much of this stormwater flow collects into a series of major drainage ways that intersect the east shore of WMC, including those along Bennett Lane, at the north and south branches of AAC, in the Southgate Road area (near the northern end of WMC), and along Glenwater Lane (at the head of WMC). Drainage to WMC also is derived from a small area to the north of the creek, beyond West Meadow Road. To the east, the WMC drainage area is very limited, due to the narrow width of the West Meadow Beach barrier spit.

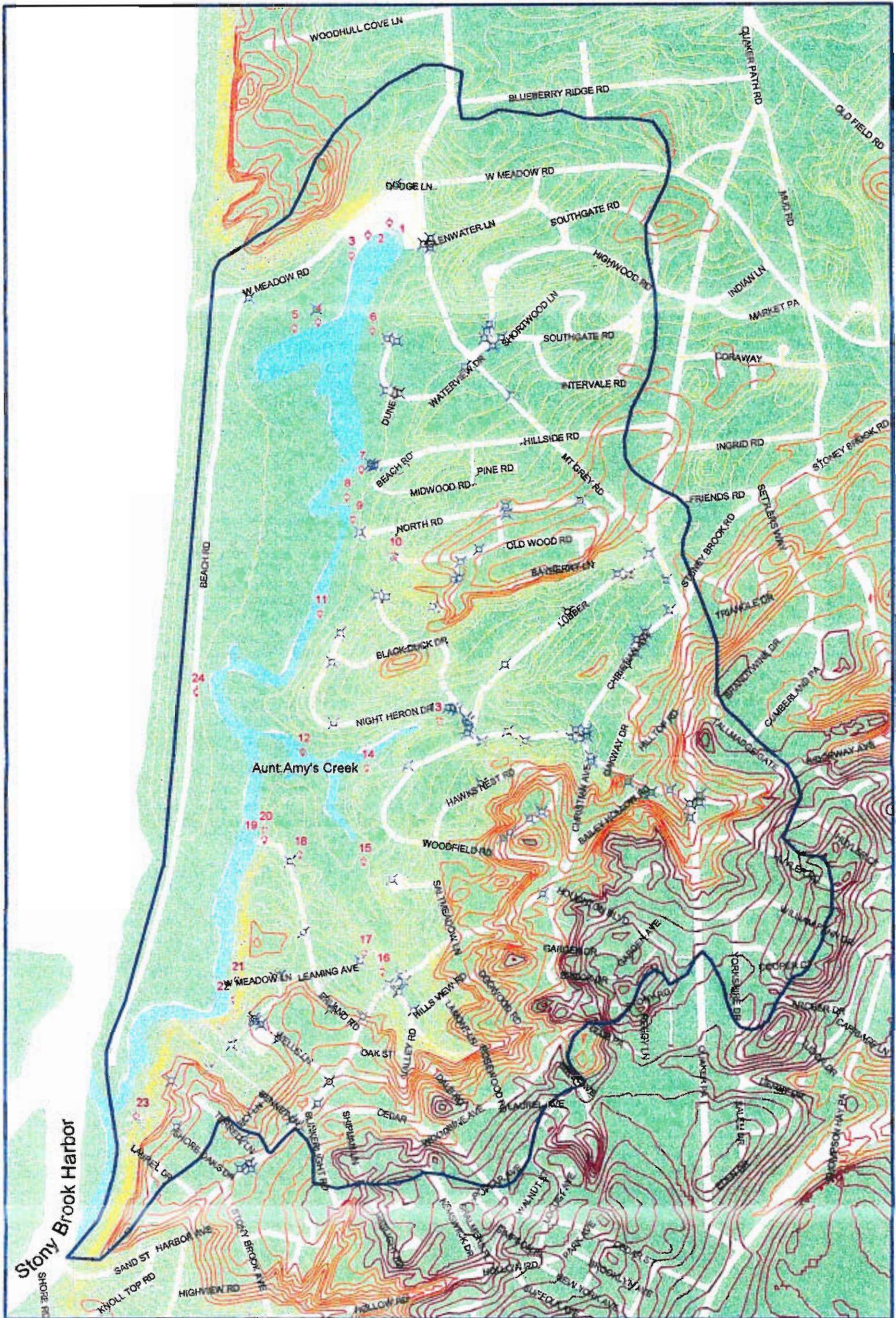
Roadway drainage is the primary source of stormwater runoff to WMC. Although non-point, overland flow from pervious areas immediately surrounding the creek also occurs to some degree, this input is of secondary importance compared to the point-source discharges from the roadway system.

2.6.2 Identification of Point-Source Discharges

A field survey was conducted in January 2000 to identify all outfalls and other stormwater conveyances along the shoreline of WMC. As shown on Map 5, this survey identified a total of 24 point-source stormwater discharges into the creek. Most of these discharge points are located along the easterly shoreline of WMC (including the AAC tributary), reflecting the fact that the majority of the drainage area lies in that direction.

The majority of the discharge points identified during the field survey are stormwater outfalls which receive runoff from upland street systems via interconnected storm drains. However, a variety of other inputs of runoff to the creek also were identified, including drains from buildings and other private structures, public and private boat ramps, eroded gullies or open swales, road ends, and pipes of unknown origin or purpose. Each of these discharges was catalogued and photographed; and the location was pinpointed using GPS equipment, which can be used to facilitate subsequent efforts to relocate these sites. Table 1 presents a summary of basic information regarding all 24 of the outfalls and other stormwater conveyances³ identified by the field investigators.

³ For simplicity, all outfalls and other stormwater conveyances are referred to generically as "outfalls" throughout the remainder of this report.



West Meadow Creek Management Plan
STORMWATER DRAINAGE FEATURES

500 0 500 1000 1500 2000 2500 Feet



Legend	
	Storm drains
	Catch basins
Contours (Feet):	
	5 - 25
	25 - 100
	100 - 150
	Creek
	Watershed boundary

Map Produced: March 21, 2001

MAP 5 - STORMWATER DRAINAGE FEATURES

TABLE 1
SUMMARY OF STORMWATER OUTFALLS/CONVEYANCES

#	Description	Type of Outfall	Source of Runoff	Discussion/Comments/Recommendations
1	Outfall at Old Field Club	Large pipe	Road runoff from West Meadow Road, Mt. Grey Road, Dodge Lane, and residential roads east of Mt. Grey Road.	The outfall is fitted with a large rubber collar, which opens with the force of stormwater but does not allow tidal water from the creek to flood the street. There are numerous storm drains located in the streets, some provide some detention and thus also act as sediment traps.
2	Old Field Club Roof and Decking	Small PVC pipe	Roof and decking of Old Field Country Club	This roof runoff may easily be diverted by gutters and leaders to a drywell.
3	Single Family Residence	Small pipe	The source of flow from this outfall is unknown.	
4	Horse Corral 1	Small plastic pipe	Turf area pitched towards drains in the field.	There are grated drains installed in the field, with a possible connection to a pump located at point number 5.
5	Horse Corral 2	Small plastic pipe connected to pump	Turf area and possible connection to storm drain on West Meadow Road	Large cement pipe at corner of West Meadow Road and Trustees Road. Not clear if stormwater from this point is directed to outfall, however, assume that there is the connection to provide worst case scenario.
6	Waterview Subdivision Outfall	Large concrete pipe	Waterview Lane and Dune Court	This outfall is related to a new subdivision, which appears to have a dedicated recharge area. It is expected that much of the flow is recharged in this area and the outfall is only provided for severe conditions.
7	Hillside Road Outfall	Small plastic pipe	Hillside and Beach Roads	This outfall is relatively small for the amount of road area and there are numerous drains/catch basins located at the end of Hillside. It is expected that runoff collects in catch basins located the end of this street and that a large portion of the stormwater is not directed to the outfall.
8	Home Owners Assoc. Boat Ramp	Impervious parking area with steep boat ramp	Soundview Property owners parking lot and boat ramp.	A relatively small area of the parking lot is pitched towards the boat ramp. The bulkhead is somewhat deteriorated and the fill has eroded into the creek. The creek bed in the area surrounding the boat ramp is very shallow.
9	North Road Outfall	Large concrete pipe	North Road, West Road and part of Bayberry Lane	Possible containment in catch basins at end of North Road and towards top of street.
10	Old Woods Road Swale	Road end with gully to beach	Old Woods Road	The end of Old Woods Road was entombed in ice during field inspections. A small metal pipe was observed jutting out of a large pile of snow at the end of the court.
11	Night Heron Drive Outfall	Large concrete pipe	Night Heron Drive, Wilderness Drive, part of Black Duck Drive and a connection to Leatherstocking Lane	This damage area was identified by the Town Highway Department as a critical point, a Bond Act Application was submitted, with funding approved for improvements. The Town Division of Environmental Protection should coordinate improvements with the Town Highway Department.
12	Boat Ramp 1 on Aunt Amy's Creek	Private boat ramp	Portion of lawn area and boat ramp	
13	Outfall at Aunt Amy's Creek	2 Large corrugated metal pipes rip-rap	Lubber Street, Fox Hill Road, Bailey Hollow Road, portions of Christian Avenue, Quaker Path, Black Duck Drive, Woodfield Road, Mt. Grey Road, Tee Drive, and Houghton Blvd.	This outfall has the greatest contributing area by far of any of the outfalls on West Meadow Creek and the greatest number of roadways involved. This drainage area has been the subject of a Bond Act application which is currently under review. The Suffolk County Soil Conservation Service is working with the Town Highway Department on this project. The Town Division of Environmental Protection should coordinate improvements with the Highway Department.
14	Boat Ramp 2 on Aunt Amy's Creek	Private boat ramp	Portion of lawn area from residential property and impervious boat ramp area	
15	Salt Meadow Subdivision Outfall	Large concrete pipe	Salt Meadow Lane	Outfall is located at the bottom of a slope located in the rear yard of a residence at the end of Salt Meadow Lane (a cul-de-sac).
16	Christian Avenue Outfall	Large concrete pipe	Christian Avenue, Valley Road, Chestnut Street, Fallsview Road, part of Ehirland Road and Dale Road	There appears to be some containment located in basins in the streets. The outfall is in good condition, as the photo will indicate, and the discharge point is located a fair distance from the surface waters of Aunt Amy's Creek.
17	Dickerson Drive Outfall	Small PVC pipe	Dickerson Drive	Storm drain located at the end of the road. Dickerson Drive is a narrow road and a resident indicated that the drain and outfall were installed by one of her neighbors. The discharge point is located far from surface water and there is sufficient area for sediment trapping and use of nutrients in stormwater discharged at this point.
18	Ehirland Road Outfall	Medium corrugated metal pipe	Most of Ehirland Road	Storm drains are located towards the end of Ehirland road on the north side. The outfall is located behind house #41. There is a wide area of high marsh vegetation between the outfall and surface water.
19	Ehirland Road End	Asphalt road end with steep slope to the beach	Part of Ehirland Road	The pavement seems to continue down the embankment to the beach. Asphalt is mounded from the top of the slope at the end of Ehirland to the beach. Stormwater runoff is directed to an eroded gully on the south side of the pavement as is indicated in the photos.
20	Ehirland Road Boat Ramp	Private boat ramp	Part of residential yard and impervious ramp	
21	West Meadow Lane Swale	Gully to beach, fairly steep path with apparent erosion	Runoff from West Meadow Lane	Long swale from top of bluff to beach, curves down the bluff through a wooded area.
22	Wells Lane Outfall	Large pipe	Wells Lane, part of Christian Avenue, and part of Blinker Light Road	Large outfall which has been modified in recent years. Some containment in road is apparent.
23	Shore Oaks Drive Road End	Road end with concrete steps to beach	Shore Oaks Road	End of Town owned-privately maintained road. Discharge point is south of entrance to West Meadow Creek.
24	Trustees Road Erosion	Low point	Trustees Road	Low point in road where runoff flows directly to the creek. Vegetated strip would provide immediate mitigation.

2.6.3 Quantification of Point Discharges

After identifying the 24 outfalls that contribute stormwater to WMC, an analysis was performed to delineate the area of roadway that is contributing drainage to each of these outfalls, based on existing topographic maps and relevant field observations. These data then were used to calculate the stormwater flow that can be expected under various magnitude rainfall events, by means of a Microsoft® Excel-based model developed previously for analysis of stormwater systems on the south shore of the Town of Brookhaven. An outfall prioritization graph was constructed to allow comparison of the computed flow volume through each outfall during a four-inch rainfall event. The computed stormwater volumes ranged from:

- a low of 38 cubic feet (cf) via a small boat ramp on AAC⁴; to
- a high of 147,938 cf via a pair of two-foot diameter pipes (outfall #13) which discharge into the head of the northerly branch of AAC, drawing drainage from extensive roadway network to the west and north, including Christian Avenue, Lubber Street, Woodfield Road, Black Duck Drive, and Night Heron Drive.

Other outfalls with a computed flow exceeding 20,000 cf for the four-inch rainfall event, which were classified with a “critical” priority rating, include:

- 115,688 cf via a large pipe at the Old Field Club (outfall #1), which discharges into the head of WMC, drawing drainage from a large area that includes West Meadow Road, Mount Grey Road, Dodge Lane, and the residential roads east of Mount Grey Road;
- 61,875 cf via a three-foot diameter concrete pipe (outfall #16), which discharges into the head of the southerly branch of AAC, drawing drainage from Christian Avenue and adjacent roadways; and
- 24,750 cf via a two-foot diameter pipe (outfall #22), which discharges from the end of Wells Street near the mouth of WMC, drawing drainage from Wells Street, and portions of West Meadow Lane and Christian Avenue.

Outfalls with a computed flow between 10,000 and 20,000 cf for the four-inch rainfall event, which were classified with a “moderate” priority rating, include:

⁴ This does not include an outfall at the north end of WMC, adjacent to a private residence, which was listed with a flow of zero because the drainage source could not be identified.

- 18,750 cf via a 12-inch composite pipe (outfall #5), which discharges from the west side of WMC, near the intersection of Trustees Road and West Meadow Road, drawing drainage from the nearby turf area at the Suffolk County Horse Show Stables site and the adjacent roadway system;
- 18,750 cf via a shallow gully (outfall #24), which cuts across the unpaved shoulder of Trustees Road and discharges into west side of WMC, drawing drainage from Trustees Road;
- 15,375 cf via an eight-inch PVC pipe (outfall #7), which discharges from the end of Hillside Road, drawing drainage from Hillside Road and the Sound View Homeowners' Association park area; and
- 13,523 cf via a concrete pipe (outfall #1), which discharges from the end of Night Heron Drive, drawing drainage from Night Heron Drive, Wilderness Path, Black Buck Drive, and Leatherstocking Drive.

All of the remaining 17 outfalls were computed to have a stormwater flow less than 15,000 cf for the four-inch rainfall event, or less than ten percent of the volume of the highest-flow outfall. The computed flow of 13 of these outfalls are less than 10,000 cf, placing them in the "low" priority category.

Section 3

Existing Local Laws

3 EXISTING LOCAL LAWS

This section of the report presents a summary of the various chapters of the Brookhaven Town Code that are relevant to the attainment of the goals and objectives of the West Meadow Management Plan. In order to correspond to the categories of information and analysis presented in other portions of this report, this discussion of existing local laws is divided into three sections: environmental protection laws (Section 3.1), land use laws (Section 3.2), and water use laws (Section 3.3).

3.1 Environmental Protection Laws

Beaches (Chapter 9) was established to regulate the use of motor vehicles on both north and south shore beaches, and to prohibit camping and overnight sleeping on beaches. Chapter 9 outlines the permitting process for exempted vehicle usage, and establishes a speed limit for the operation of exempted vehicles.

Sanitation (Chapter 45) regulates the commercial collection, handling and disposal of solid and liquid wastes, littering, and the distribution of handbills. The collection of solid and liquid wastes is allowed strictly by permit. The hours of collection and regulations for waste disposal are also set forth in this chapter. The disposal of hazardous waste, and the disposal of any materials collected outside the Town, at or on any public facility, is prohibited. Private disposal areas also are prohibited.

Petroleum Substances Disposition (Chapter 47) was established in recognition of the necessity of protecting and preserving natural resources. Chapter 47 of the Town Code regulates the disposal, storage, and transportation of all waste oil in the Town of Brookhaven and requires the licensing of vehicles carrying such oil. The discharge of waste oil into the ground, sewers, leaching pools, wells or any other water bodies, or onto roadways, is strictly prohibited.

Sand and Gravel, Excavation, Topsoil Removal (Chapter 53) was established to recognize that sand and gravel are valuable resources for property owners within certain areas of the Town, and that in past years the excavation of sand and gravel has proceeded in a manner that has resulted in the elimination of ground cover, natural vegetation and the degradation of slopes, radical changes in stormwater runoff and other environmental problems. Development that utilizes existing slope contours is encouraged wherever possible so that drainage patterns and disturbance to existing vegetation will be minimized. Chapter 53 restricts the removal of sand and gravel to those instances where it is absolutely essential to remove raw materials from a site in connection with the residential, commercial or industrial development of the premises. Mining operations shall be limited to the extent necessary to implement the approved site plan or the criteria set forth by the Planning Board where no site plan is required. Additionally, no

sand/gravel mine shall be used as a sanitary landfill or other landfill. Mining and excavation operations are regulated through the site plan approval process and are assessed fees based on the yardage of material removed. Approved operations are required to post performance bonds, and are restricted to a one-year time limit.

Shellfish (Chapter 57) regulates the commercial and non-commercial taking of shellfish from Brookhaven Town-owned underwater lands, regulates the commercial buying of shellfish, and establishes a commercial harvesting permit system. The taking of shellfish from Town-owned underwater lands is restricted to Brookhaven residents only, with the exception of Town of Islip residents who may take shellfish from the Great South Bay (outside the present study area) if they possess approved permits issued by the Town of Islip. Restrictions are outlined with respect to harvesting, including allowable sizes and harvesting methods, as well as night and Sunday restrictions, with specific requirements set for each species.

Tree Preservation (Chapter 70) was established to recognize that trees provide various benefits to the environment, including stabilization and preservation of soil, absorption of air pollutants, release of oxygen, provision of natural barriers to noise, and wildlife habitat. Chapter 70 prohibits the destruction or removal of any tree on a property of two acres in size or greater without a permit. Permits shall only be issued upon site plan approval, subdivision approval, and/or the issuance of a building permit.

Trespassing (Chapter 71) establishes that no person shall mar, deface, damage, destroy, or remove any flowers, plants, shrubs, trees, buildings or structures on public or private property within the Town without consent or authority of the property owner or the Town.

Vegetation on Beaches (Chapter 75) prohibits the removal and/or destruction of any grass or other vegetation whatsoever from any lands on the Great South Beach and on the beach and cliffs adjacent to the Long Island Sound. Exception to this regulation is by permit only as issued by the Town.

Critical Environmental Areas/SEQRA Implementation (Chapter 80) was established pursuant to the requirements of the New York State Environmental Quality Review Act (SEQRA). The Town of Brookhaven contains vast and precious natural and human environmental resources, including woodlands and open spaces, flora and fauna, wetlands, groundwater, unique geological features, air quality, agriculturally fertile lands, historic and archeological resources and other areas of important aesthetic and scenic quality. The Town Board recognizes that there is now and will continue to be significant development pressure within the Town which, without appropriate restrictions to control growth, may lead to the destruction or impairment of the Town's environmental resources as a result of sewage disposal, groundwater contamination, air impacts, solid waste and traffic generation, loss of wetlands and destruction of woodlands and open areas.

It is the intention of Chapter 80 to protect these valuable resources to the maximum extent possible for the benefit and enjoyment of Town residents. This law establishes that any actions which are specifically identified as unlisted actions which may pose a significant impact upon the environment will be processed in the same manner as a Type I action under SEQRA and, therefore, receive the same thorough environmental review, including the completion of a full Environmental Assessment Form and lead agency coordination. Chapter 80 designates three critical environmental areas (CEAs) within the Town, where Type I review requirements apply in order to help protect valuable resources. One such CEA is the entire coastal zone area in the Town of Brookhaven, which includes most of the present study area (excluding the easternmost portions of the watershed). This law also sets forth a listing of Type I and Type II actions for SEQRA implementation.

Wetlands and Waterways (Chapter 81) regulates activities in and around surface waters, underwater lands, and tidal and freshwater wetlands. These features are environmentally important because of the wide-ranging functions they serve, including: flood and storm control, pollution treatment, wildlife habitat, erosion control, sources of nutrients for marine and freshwater species of wildlife, open space and aesthetic appreciation, a means for scientific and educational research, and commercial and recreational opportunities. The Town of Brookhaven recognizes the need to protect and enhance these functions of surface waters, underwater lands, and tidal and freshwater wetlands, and the need to prevent the despoliation and impairment of these natural resources, by regulating uses and development in these areas and surrounding buffer zones. Chapter 81 regulates and protects these resources pursuant to the authority conferred upon the Town by Articles 24 and 25 of the New York State Environmental Conservation Law and SEQRA. Chapter 81 establishes a listing of regulated activities (e.g., construction of docks and other shoreline structures, dredging and filling, excavation and grading, clearing of vegetation, erection of buildings, waste discharges, etc.), exceptions, and permit application procedures.

3.2 Land Use Laws

Parks and Recreation Areas (Chapter 10) regulates the usage of parks and recreation areas, by means of a system of fees and permits, and restrictions on fishing, camping, bathing, horseback riding, bicycles, aviation, games, and other such recreational activities. Chapter 10 outlines restrictions and/or prohibitions governing littering, fires, animals, soliciting and contributions, the destruction of property, traffic, explosives, firearms and weapons, and loitering in these areas.

Grading (Chapter 35) regulates and controls the regrading of land throughout the Town in all zoning districts, so as to prevent serious and irreparable damage to natural resources, to minimize and retard the erosive effects of wind and water, to prevent the depreciation of

property values, to prevent the loss of lateral support for abutting streets, lands and structures, to preserve natural watersheds, to provide adequate drainage for surface water runoff, to protect persons and property from the hazards of periodic flooding and, in general, to protect the health, welfare and safety of the residents of the Town. Applications for building permits and certificates of occupancy are approved, disapproved, or approved with modifications pursuant to the grading standards established in this chapter.

All-Terrain Vehicles (Chapter 37) regulates the use of all-terrain vehicles on public and private property in the Town of Brookhaven. No such vehicle shall be operated on public property under the jurisdiction of the Town unless a permit has been issued, and no such vehicle shall be operated on private property in the Town unless the operator has obtained written permission from the owner of the property.

Zoning (Chapter 85) regulates all land use activities within the Town and establishes specific land use classifications, or zoning districts, promulgates restrictions which regulate development within each such district.

Chapter 85 contains several articles that are applicable to the implementation of the West Meadow Creek Management Plan, including:

- Site Plans (Article 54) requires the preparation of site plans for new construction or for the substantial alteration of existing commercial or institutional uses, and for large residential developments. Site plans must undergo a coordinated departmental review with subsequent approval, approval with modifications, or disapproval. This review considers the potential impacts of the proposed action on adjacent uses with regard to public health, safety and welfare.
- Supplementary Provisions (Article 55)
 - a. Waterfront Lots (Section 85-433) - This section of Article 55 prohibits the issuance of a building permit for the construction or alteration of any structure located within a freshwater or tidal wetland unless the applicant has complied with all the provisions set forth in Chapter 81 of the Town Code, and has obtained a Town wetlands permit.
 - b. Sewage Disposal (Section 85-444) - This section of Article 55 requires the issuance of a building permit for the construction, alteration or use of any building or structure for sewage disposal and treatment. The issuance of a building permit is contingent upon Planning Board approval of site plan for the action. When the Planning Board is reviewing a site plan that includes a sewage treatment and disposal facility, a public hearing must be convened.

Subdivision Regulations (Part 1 of the Appendix to the Town Code) regulates the subdivision of land. A subdivision application is required when four or more residential building lots are created by the division of a parcel of land. The regulations establish procedures, fees and requirements for preliminary layouts and final plats, and requires the preparation of drainage plans as well as the issuance of surety bonds. General requirements are listed for the layout and construction of roadways, lots and blocks, site grading, bulkheading, construction of public improvements, and provision of recreational improvements.

3.3 Water Use Laws

Bay and Harbor Bottoms (Chapter 8) is intended to regulate the placement of boat moorings to avoid use conflicts, provide for safe navigation, and the protection of existing natural resources, public health and welfare; and to ensure that areas for water-dependent recreational activities are available to the residents of the Town of Brookhaven. Chapter 8 establishes the requirement for a Town-issued mooring permit is required before a mooring can be placed in Town waters, and promulgates a process to obtain said permit.

Parks and Recreation Areas (Chapter 10) regulates uses and activities in Town parks and recreation areas (which includes the Town's West Meadow Beach facility). Chapter 10 establishes: hours of operation; requirements for overnight camping, ballgames, and use of facilities for organized outings; provisions for permits and payment; restrictions on bathing and swimming; prohibition on fishing during the bathing season; general prohibition on fireworks, explosives, littering, soliciting and peddling; and controls on fires and animals.

Boat Control (Chapter 13) contains the bulk of the local regulations governing vessel operations in Town waters, including WMC. The main provisions of Chapter 13 are summarized as follows:

Section 13-2 — reinforces the applicability of the New York State Navigation Law and federal navigation rules to the navigable waters of the Town of Brookhaven

Section 13-4.B — requires boat operators to comply with lawful orders and directions of any police officer, bay constable, harbormaster, dock master, and any other person duly empowered to regulate boat traffic in the Town of Brookhaven

Section 13-5 — sets the speed limit at six miles per hour for vessel operation in creeks, among other designated areas

Section 13-17 — sets the maximum penalty for violation of Chapter 13 at a fine of \$500 or imprisonment for 15 days, or both.

Houseboats (Chapter 14) prohibits the occupation, use, mooring or anchoring of houseboats and floating homes to any dock, piling or shore within Town waters. This article also prohibits marinas from permitting the in-water or out-of-water storage, anchorage, mooring or docking of any floating home or residential houseboat. Pre-existing houseboats shall be allowed as special permitted uses pursuant to the conditions set forth in Chapter 14. These regulations were established in order to limit pollution entering estuaries that provide habitat for commercial and recreational finfish and shellfish, and to protect environmentally sensitive coastal areas.

Docks (Chapter 22) was established to regulate the use of Town-owned docks, piers, bulkheads and jetties. The utilization of these structures for bathing, swimming or diving is prohibited.

Fish Nets (Chapter 32) prohibits the placement of fish netting in waters over Town Trustee lands in Stony Brook Harbor, West Meadow Creek, Conscience Bay, Setauket Harbor, Port Jefferson Harbor, or Mt. Sinai Harbor.

Section 4

Analysis

4 ANALYSIS

This section analyzes the various important issues that relate to the achievement of the goals of this management plan, namely: to maintain and, to the extent practicable, enhance water quality in WMC; and to preserve and protect important ecological resources in the study area. A future phase of this investigation will formulate a program of actions to advance these goals.

4.1 Physical Conditions

Based on preliminary calculations, it appears that the existing tidal exchange is not likely to reverse ongoing shoaling at the mouths of either WMC and AAC naturally. Therefore, problems associated with the progressive infilling of this tidal creek network with sediment, such as impeded navigation during lower tidal stages, would be expected to worsen over time. Certain actions can be taken to moderate the infilling of the creek, such as the implementation of measures to reduce sediment loadings in stormwater discharges to the creek. These measures include: the timely sweeping of roadway surfaces in the WMC watershed, to remove sand deposits placed during the winter season before this material can be washed into the creek; and the retrofitting of existing stormwater drainage systems with treatment capabilities, such as settling and leaching basins.

A large fraction of the sediment accumulating in the WMC is carried into the creek from Stony Brook Harbor. Therefore, even if effective measures were implemented to control stormwater-derived sediment inputs to WMC, shoaling of the creek bed still would continue, although at a somewhat slower rate.

WMC — as well as a contiguous area outside WMC itself, extending about half-way down the east side of Youngs Island — is closed on a year-round basis to shellfish harvesting due to chronically elevated levels of coliform bacteria. AAC also is uncertified for shellfish harvesting, and occasionally exceeds the criteria for primary contact recreation (e.g., swimming). Numerical modeling analysis indicates that dredging may reduce concentrations of coliform bacteria in WMC by as much as 50 percent. However, coliform reductions of several orders of magnitude are required to meet state standards for shellfish harvesting. Therefore, it does not appear that dredging in itself would result in a level of water quality improvement that would enable this area to become available for shellfish harvesting.

Because of poor water circulation, the deep basin at the head of WMC is experiencing an accelerated rate of fine-grained sediment and organic material accumulation, high pollution susceptibility, and depressed dissolved oxygen levels. These conditions diminish the suitability of the basin area as habitat for marine animals, particularly less mobile benthic species such as bivalves, and may adversely impact water quality in the adjacent segments of WMC.

Severe shoaling has occurred in the headwater section of the north branch of AAC. This accumulated sediment, derived from stormwater discharged through a pair of large outfall pipes at this location, has damaged the wetlands and reduced the effectiveness of tidal flushing in this area, thereby diminishing habitat value, and causing deteriorated water quality and an odor problem.

Water quality issues related to stormwater discharges are examined in more detail in Section 4.5.

4.2 Ecological Resources

WMC is widely recognized as an important ecological resource, as evidenced by its incorporation into special management areas by a variety of governmental agencies. These include: Significant Coastal Fish and Wildlife Habitat, on both a State and federal level; State-designated Outstanding Natural Coastal Area; and State-designated tidal wetlands. The habitat in WMC is in generally good condition, and does not require large-scale remedial action. However, certain actions can be undertaken to reduce existing conflicts and the potential for future conflicts caused by human use of the creek and the surrounding area, as discussed in Sections 4.3 through 4.5.

The biological survey of WMC undertaken as part of this investigation revealed the presence of non-native shore crabs (*Hemigrapsus* spp.) in WMC, near its mouth. Although the impacts that these introduced crabs will have on the WMC ecosystem is not presently known for certain, there is concern that native crab populations may be displaced by these aggressive invaders. Further study is needed to assess the seriousness of this problem and to formulate a suitable mitigation strategy if the ecological threat is determined to be significant.

Although the wetlands in the study area generally are devoid of *Phragmites*, this species is present at some locations in AAC and in a few small patches elsewhere. *Phragmites* is an invasive plant, which has a much lower habitat value than native salt marsh vegetation, such as *Spartina alterniflora* and *S. patens*. Measures to eliminate replace areas of *Phragmites* growth with these indigenous grasses would improve the habitat quality of WMC for various wildlife species.

4.3 Zoning and Land Use

The WMC watershed area is almost completely built-out. Currently there are a total of 1,127 developed residential lots, in addition to a relatively small number of developed non-residential properties. Vacant land within the watershed potentially could yield an additional 64 residential lots, covering a total area of approximately 29 acres. Twenty other vacant upland lots that currently are in private ownership appear to be unbuildable because of inadequate dimensions,

while another 20 lots are not suitable for development because they are landlocked. Sixteen private parcels of underwater land also are unbuildable.

Development of the 64 vacant lots which have been identified through this investigation as being potentially buildable would result in a 5.7 percent increase over the current number (1,127) of developed residential lots in the WMC watershed. At a reported family size in the Town of Brookhaven of 2.99 persons (*LIPA Population Survey 2000*), full build-out of the 64 potential additional lots in the WMC watershed would increase the population of this area by 191 persons.

Almost all of the potentially developable lots in the study area represent individual parcels of land that are less than one acre in size and would not be subject to subdivision. As long as the proposal for the development of any such single lot complies with the dimensional requirements for the applicable zoning district, including lot size and setbacks, the Town of Brookhaven has very little regulatory discretion over the approval process. The primary available means of implementing best management practices in association with the development of these parcels is education of the involved property owners prior to the initiation of site preparation activities. The wooded character of present residential development in the WMC watershed makes it more likely that new housing lots also will preserve at least some of the existing trees. However, no restriction is in place under the Town Code to prevent full clearing of any parcel that is less than two acres in area, and extensive tree removal is commonly undertaken on smaller lots in order to accommodate the house and other improvements.

Even in cases of existing lots that require minor variances to allow development, the occurrence of similar non-conformities in the surrounding neighborhood provides the applicant with a basis for requesting the Zoning Board of Appeals to grant relief that would allow development to occur. Such non-conformities are common in some of the areas where there are individual vacant lots that would not be able to conform to zoning requirements. Except in cases where lots clearly are too small to accommodate a home site, this build-out analysis assumed that substandard lots potentially could be developed in the future.

Any application that requests relief from the requirements of the Town Zoning Code, requiring one or more variances, is forwarded for review by the Town Division of Environmental Protection. In this way, appropriate environmental restrictions can be incorporated into the Town permits for such actions, so as to minimize potential impacts to important natural resources, including the retention of existing vegetation and implementation of measures to mitigate stormwater-related impacts. However, as noted previously this situation does not pertain to individual building permit applications for which no zoning variances are requested.

Some degree of local regulatory control is exercised for any development proposal that requires a wetland permit from the Town of Brookhaven, pursuant to the provisions of Chapter 81 of the Town Code. In such cases, the Town Division of Environmental Protection has the authority to establish restrictions regarding the extent of clearing and land disturbance that can be undertaken by the applicant, so as to retain adequate buffers around wetlands. This authority was exercised with respect to the recent development of a single home site on a 3.5-acre parcel (designated as section 152, block 3, lot 13) which lies at the head of the southerly branch of AAC, where extensive buffers were established by the Town to protect the adjacent wetlands.

The North Shore Horse Show Stables occupies a 13-acre property owned by the County of Suffolk at the head of WMC. Old Field Ltd., uses the site for horse shows under a license agreement with the County. The proper management of horse manure generated at this location is a major environmental concern. Presently, only one or two horse shows occur each year, although the agreement allows a maximum of six such annually. A facility renovation project is in progress, which it is expected eventually will allow the level of activity at the site to approach the contract maximum of 30 days. Under the terms of its agreement with the County, this responsibility falls to Old Field Ltd. Although to date this management program has been conducted in accordance with the terms of the agreement, more intensive oversight will be needed once the ongoing improvements have been completed. This situation should be monitored closely to ensure that the potential is minimized for adverse water quality impacts to WMC due to the generation of horse manure on this shorefront property.

The Old Field Club contains private recreational and catering hall facilities. Although the site has supported these uses for many years, redevelopment pressure may intensify in the future. Under the A-1 zoning district of this 4.5-acre site, as many as four single-family homes potentially could be constructed. Such development would pose the threat of causing further deterioration of water quality in the creek, due both to stormwater discharges and subsurface sewage disposal in poor soils with high groundwater elevations. Increased impacts to adjacent wetlands and habitat areas also could result. Furthermore, this parcel is prone to flooding, as it lies in the 100-year flood plain.

Various properties on the hillside to the east of WMC have been subject to tree removal in an effort to improve views. This action increases the susceptibility of the slope to erosion, which potentially can increase the discharge of sediment-laden stormwater to WMC.

4.4 Water Uses

As discussed in Section 1.3, WMC contains extensive areas of tidal wetlands, which form part of the federally-designated Port Jefferson-Stony Brook Harbor SCFWH, the State-designated Stony Brook-Setauket ONCA, and the State-designated Stony Brook Harbor and West Meadow SCFWH. These are sensitive ecological resources that have been identified and targeted for

protection. In order to achieve this overriding goal of natural resource protection, human uses in WMC must be of relatively low intensity.

In general, the in-water uses of WMC by humans are of a suitable low intensity so as to avoid significant conflicts with the use of this area by fish and wildlife. However, inappropriate powerboat operations have been identified as causing adverse effects on these vital ecological resources. Of special concern are vessels that exceed the posted speed limit of six miles per hour, which can discourage maximum potential usage of the study area by wildlife. Certain species of water birds that utilize WMC are especially sensitive to the type of disturbance caused by speeding boats — including noise, wakes, and visual commotion — and are more likely to avoid an area that is subject to such disturbance. Personal watercraft are of particular concern in this regard, since their shallow draft allows them to enter areas from which deeper draft motorized vessels are excluded, which areas are the most sensitive with respect to wildlife activities. Furthermore, since personal watercraft are relatively inexpensive to purchase and maintain and easy to operate, they are available to a larger segment of the population, many of whom have little or no prior experience with vessel operation, which increases the likelihood of improper behavior.

The Stony Brook Estuaries Council has reported that in addition to the general nuisance created by inappropriate and improper vessel operation in WMC, public safety is potentially compromised when power boats do not maintain adequate distance from other in-water uses. This problem would be ameliorated by enforcing the requirements of Section 10-25 of Chapter 10 (Parks and Recreation Areas) of the Brookhaven Town Code which, in part, specifies that: “No boats or vessels propelled other than by hand shall cruise or be operated within one hundred (100) feet of any lifelines or bathing floats or, if there are no lifelines or bathing floats, then within one hundred fifty (150) feet of any public or semipublic beach regularly used for bathing or swimming..”.

The Stony Brook Estuaries Council has reported that alcohol consumption has been a factor in inappropriate and improper vessel operation in WMC. This problem would be mitigated by enforcement of the existing prohibition against the operation of boats while under the influence of alcohol, including Section 3-2 of Chapter 3 (Alcoholic Beverages) and Section 13-8 (Boat Control) of the Brookhaven Town Code.

Although WMC has abundant shellfish populations, this resource is not available for harvesting because the creek and the adjoining area extending about half-way down the east side of Youngs Island have consistently failed to meet New York State water quality standards for that use. Anecdotal reports that shellfish are being taken illegally from this area raise concerns that potentially tainted product may be introduced into the market, which has serious implications with regard to the protection of human health. Efforts to mitigate stormwater discharges to the

Creek may expand the area of underwater lands available to shellfish harvesting, especially with respect to the current area of closure directly outside the mouth of the creek.

The operation of small hand-powered boats (e.g., canoes and kayaks) generally is considered to be compatible with the high level of environmental sensitivity of WMC. However, there is no officially-designated and established point along the shoreline of WMC from which the general public can launch such boats in order to access these waters at the present time. Provision of a suitable small boat launching location would increase the public enjoyment of the creek and its scenic resources; and would discourage launching from inappropriate locations such as Shipman's Point, where parking is prohibited.

Future proposals for dredging of WMC channel should not be considered unless an overriding public benefit can be demonstrated. Presently, since there is no site at which the public can gain direct vessel access to WMC (e.g., for boat launching), it would be difficult to demonstrate that a public benefit would be fulfilled by a channel dredging project. Even if a small vessel launching facility is established on the creek's shoreline, the types of vessels that would be served by such a facility (i.e., canoes, kayaks, and other hand-powered boats) could readily be accommodated without dredging. Given the ecological importance of WMC, and the fact that existing vessel uses are of a generally low intensity, it does not appear that channel dredging for navigational purposes can be justified in this water body under current circumstances and conditions.

A significant portion of the underwater lands in WMC are owned by the Ward Melville Heritage Organization. Further investigation would be needed to ascertain the degree of authority the Town of Brookhaven has relative to the regulation of activities in the creek.

The usability of the roped swimming area at Sound View Beach is being impaired by progressive shoaling in the creek. The site also is suffering from an ongoing shoreline erosion problem.

4.5 Stormwater Drainage

The protection of water quality in WMC is one of the primary goals of this management plan. In order to achieve this goal, it will be necessary to identify and implement measures to mitigate stormwater discharges, since stormwater runoff from the adjacent upland area is the most important source of contaminants discharged to WMC. Therefore, a significant amount of time and resources during this phase of the WMC management plan were devoted to the collection and analysis of information regarding the existing stormwater drainage system in the WMC watershed.

Based on the inventory of existing stormwater drainage conditions in the WMC watershed, as set forth in the February 2000 *Stormwater Outfall Inventory for West Meadow Creek* report, an analysis was performed to identify preliminary priorities for future mitigative action to improve water quality conditions in the creek. That assessment included a determination of locations that would benefit from sediment control devices, as well as locations where such devices are present but require repair.

As discussed in section 2.5.3, Stormwater Impact Prediction (SIP) computer modeling was performed to calculate the stormwater discharge volume that can be expected from each of the 24 outfalls along the shores of WMC during the four-inch rainfall event. Based on these results, the outfalls were prioritized on a preliminary basis, as follows:

1. **Outfall #13** — a pair of two-foot diameter pipes which drain into the head of the north branch of AAC, with a calculated flow of 147,938 cf. This is the highest discharge volume of all 24 outfalls around the perimeter of WMC. The Stony Brook Estuary Council has indicated that the true discharge from this outfall may even be somewhat greater than has been calculated, due to illegal connections from private properties.
2. **Outfall #1** — a large pipe at the Old Field Club which drains into the head of WMC, with a calculated flow of 115,688 cf. This is 78 percent of the discharge volume of outfall #13.
3. **Outfall #16** — a three-foot diameter concrete pipe which drains into the head of the south branch of AAC, with a calculated flow of 61,875 cf. This is 42 percent of the discharge volume of outfall #13.
4. **Outfall #22** — a two-foot diameter pipe which drains from the end of Wells Street near the mouth of WMC, with a calculated flow of 24,750 cf. This is 17 percent of the discharge volume of outfall #13.
5. **Outfall #5** — a 12-inch composite pipe which discharges from the west side of WMC, near the intersection of Trustees Road and West Meadow Road, with a calculated flow of 18,750 cf. This is 13 percent of the discharge volume of outfall #13.
6. **Outfall #24** — a swale which cuts across the unpaved shoulder of Trustees Road and discharges into west side of WMC, with a calculated flow of 18,750 cf. This is 13 percent of the discharge volume of outfall #13. The degree of water quality impact at this location is exacerbated by ongoing erosion due to concentrated stormwater flow and pedestrian traffic.

7. **Outfall #7** — an eight-inch PVC pipe which discharges from the end of Hillside Road, with a calculated flow of 15,375 cf. This is 10 percent of the discharge volume of outfall #13.
8. **Outfall #11** — a concrete pipe which discharges from the end of Night Heron Drive, with a calculated flow of 13,523 cf. This is 9 percent of the discharge volume of outfall #13.

It is important to recognize that the prioritization list presented above only reflects relative magnitude of stormwater discharges, taking into account broad land use characteristics. Although stormwater volume is a major factor in the degree of water quality impact experienced by a receiving water body, and often is the overriding controlling variable, a number of other parameters also influence contaminant loadings to coastal waters to a greater or lesser degree. These include:

- A. **the types of soils in the watershed area** — Some soils, particularly highly permeable soils in areas of gentle slopes, absorb stormwater more efficiently than others, resulting in less stormwater being discharged to receiving water bodies.
- B. **the extent and type of vegetative cover** — Dense woodland vegetation is more effective at retaining stormwater and reducing the amount of runoff generated, as compared to sparse herbaceous vegetation.
- C. **special land use conditions in the watershed area** — Certain specific types of land uses, which are not reflected in the broad land use categories employed by the SIP model, may generate contaminants at a higher rate than other land uses. For example, the North Shore Horse Show Stables property may be a significant source of pathogens at times of peak activity.
- D. **the presence or absence of treatment devices in stormwater drainage systems** — Leaching pools, recharge basins, retention basins, and similar devices remove contaminants from stormwater prior to discharge through the outfall pipe.
- E. **drainage area's proximity to WMC** — Outfalls that draw from watersheds that lie in closer proximity to receiving waters generally discharge a higher proportion of their pollutant loadings, as compared to watersheds that extend further inland, since pollutant levels typically diminish gradually as stormwater travels through the system. This is particularly true for pathogens, which experience progressive die-off with the passage of time.

- F. **outfall's proximity to mouth of WMC** — A contaminant discharge to WMC that is closer to its mouth generally has less of an impact on the creek's water quality than a similar input that is located further upstream, since mixing and dilution with the waters of Stony Brook Harbor occur more rapidly at the mouth of the creek than in the vicinity of its head.

Before proceeding with project implementation, further analysis should be undertaken in the seven top-priority sub-watersheds in order to characterize site-specific conditions more precisely with respect to the six factors enumerated above. Such an analysis should be based on qualitative characteristics, perhaps arranged in a matrix to allow ready comparison.

The recommended measures for mitigating stormwater discharges at each of the seven highest priority outfalls, as set forth in the February 2000 *Stormwater Outfall Inventory for West Meadow Creek* report, are summarized below:

1. **Outfall #13 (north branch of AAC)** — Use the Town easement property to provide storage and filtering devices; add rip rap to the area south of the outfall, where erosion is occurring beyond the existing area of rip rap; and add storage in the contributing roadways. This project has received matching grant funding under the New York State Clean Water/Clean Air Bond Act program. Work on this project has been, and will continue to be, a cooperative effort among a variety of local agencies, including the Town of Brookhaven Highway Department and Division of Environmental Protection, and the Suffolk County Soil Conservation Service. NYSDEC also is an important involved agency, as the administrator of the Bond Act grant.
2. **Outfall #1 (Old Field Club, at head of WMC)** — Install additional stormwater storage in the street, to supplement the numerous existing storm drains that provide some detention and sediment removal at the present time; explore the potential use of the recharge area associated with the Waterview subdivision; possibly relocate the outfall above the high water line to facilitate drainage; and add a vegetative filter strip to correct erosion caused by runoff in the intertidal zone.
3. **Outfall #16 (south branch of AAC)** — No recommendations have been formulated at this location. Further analysis is needed.
4. **Outfall #22 (Wells Street)** — Provide additional storage by means of leaching pool systems.
5. **Outfall #5 (Trustees Road, near head of WMC)** — No recommendations have been formulated at this location. Further analysis is needed.

6. **Outfall #24 (Trustees Road swale)** — Install catch basins; and provide a vegetative buffer at the runoff point.
7. **Outfall #7 (Hillside Road)** — No recommendations have been formulated at this location. Further analysis is needed.
8. **Outfall #11 (Night Heron Drive)** — Based solely on the quantity of stormwater generated, this location would appear to be a relatively low priority for mitigative action, since the computed flow volume is only 9 percent of the flow volume of outfall #13. However, a more detailed assessment reveals that outfall #11 receives stormwater runoff from a fairly extensive roadway network in a residential subdivision, via a drainage system that includes virtually no storage capacity. Consequently, this runoff is discharged to WMC without significant treatment. A proposal to retrofit storage structures into the existing drainage system has received a matching grant funding under the New York State Clean Water/Clean Air Bond Act program.

Where mitigation measures have been identified above, they are expressed in terms of general management techniques which are believed, based on current information, to be the most appropriate at each location. Even where such techniques have been recommended, however, further, site specific analysis is needed in order to formulate preliminary conceptual designs which would represent the basis for actual project implementation. Suitable management techniques must be identified for the three locations for which the February 2000 report does not provide such recommendations, before proceeding with the preliminary conceptual design phase.

Engineering feasibility should be taken into account in developing the preliminary conceptual designs. Site-specific conditions, such as shallow depth to groundwater or poorly draining soils, may make commonly used recharge methods problematic at any given location, thereby requiring more sophisticated engineering approaches. Implementation costs also should be considered during the conceptual phase of the project. In comparing cost-effectiveness of the measures proposed at the various locations, it may be useful to calculate the project cost-per-cubic-foot of stormwater to be treated. Depending on the results of the analysis of these two factors, feasibility and cost, it may be necessary to adjust the priority order so as to give preference to projects that are more readily implemented and/or are more cost-effective.

Subsequent to the completion of the February 2000 *Stormwater Outfall Inventory* report, the Stony Brook Estuary Council identified one additional point source that was not inventoried in that report, but which is believed to be a potentially significant source of contaminant input to WMC:

- **Bennett Lane Road End** — This location is on the east side of the creek, near its mouth. Overland flow has resulted in the formation of a large gully, which is causing sediment to be washed into WMC. The presence of the former Wells Boatyard property along the flow path raises concern regarding the potential for the stormwater discharge from this road end to contain contaminants. In addition, the ongoing erosion problem is threatening the integrity of the bulkhead at the road end. If this bulkhead fails, there could be a substantial increase in the quantity of sediment, possibly contaminated, that is introduced into the creek. An application to repair this bulkhead is pending.

Section 5

Next Steps

5 *NEXT STEPS*

This report provides an inventory and analysis of environmental conditions in the West Meadow Creek drainage basin, and represents the first phase of an ongoing effort to develop a management plan for the study area. During the pending second phase of the project, the Town of Brookhaven will use the findings presented in this report to formulate a series of recommended measures to preserve and enhance the important environmental and recreational resources of West Meadow Creek and its watershed.

This document will be issued for review by the New York State Department of State, which is supporting the project through a matching grant under the Environmental Protection Fund Program, and also will be made available for review by interested parties and stakeholders in the West Meadow Creek area. Any substantive comments received as a result of the review of this *Inventory and Analysis* report will be incorporated into the final *Management Plan for West Meadow Creek*.

Further public input will be sought during the development of management measures for West Meadow Creek in the next phase of the project. This will ensure that the final plan reflects the community's goals and objectives, so that proposed implementation actions will receive sufficient public support.

List of References

LIST OF REFERENCES

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List of Abbreviations

LIST OF ABBREVIATIONS

AAC	Aunt Amys Creek
cf	cubic feet
DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
LISCMP	Long Island Sound Coastal Management Program
MLW/SBH	mean low water in Stony Brook Harbor
MPN/100 ml	most probable number of organisms in a 100 milliliter sample
NURP	Nationwide Urban Runoff Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOS	New York State Department of State
ONCA	Outstanding Natural Coastal Area
SCFWH	Significant Coastal Fish and Wildlife Habitat
SUNY	State University of New York
WMC	West Meadow Creek
WMHO	Ward Melville Heritage Organization