Nassau County
Stormwater Management Program

MILL RIVER SUBWATERSHED
Stormwater Runoff Impact Analysis AND CANDIDATE SITE ASSESSMENT REPORT

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Mill River Subwatershed
Stormwater Runoff Impact Analysis

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1. INTRODUCTION

The Mill River Stormwater Runoff Impact Analysis (Analysis Report) has been prepared in accordance with the Nassau County Stormwater Management Program *Stormwater Runoff Impact Analysis Procedures Manual* (Procedures Manual). The Procedure Manual provides a methodology to assess and score all of the subwatersheds in the County in accordance with a standardized procedure. The Analysis Report contains a summary of all of the assessment data collected and developed regarding the subwatershed condition and also identifies potential water quality improvements.

The goals and objectives of the Stormwater Runoff Impact Analysis are to:

- Assess the condition of the existing subwatershed;
- Map the drainage infrastructure;
- Identify pollutants of concern; and
- Develop candidate projects and sites for mitigation of pollutant loading and improvement of water quality within the stream to the greatest extent possible.

The Analysis Report is organized into two main sections as follows:

- Subwatershed assessment; and
- Stormwater management practice (SMP) candidate site assessment and recommendations.

The subwatershed assessment section describes the drainage infrastructure mapping, vulnerability analysis and stream assessment which were conducted in accordance with the methodology outlined in the Procedures Manual. The SMP candidate site assessment and recommendations section analyzes the collected data and identifies potential locations to site SMP's and also provides an analysis of potential pollutant load reduction and water quality improvement.

The data developed in this report can be entered into a comparative analysis sheet that will allow the County to track existing conditions and anticipated improvements for each subwatershed in the County.

2. SUBWATERSHED ASSESSMENT

The Center for Watershed Protection (CWP) classifies watersheds into five watershed management units. These include catchment area, subwatershed, watershed, sub basin, and basin. According to the CWP, the subwatershed-scale is preferred for assessment studies and is therefore the scale is used for this analysis. The drainage basins for waters in Nassau County are the South Shore Estuary on the south shore and the Long Island Sound on the north shore. Nassau County has defined the watersheds based on the bay or inlet to which tributaries drain. The Oyster Bay Harbor/Mill Neck Creek watershed is located between Locust Valley and Oyster Bay Cove on the north shore. Subwatersheds are the tributaries that drain to the watersheds. For Oyster Bay Harbor and Mill Neck Creek the tributaries include Tiffany Creek, Whites Creek and Mill River which drain directly into the harbor and Francis Ponds/Beaver Brook, Kentuck Brook and Bailey Arboretum Brook which drain into Mill Neck Creek.

The subwatershed assessment included review of available subwatershed data including Nassau County Geographic Information System (NCGIS) mapping, other available municipal mapping, Nassau County record documents and other available municipal record documents. After available records were reviewed, the land use data was utilized to estimate existing impervious cover, water quality storm volumes and pollutant loads. The stream assessment was conducted to verify mapping, assess field conditions and examine drainage infrastructure systems. The compiled information was analyzed to identify locations where stormwater runoff is impacting the stream either via inputs (i.e., outfalls, illicit discharges or lack of buffers) or through effects on the stream corridor (erosion, channelization or stream crossings). This data is used to identify potential candidate site locations for recommended stormwater management practices.

2.1. DRAINAGE INFRASTRUCTURE MAPPING

All sources of potentially available drainage data were reviewed and the information collected on a new layer in the GIS system. Prior to completing the stream assessment, areas where drainage infrastructure appeared to be lacking were noted and highlighted for review in the field. Drainage infrastructure data collected during the stream assessment was added to the drainage infrastructure maps.

2.1.1. MAP DEVELOPMENT

The Nassau County Geographic Information System (NCGIS) files for the subwatershed were requested and received from the Nassau County Department of Information Technology. The NCGIS data served as the base map on which newly identified information could be added.

At the offices of the NCDPW Engineering Department, a list of drainage maps for road projects and subdivision developments within the subject subwatershed was compiled from the County drainage books (a series of three sets of documents). A Freedom of Information Law (FOIL) request including the list of drainage maps necessary for the subject infrastructure review was prepared. Table 2-1 shows the list of documents requested via the FOIL. Review of the Nassau County as-built records identified 16 documents that pertained to work conducted in the Mill River subwatershed. The maps were provided to a printing sub-consultant for scanning into Tagged Image File (TIFF) formatted documents. The documents were returned to the NCDPW Engineering Department along with a CD copy of the scanned documents. The drainage information from the scanned documents was transferred to a new GIS layer in accordance with Nassau County mapping protocols.

A FOIL request for available record documents for road projects within the subwatershed was made to New York State Department of Transportation. Paper copies of record documents were received. The drainage information that pertained to

the subwatershed was mapped in AutoCAD and transferred to GIS format on the same layer as the scanned data from Nassau County record documents.

The final layer combining the data from all sources is titled "Final GIS Layers" and includes identification of the source of the data in the "Origin" database column. The data identified in the field using GPS is included on the "Final GIS Layers" and is identified as "Cashin Associates GPS".

2.1.2. FIELD DATA COLLECTION

Using the mapping developed in Section 2.1.1, areas with incomplete drainage mapping were identified. A field survey of the drainage infrastructure in those locations was conducted. This task was performed in conjunction with the Stream Assessment described in Section 2.3. During the assessment, the stream corridor was walked to verify the mapped outfalls and to identify other locations where storm runoff appeared to be directly entering the stream. The drainage infrastructure upstream of each outfall was then field verified to identify the extent of the drainage infrastructure contributing to each outfall. The drainage infrastructure of the Mill River subwatershed is shown on Map 2-1.

2.2. SUBWATERSHED VULNERABILITY ANALYSIS

The Subwatershed Vulnerability Analysis consists of three components as follows:

- subwatershed characterization;
- impervious cover assessment; and
- pollutant load analysis.

The subwatershed characterization includes a description of the subwatershed's size, land uses, boundary, and length of waterbody. The impervious cover assessment calculates the amount of impervious area in the subwatershed based on: 1) NCGIS data for parking lots, roads, building footprints; and 2) area calculations for sidewalks and driveways. The

pollutant load calculation uses NCGIS data for land use in conjunction with standard coefficients for runoff pollutant levels, resulting in an estimate of pollutant loads for the subwatershed.

2.2.1. SUBWATERSHED CHARACTERIZATION

The Mill River is located within the Town of Oyster Bay in the northeastern portion of Nassau County. The Mill River extend from wetlands in the Muttontown Preserve north under North Hempstead Turnpike (NYS Route 25A). The river becomes a channelized segment with intermittent flow for a long segment along Mill River Road. This segment has both piped section and daylighted segment and receives drainage from multiple small outfalls between North Hempstead Turnpike (25A) and Oyster Bay-Glen Cove Road. Mill Pond is a large pond located between Oyster Bay-Glen Cove Rd. and West Main St. which receives drainage from multiple stormwater outfalls and sluices from the encircling roads. The pond outflows under Main Street and discharges through the tidal segment of Mill River into Oyster Bay Harbor. This report is limited to the freshwater segment of the river from main street south.

The geographic limits of the Mill River subwatershed were defined through review of topographic maps, plans of existing municipal drainage infrastructure, and field assessment. Map 2-2 shows subwatershed topography along with existing drainage infrastructure.

The Mill River subwatershed encompasses approximately 2,159 acres that potentially contribute runoff to Mill River. The original subwatershed has been reduced in size by the installation of recharge basins and other drainage infrastructure that contain storm runoff from roads, housing developments and individual sites. See Section 3 for a description of the self-contained areas that no longer contribute water quality volume runoff to Mill River. The Mill River watershed extends from Main Street south to Muttontown Road and is ranges from approximately 3,000’ to 4,000’ in width. The

land use with in the subwatershed is comprised of 48% residential and 47% "other" which includes parkland, preserves and, municipal facilities. Commercial use comprises 2% of land use and roads account for 3% of land use. Of the 851 residences in the subwatershed, 445 or 52% are equal to or less than one-quarter acre in size and out of the 406 residences remaining 149 or 18% are in between one-quarter acre and one-half acre and 257 or 30% are larger then 1 acre. There are few developed municipal lots and large open space within the subwatershed.

2.2.2. IMPERVIOUS COVER ASSESSMENT

Percentage of impervious cover has been determined to be an indicator of subwatershed health. Lower percentages of impervious cover in a subwatershed generally indicate that water quality is less impacted by pollutants than in subwatersheds with higher impervious cover percentages. The Center for Watershed Protection (CWP) has established subwatershed classification based on percentage of impervious cover ranging from sensitive streams (0-10% impervious) to urban drainage stream (>60% impervious). The impervious cover assessment uses methodology included in the NC Procedures Manual. The methodology is based on CWP procedures that use GIS data to estimate impervious cover. The impervious cover within the subwatershed was calculated from the NCGIS data and standardized tables developed by the CWP. The NCGIS data necessary to calculate impervious cover is presented in Table 2-2 GIS Data Chart.

The following sources or methods were used to calculate the impervious cover in the Mill River subwatershed:

- NCGIS data allowed the actual footprint of all building areas and parking lot areas within each land use to be calculated.
- Area of roads was calculated from the NCGIS data.

- Total average driveway area was estimated by tallying the number of residences in each of five size categories, ranging from less than 1/8 acre to greater than one acre and applying impervious driveway factors from CWP as developed by Cappiella and Brown , 2001.
- Sidewalks were estimated by viewing aerial photography of the site and estimating the percentage of the subwatershed roads with sidewalks. In the case of Mill River, 20% of the streets are estimated to have 4' wide sidewalks on both sides.

The impervious cover data was entered into the standard table from the Procedures Manual. The data table and results of calculations are shown on Table 2-3. The impervious area of the Mill River subwatershed is 161 acres of the 2,159 total subwatershed acres. This represents 7% of the subwatershed. Based on the 7% impervious figure, Mill River receives a subwatershed classification of sensitive stream

Sensitive streams have a subwatershed impervious cover of 0% to 10%. The streams are generally of high quality, typified by stable channels, excellent habitat structure, good to excellent water quality, and diverse communities of both fish and aquatic insects. Due to the low impervious cover condition, frequent flooding and other hydrological changes that accompany urbanization are not experienced. It should be noted that some sensitive streams located in rural areas may have been impacted by prior poor grazing and cropping practices which may have severely altered the riparian zone. Consequently, all the properties of a sensitive stream may not be present. However, once riparian management improves, these streams are often expected to recover. The main goals for sensitive subwatershed management in Mill River's case are to maintain the biodiversity, maintain channel stability, and reduce direct surface runoff from a nearby adjacent roadway.

2.2.3. STORM POLLUTANT LOAD CALCULATION

Nassau County has identified a number of pollutants associated with stormwater runoff to be of concern for the County's subwatersheds. Impervious surfaces act as a "trap and conveyance" mechanism for the pollutants, ultimately resulting in deposition of the pollutants into nearby waterbodies. These pollutants negatively affect the surface water quality. The pollutants identified by the County are carried in large quantities in storm runoff from roads and paved surfaces.

Total Suspended Solids – Total Suspended Solids (TSS), which includes silts and sediments, constitute the largest mass of pollutant loadings to surface waters. This pollutant is exported in greatest quantities from construction sites. In addition, TSS is generated from lands with insufficient vegetative cover, stream channel erosion, street sanding operations, and vehicle tires. NYSDEC has identified TSS as a pollutant of concern for New York State waters and requires that 80% of TSS be removed from runoff from new construction. The subwatershed's adjacent roadway with insufficient vegetative cover and channel erosion conditions contribute to TSS in Mill River.

Phosphorus and Nitrogen – Total Phosphorus (TP) and Total Nitrogen (TN) are two nutrients necessary for plant growth. Nonpoint sources of TP and TN are recognized causes of water quality degradation in many water bodies. These nutrients, washed into waterbodies via stormwater runoff, typically originate in lawn fertilizers and animal wastes from pets, waterfowl, small mammals and livestock. NYSDEC has identified TP as a pollutant of concern for New York State waters and requires that 40% of TP be removed from runoff from new construction. Residences with large yards that drain to the street and pet wastes contribute TP and TN to Mill River.

Fecal Coliform and Other Pathogens – Pathogens include bacteria, viruses and other microorganisms that can cause human illnesses such as hepatitis A. The suspected causes of this impairment originate in the feces of pets, livestock and waterfowl that

are carried into waterbodies by stormwater runoff. Pet and waterfowl wastes contribute to fecal coliform levels in Mill River.

Hydrocarbons (Oils and Grease, Petroleum Compounds) – Oils and grease contain an array of hydrocarbon compounds, some of which can be toxic to aquatic life even at low concentrations. The major source of hydrocarbons in urban runoff is through the leakage of crankcase oil and other lubricating agents from motor vehicles and from facilities that service motor vehicles (e.g., repair shops and gasoline stations). Hydrocarbon concentrations are typically highest in runoff from parking lots, roadways, and service stations. Mill River's adjacent roadway and municipal equipment yards are large contributors to the stream's high concentration of hydrocarbons. Illegal disposal of waste oil onto streets and into storm sewers can also contribute to this problem.

Floatable Debris – Besides the obvious negative aesthetic effects, trash can impact aquatic life through either ingestion or entanglement. The adjacent road to Mill River's stream can contribute a large floatable debris load. In addition, dumping of debris was also observed in the Mill River corridor.

The pollutant loads were calculated in accordance with the Nassau County Procedures Manual using the "Simple Method" for all pollutants with the exception of Floatable Debris. The Simple Method uses the land uses and CWP pollutant coefficients to calculate the pollutant loads. Land use was separated into the five categories of residential, commercial, industrial, roads and other. Pollutant load coefficients were assigned based on the land use. The "other" category includes parks, municipal properties and any other uses not included in the categories mentioned. Existing land uses within the subwatershed are presented on Map 2-4. The NCGIS land use data necessary to calculate pollutant loads is presented in Table 2-2 GIS Data Chart. Nassau County development criteria have long mandated that commercial and

industrial properties contain their storm runoff on site. Those land uses can be excluded from the calculation if the field assessment confirms that these land uses are self-contained and do not contribute runoff to the waterbodies. For floatable debris, coefficients based on land use were developed for the categories of residential, commercial, industrial, roads and other. The coefficients are applied to each land use area to estimate floatable debris generation with the subwatershed.

The data was entered into the Water Quality Volume and Pollutant Load Calculation Table provided in the Procedures Manual. The resulting pollutant loads are shown on Table 2-4. The pollutant loads for each pollutant were assigned severity points based on the least, 1 point, to the most, 6 points, severe pollutant threat in the watershed. The pollutant loads are multiplied by the assigned severity points and the total is divided by 100 and entered into the pollutant severity score row on the Comparative Analysis Table. The pollutant loads are also used to assess potential SMP improvements to each individual subwatershed.

2.3. STREAM ASSESSMENT

The stream assessment was conducted in accordance with the NC Procedures Manual. In addition, the CWP *Unified Stream Assessment: A User's Manual* was reviewed prior to the field effort. The assessment was conducted during the winter months when the lack of vegetation improved access to and provided visibility of the outfalls and stream corridor condition. Mill River was assessed by traveling downstream from the southern end of the river at Muttontown Preserve. On the data sheets, the banks are described as left (west) and right (east) looking downstream.

The stream assessment for Mill River was conducted from December 20, 2006 to December 27, 2006. The equipment used by survey personnel to conduct the assessment included data assessment sheets, GPS unit, dry erase board and markers, digital camera, clipboard, tape measure and waders. For this subwatershed, aerial photos and property

line maps were used to record field data. In the event that property owners had concerns regarding the work, the survey team carried a contact list of the governing authority to provide to the residents. Each stream assessed was assigned an identification number starting with 100. Mill River was the second stream assessed by this methodology and was assigned identification number 101.

During the stream assessment, the stream corridor was photographed at regular intervals and at specific locations. The interval photographs record the stream surroundings and any immediately identified points of interest. When a data assessment sheet was completed, a photograph of the specific location was taken. For each Outfall (OT) sheet, photographs were taken from three different directions. When the location to be photographed was accessible, a dry erase board was labeled with the RCH and OT #'s and sited to appear within the photograph. All photographs were immediately logged on the Photo Log sheet. The photographic log and photographs are included in Appendix B.

The data sheets were completed in either the field at each location or, when field conditions did not allow the immediate completion, immediately after returning from the field. Data Sheets are included in Appendix A. The data sheets are organized by reach in number order. In each reach section, the reach data sheets (RCH) are first followed by the outfall data sheets (OT), then the other data sheets.

When it was necessary to cross private property to reach the stream corridor, the assessment team would explain the purpose of the assessment and ask the property owner for permission to cross the property.

Reach boundaries were determined during the field assessment. The reach limits are selected based on one or more of the following criteria: change in surrounding land use; change in stream conditions; or a dividing characteristic such as a stream crossing or long culvert. Mill River was assigned 5 reaches based on surrounding land use, change in

stream conditions, and stream crossings. The reaches were assigned identification numbers starting with xxx-1 at the subwatersheds upstream end. The reaches are assigned as flows for this report;

- Reach 101-1 Muttontown Preserve to NYS Route 25A
- Reach 101-2 NYS Route 25A north to north side of small ponds
- Reach 101-3 Ponds north to Remsen Lane – pipe and roadside channel
- Reach 101-4 Remsen Lane north to Mohawk Drive – roadside channel
- Reach 101-5 Mohawk Drive north to Main Street -natural river channel and Mill Pond

If branches had been encountered, the major branch reaches would have been completed and numbered first. The secondary branches subsequently would have been completed heading downstream from the point of confluence with the main branch.

The following paragraphs are a summary of the data collected on the assessment sheets. Mill River is approximately 4 miles long and flows north into Oyster Bay Harbor. The river is a natural waterbody with headwaters in wetlands in Muttontown Preserve and flows north. The river has intermittent flows along the mid-section where the channel is located along the road shoulder. The river received heavy stormwater flows from the roads and upgradient drainage infrastructure. The wetland areas also overflow during periods of heavy rainfall and period of high water table, such as during a spring thaw.

Reach 101-1 includes the Muttontown Preserve, which is almost entirely forested and includes ponded areas and small piped stream crossings. The eastern section of the reach has an area of medium-density residential land use. Residential area drainage infrastructure discharges into the stream at OT-2 at Muttontown Lane and Locust Avenue. The entire reach appears to have optimal overall stream conditions and optimal overall buffer and floodplain conditions.

In Reach 101-2, the stream's right bank is adjacent to Mill River Road just north of North Hempstead Turnpike (25A) and has little or no buffer/riparian zone. The left bank consists of a steep forested slope and adequate buffer/riparian zone. The reach contains two ponds formed by small weirs. Only one outfall was assessed in this reach. Field investigation identified an overflow pipe from recharge basin NYS #130 located on the north side of NYS Route 25A east of the river. That recharge basin has a pipe connection to OT-1 with a moderate dry weather flow observed. The overall stream condition was assessed to be in the optimal range with a suboptimal vegetative protection assessment of the right bank due to the adjacent roadway. Consequently, the overall buffer and floodplain conditions were assessed to be in the optimal range, although a suboptimal assessment of the right bank's vegetated buffer width was noted.

The stream in Reach 101-3 has a very narrow and entirely channelized segments located on both sides of Mill River Road. The channels on either side of the road are connected by pipes extending under Mill River Road. The surrounding areas are low-density residential. Yards, and occasionally a structure, are directly adjacent to the stream's bank as is the roadway. Four outfalls were observed in this reach. Various locations show signs of bank erosion or partial collapse of channelized material. Attempts to prevent erosion of the channel such as wood or stone along the banks were observed through this segment. The overall stream condition was assessed to be in the marginal to suboptimal range due to inadequate in-stream habitat availability, little vegetative protection, and moderate levels of bank erosion, especially along the roadway. The overall buffer and floodplain condition was assessed in the poor to marginal range due to a small buffer zone width, inadequate floodplain vegetation, significant floodplain encroachment, and an uneven mix of wetland and non-wetland habitats.

The Reach 101-4 assessment determined that the entire reach is very narrow and completely channelized, containing numerous stream crossings, most of which are private driveways and roads. This segment appears to have intermittent flow that is dependent on storm runoff or a raised groundwater table in the headwater wetland area. This reach has a

total of nine outfalls, one of which discharges from the Mill River Club golf course. Depending of the source of the drainage, nitrogen and phosphorus may be being discharged to the stream. The stream channel shows areas of erosion and exposed tree roots, which could possibly result in tree collapse and damage to private driveway crossings. A utility pole and manhole located in the stream bed have also shown some signs of erosion, indicative of possible utility damage. The overall stream condition was assessed to be in the poor to suboptimal range due to poor vegetative protection, severe bank erosion areas, and inadequate floodplain connection. The overall buffer and floodplain condition was assessed to be in the marginal to poor range due to the lack of buffer zone and high levels of floodplain encroachment.

Reach 101-5 extends form Mohawk Road north to Main Street and includes Mill Pond. The river has year round flow in this segment and may be fed by and underground springs and is in a natural channel that runs through several low-density residential properties before crossing under Glen Cove Road and into the preserve land around Mill Pond. This stream segment of this reach is predominantly forested area with low density residential. Around Mill Pond the residential use is higher density and there is a municipal highway yard along the west of the pond on Lake Avenue. The municipal yard has stockpiles of road sand/salt along with various pieces of heavy equipment. Leaking motor vehicle lubricants and washout from the stockpiles enter surface inlets in the yard, possibly discharging into the wetland immediately east of the yard. There are reported to be high waterfowl population of the pond. The stream assessment identified a total of eight outfalls, two of which, OT-1 and OT-3, are severely damaged with collapsed end sections. All of the outfalls carry road runoff directly into the pond or surrounding wetlands. The overall stream condition was assessed to be in the suboptimal to optimal range because of a stable in-stream habitat, good vegetative protection, and very good floodplain connection. The overall buffer and floodplain condition was assessed to be in the suboptimal to optimal range due to a wide buffer zone and an even mix of wetland and non-wetland habitats.

Table 2-5 Subwatershed Comparative Analysis tabulates the information collected during the field assessment, along with the impervious cover results and pollutant severity score to produce a subwatershed total score. While the subwatershed total score can be subjective due to the many additional factors involved in assessing the subwatershed condition and the feasibility of SMP's, the general subwatershed score categories are as follows:

- 0-15 Optimal/Sensitive
- 16-30 Suboptimal/Impacted
- 31-45 Marginal/Non-supporting
- 46+ Poor/Urban

Mill River was scored a 7 placing the creek in the optimal/sensitive condition. Optimal/sensitive streams are estimated to have low levels of impervious cover and pollutant loads. The score of 7 is reflective of large forested areas at both ends of the stream with few impacts or encroachment. Several of the other reaches exhibit characteristics more impacted streams where the channel has been significantly modified and the stream has inadequate buffers, floodplain encroachment, multiple stream crossings, and high levels of roadway stormwater runoff. Sites for structural SMP locations may be limited due to high level of private residential land ownership and roadway encroachments. Based on the conditions identified during the field assessment, a large segment of Mill River is in marginal condition and has been impacted by the surrounding land use and channelized stream banks.

The subwatershed score can also be used to assess the conditions of a specific subwatershed in relation to other subwatersheds in the County or other jurisdiction. For example a watershed with a score of 48 would be identified as poor/urban and would face greater impacts that a watershed with a score of 11. However, even watersheds with low score may have segments that can be improved by specific stormwater management practices.

3. SMP CANDIDATE SITE ASSESSMENT AND RECOMMENDATIONS

3.1. WATER QUALITY CLASSIFICATIONS/DESIGNATED USES

Table 3.1 summarizes the NYSDEC general water quality classifications in terms of their best usage. The subwatershed that was analyzed for this report includes the freshwater sections of the creek tributaries which fall within the Class 'C" waters.

Table 3.1 NYSDEC Water Quality Classifications (6 NYCRR Part 885 and Part 701)**.**

Waterbody	Water Classification	Best Usage
River /Creek - freshwater	C	The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. (TS) – Designated waters are suitable for trout spawning and the dissolved oxygen specification for trout spawning waters shall apply. (T) – Designated waters are suitable for trout that the dissolved oxygen specification for trout waters shall apply.
River/Creek - tidal	SC	The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Oyster Bay Harbor	SA	The best usages of Class SA waters are shell fishing for market purposes, primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.

The NYSDEC has designated Oyster Bay Harbor a priority waterbody with known aquatic life impairment. A priority waterbody is a waterbody determined by NYSDEC staff, with public input, having uses precluded, impaired, stressed or threatened and, in some cases, requiring establishment of a TMDL. The causes of the impairments have

been identified as pathogens from urban/storm runoff and municipal sources. The southern portion of Oyster Bay Harbor is a NYSDEC uncertified shellfishing area. Uncertified shellfishing areas are lands where the NYSDEC has prohibited shellfish harvesting for food uses in accordance with NYSDEC regulation 6NYCRR Part 41. Pathogen TMDL's for shellfishing waters in Oyster Bay Harbor have been completed. There are set target percent reductions for pathogens levels.

Table 3.1 identifies "best usages". The actual usage of the waters is dependent upon the impairments to the quality of the waters. The numerous parameters that commonly characterize water quality include taste, color, suspended solids, oils, refuse, thermal discharges, phosphorus, nitrogen, pathogens and dissolved solids. A common example of this is Class "B" waters that have a best usage for primary recreational contact (swimming) but are closed due to of impacts to the water quality as a result of high bacteria levels. Town and County beaches are often closed after a rainfall that causes high bacteria levels in those waters.

Two major water quality parameters for Class "C" waters are dissolved oxygen (DO) and coliform bacteria concentrations. Adequate DO is essential to the growth and reproduction of finfish and shellfish. DO is also important for the natural decomposition of organic wastes. Current public health standards call for low coliform bacteria concentrations as the presence of such bacteria is regarded to be an indication of potentially pathogenic contamination from human or animal wastes. The actual water quality may not be suitable for the best usage based on these water quality parameters.

3.2. SITE ASSESSMENT/SMP SELECTION

The Mill River subwatershed is dominated by low-density land use with areas of preserved land and parkland. The subwatershed was assessed to be 7% impervious. While the Mill River was assessed to be a sensitive stream with stable channels, little buffer

encroachment an extensive vegetative cover it was noted that several segments have more impacts due to channelization of the river corridor and road drainage around Mill Pond.

Several potential "hot spots" or illicit discharges were identified in the vicinity of the river. The Town of Oyster Bay Highway Yard on Lake Avenue, a golf course along Mill River Road and commercial businesses on NYS Route 25a have the potential to be "hot spots" or illicit discharges. Hot spots are land uses that are known to have high levels of hazardous materials such as oil, grease, automotive or marine parts, dumpsters, gas tanks, or other such materials. Illicit discharges are locations where storm runoff or unpermitted discharges outfall directly into the creek corridor or into infrastructure that discharge into or will eventually reach the creek.

The area of the subwatershed that actually contributes surface runoff to the Mill River waterbodies has been reduced by the installation of upgradient recharge basins and other drainage infrastructure that contain the storm runoff volume from roads and subdivision developments. When an area contains storm runoff in on-site drainage infrastructure with no overflow, that area is described as self-contained. It appears that several recharge basins have been installed at the upper limits of the Mill River subwatershed. Locations where recharge basins appear to contain the storm runoff from subdivisions are north of North Hempstead Turnpike (NYS route 25A) along the eastern boundary of the subwatershed. These locations are shown on Map 3-1. Based on the design and location of the drainage infrastructure, it appears that these facilities, at a minimum, contain the water quality volume and/or have properly designed overflows. These areas can be considered to be self-contained.

The subwatershed has limited drainage infrastructure that outfalls to the river. The largest locations identified include two piped drainage systems that outfall to the east side of river from the neighborhood south of NYS Route 25A and from the NYS Route 25a and Route

106 road drainage system. There are numerous individual catch basins and leaching structures located along the subwatershed roads that have outfalls to the waterbodies.

A large portion of the watershed appears to surface drain to creek. The majority of these areas have significant wooded buffers and extremely limited development and no visible signs of erosion from surface runoff and no SMPs are recommended for these areas. Should the land use in these areas be modified, the need for SMPs should be reassessed.

SMP's that can treat pollutants found in runoff from roads include ponds, infiltration trenches, sand filters, and bioretention basins. Additionally ultra-urban retrofits can be considered if suitable locations for other SMP's are not available or feasible.

3.3. SMP IMPLEMENTATION CANDIDATE SITES

Mill River Subwatershed has several potential locations that could be used to site SMP's from several of the outfalls identified. The proposed candidate sites and the SMPs discussed herein are shown on Map 3-1 Candidate Sites Map.

Candidate Site 1 is Town of Oyster Bay Highway Yard located on Lake Avenue in reach 101-5. The yard is used for vehicle repair and snow removal operation. The site is not curbed and has limited on-site drainage infrastructure. Puddles on the site have a greasy sheen on their surface and runoff laden with oil and grease travels directly into the adjacent wetlands. In addition, winter salting operations are conducted from the north end of this site. The salt materials are located within a small storage building but spill onto the ground in the yard and are also stockpiled in the open yard. An existing manhole that appears to connect to road catch basins and an outfall into the wetlands is located in the center of this yard. The entire yard should be redeveloped to contain all storm runoff on-site and to bring the facilities into conformance with current hazardous materials regulations.

Candidate Site 2 is the outfalls located in the vicinity of Glen Cove Road and Mill River Road Intersection in Reach 101-5. The area at the northwest corner of the intersection should be investigated to determine if the area can provide a location for a filtering system such as a bioretention basin. If that SMP is not feasible, the drainage infrastructure should be reconstructed to allow for the installation of a water quality inlet (WQI) at each outfall or the catch basins can be piped to a single WQI.

Candidate Site 3 is the outfalls located along Lake Avenue in Reach 101-5. The drainage infrastructure should be reconstructed to allow for the installation of a water quality inlet (WQI) at each outfall or the catch basins can be piped to a single WQI. The drainage system that extends through the Town of Oyster bay Highway Yard should be relocated to prevent pollutant from those operations from draining to the adjacent wetlands.

Candidate Site 4 is the river channel along Mill River Road. The sections of the channel that are eroding should be stabilized and revegetated. Investigate the potential to install infiltration practices where space permits such as at locations before culverts.

Candidate Site 5 is the outfall OT-2 in Reach 101-2. OT-2 carries flow from NYS Recharge basin # 130 located on NYS Route 25A east of the Mill River. Nassau County should work with New York State investigate the drainage patterns of this basin and other upgradient recharge basins and modify overflow mechanisms or install bypasses to contain the water quality storm volume in the recharge basin and allow larger volumes to bypass the basin is capacity does not exist

Nonstructural SMP's that can aid in reducing the pollutants that enter Mill River include:

- Increased street sweepings;
- Public education on garden fertilizer and chemical use and disposal;
- Public education on the importance of buffers between cultivated lawns and waterbodies; and
- Public education on the importance of vegetative cover to prevent soil erosion.

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
NCDPW Engineering Department
Map File List of Requested Plans
Table 2-1

Mill River (ID No. 101)					
COUNTY FILE # (BROWN / BLACK BOOK)		**OLD COUNTY FILE #** (BLUE BOOK)		**MUNICIPALITY FILE #** (RED BOOK)	
4343-1		617-8		7208-1	
1030-7		L2-42-1		139-2	
135-9				139-1	
2023-1				1380-7	
183-11				182-1	
182-1					
3298-8					
592-3					
558-4					

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
GIS Data
Table 2-2

Name of Subwatershed: **Mill River (ID No. 101)**

Tributary to:	**Oyster Bay Harbor**
Adjacent Land Use:	**High Density Residential**

Impervious Information

	Area		Building Area		Parking Lot Area		Length of Roads		Number of Residences
Residential	1,045	Acres	44	Acres					851
Commercial	33	Acres	5	Acres	8	Acres			
Industrial	0	Acres	0	Acres	0	Acres			
Roadway (Pavement)	71	Acres							
Other (Parks, Municipal, (ROW-Pvmt), Etc.)	1,009	Acres	9	Acres	15	Acres			
Total Subwatershed	2,159	Acres	58	Acres	23	Acres	7,262	LF	

Residential Lots	Quantity in Subwatershed
43,561 +	257
21,781 - 43,560 SF	32
10,891 - 21,780 SF	117
5,446 - 10,890 SF	382
0 - 5,445 SF	63
Total Number	851

Assumed Percentage of Roadway With Sidewalks (%)	20
Sidewalk Width (FT)	4
Assumed Sides of Roadway With Sidewalk	2

*** Source NCGIS Database Dated July 24, 2006**

Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Impervious Cover Calculations
Table 2-3

Impervious Driveway Factors		
Residential Lot Area (AC)	**Average Driveway Area (SF)**	**NC criteria**
2	3,212	1-2+ AC
1	2,073	1/2-1 AC
1/2	1,152	1/4-1/2 AC
1/4	652	1/8 - 1/4 AC
1/8	432	0-1/8 AC
Source : Cappiella and Brown, 2001		
WVA Table 4: Average Driveway Areas in the Chesapeake Bay Region		

Average Residential Driveway Area Calculation				
Subwatershed:	**Mill River (ID No. 101)**			
Tributary to:	Oyster Bay Harbor			
Residential > 1 acre - 3212 SF	Units	257	Acres	2.5
Residential > 1/2 acre to ≤ 1 acre - 2,073 SF	Units	32	Acres	0.3
Residential > 1/4 acre to ≤ 1/2 acre - 1,152 SF	Units	117	Acres	1.2
Residential > 1/8 acre to ≤ 1/4 acre - 652 SF	Units	382	Acres	3.8
Residential ≤ 1/8 acre - 432 SF	Units	63	Acres	0.6
Total Acres Driveways Impervious	Units	851	Acres	8

Sidewalk Area Calculation	
Subwatershed:	**Mill River (ID No. 101)**
Tributary to:	Oyster Bay Harbor
Linear feet of road	7,262
Assumed percentage with Sidewalks	20
Sidewalk Width	4
Sides Sidewalk	2
Total Acres Sidewalk	0
Calculation : LF of road x % with sidewalks x 4 ft w x 2 sides	

Impervious Area Calculation		
SubWatershed:	**Mill River (ID No. 101)**	
Tributary to:	Oyster Bay Harbor	
Adjacent Land Use:	High Density Residential	
Total Subwatershed Area	Acres	2,159
Impervious areas		
Buildings Area	Acres	58
Roads Area	Acres	71
Parking Lot Area	Acres	23
Sidewalks Area - See Table	Acres	0
Driveway Area Total - See Table	Acres	8
TOTAL IMPERVIOUS AREA	Acres	**161**
TOTAL % IMPERVIOUS	%	**7%**
Classification	**8**	

Impervious Area Notes
1. GIS Data Table is source for areas of buildings, roads and parking lots.
2. Sidewalk area calculations are based on percentage of sidewalk area estimated by preparer
3. Impervious Driveways Factors Table - Average Driveway Areas Souce: WVA Table 4, Cappiella and Brown

Initial Subwatershed Classification			
	8	Sensitive Stream	0-10% impervious
	6	Impacted Stream	>10%- to 25% impervious
	4	Non-Supporting Stream	> 25%- 60% impervious
	2	Urban Drainage Stream	> 60% impervious
Source: WVA Figure 4 and Table 2			

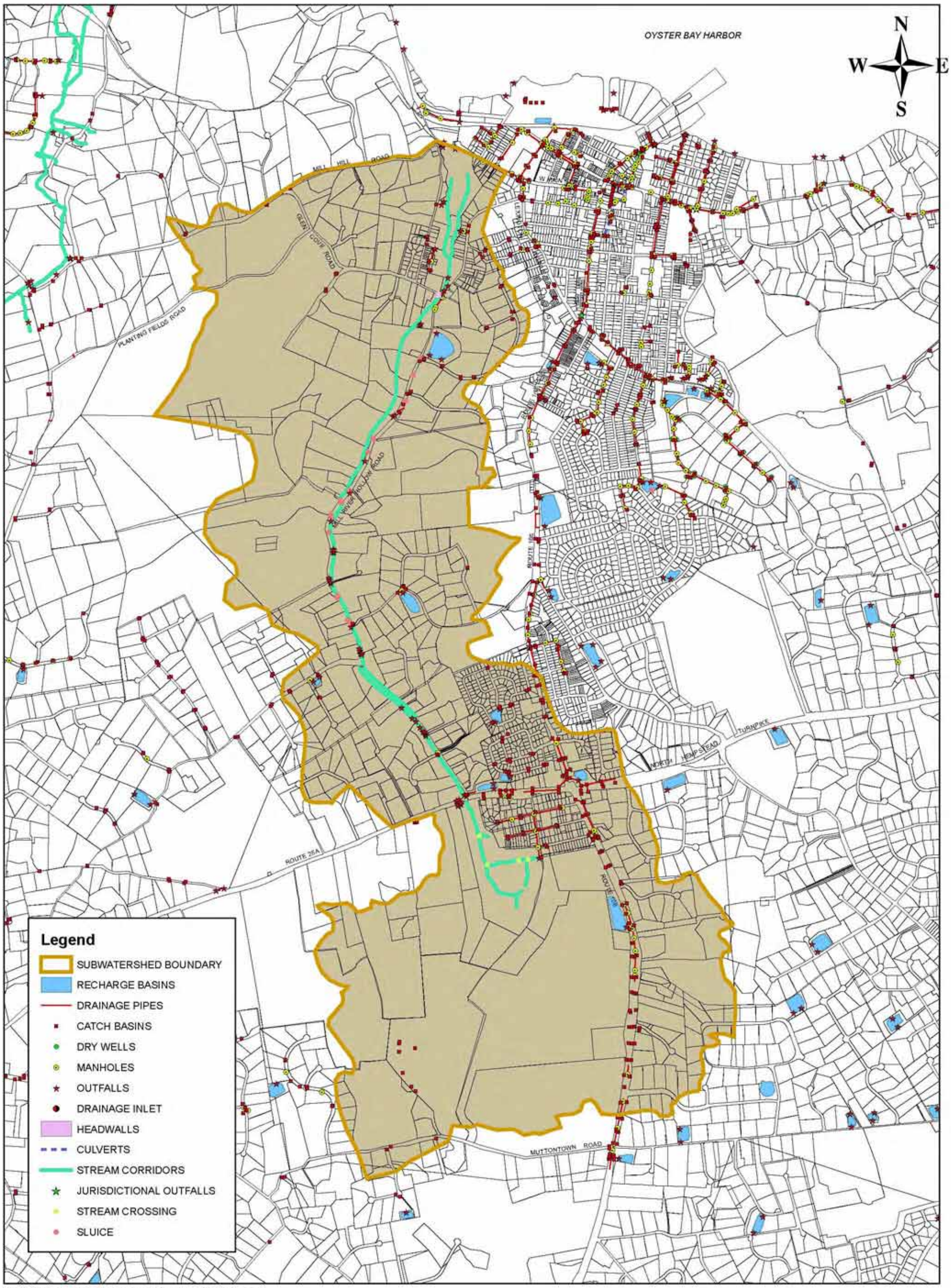
Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Water Quality Storm Event (WQSE) Volume and Pollutant Load Estimates
Table 2-4

Subwatershed		**Mill River (ID No. 101)**							
Tributary To		Oyster Bay Harbor							
Land Use		**Residential**	**Commercial**	**Industrial**	**Roadway**	**Other**	**TOTAL**		
Contributory Area	Acres	1,045.5	33.4	0.0	71.2	1,008.7	**2,158.8**		
Impervious Area	Acres	44.1	12.9	0.0	71.2	24.2	**152.3**		
Impervious Area	%	4.2	38.5	0	100.0	2.4	7.1		
Water Quality Storm Event Volume	WQv-acre-feet	9.2	1.3	0.0	6.8	7.2	24.5		
Water Quality Storm Event Volume	WQv-Cubic Feet	400,558.2	57,642.9	0.0	294,557.1	314,420.4	1,067,178.6		
Annual Rainfall	inches	42.0	42.0	42.0	42.0	42.0	42.0		
Annual Runoff	inches	3.3	15.0	1.9	35.9	2.7	4.3		
Total Nitrogen (TN)	coefficient mg/l	2.2	2.0	2.5	3.0	2.0		SEVERITY PTS.*	TOTALS
	lbs	1,728.2	226.1	0.0	1,733.0	1,233.3	**4,920.6**	3.0	14,761.8
Total Suspended Solids (TSS)	coefficient mg/l	100.0	75.0	150.0	120.0	54.5			
	lbs	78,555.7	8,478.5	0.0	69,320.7	33,606.2	**189,961.2**	4.0	759,844.8
Total Phosphorus (TP)	coefficient mg/l	0.4	0.2	0.4	0.5	0.3			
	lbs	314.2	22.6	0.0	288.8	160.3	**786.0**	2.0	1,572.0
Fecal Coliform (F Coli)	coefficient mpn/100 ml	7,750.0	3,000.0	2,400.0	1,700.0	5,000.0			
	billion colonies	2.8	0.2	0.0	0.4	1.4	**4.8**	6.0	28.7
Floatable Debris	coefficient CF/AC	5.0	8.0	5.0	8.0	5.0			
	CF	5,227.5	266.9	0.0	569.4	5,043.7	**11,107.5**	1.0	11,107.5
Oil and Grease	coefficient mg/l	3.3	5.0	4.0	8.0	3.0			
	lbs	2,592.3	565.2	0.0	4,621.4	1,849.9	**9,628.8**	5.0	48,144.2
							216,408.9		**835,458.9**
								SCORE	**387.0**

SOURCE:
"C" Valve Source; See Table
Impervious Area is based on NCGIS Impervious Area Data from building areas, parking areas, and road areas
* The pollutant loads for each pollutant were assigned severity points based on the least, 1 point, to the most, 6 points, severe pollutant threat in the watershed. The pollutant loads are multiplied by the assigned severity points and the total is divided by 100

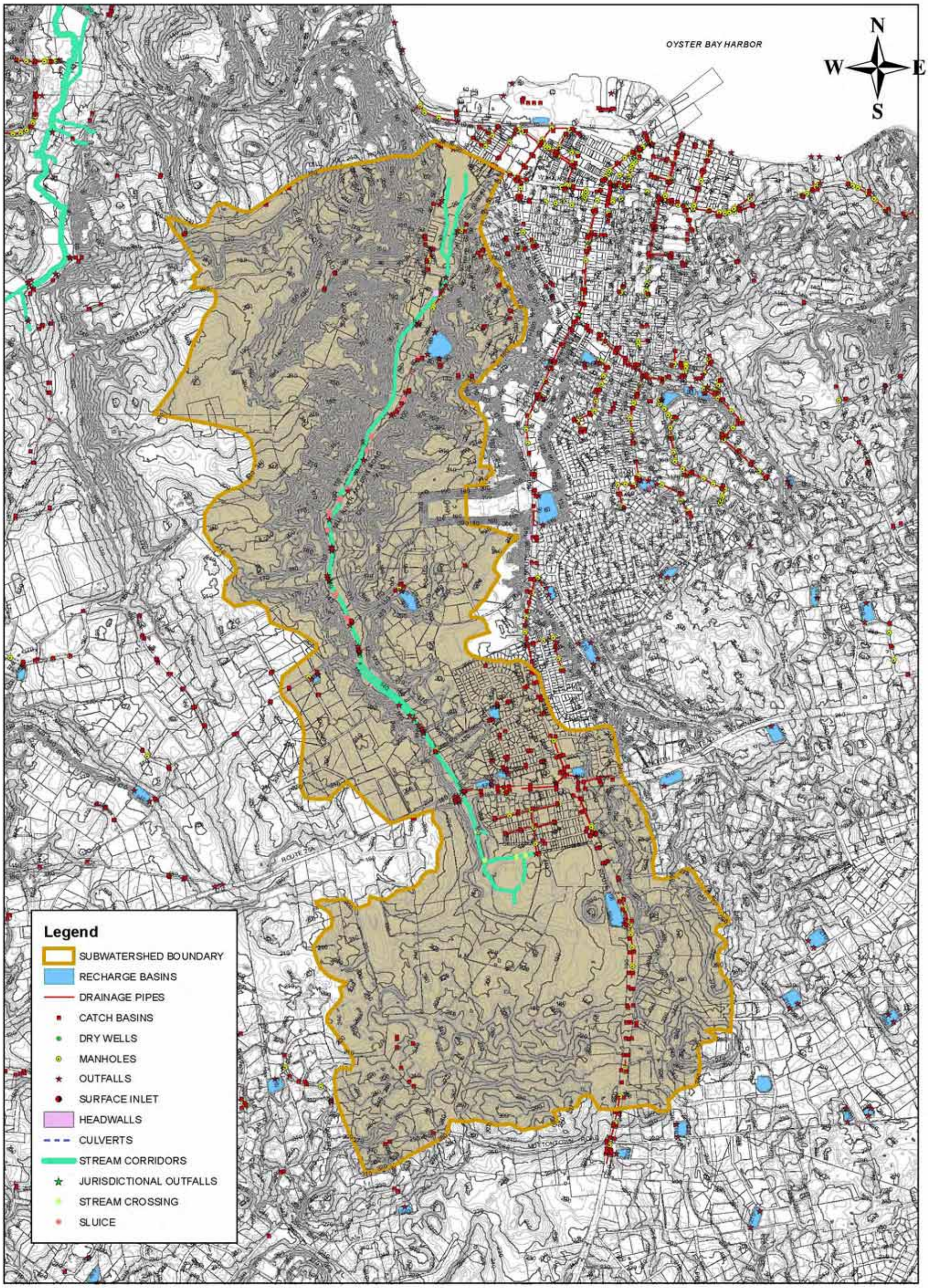
Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Subwatershed Comparative Analysis
Table 2-5

	Unit Criteria	Scoring Criteria	Mill River (ID No. 101)									
			101-1		101-2		101-3		101-4		101-5	
Stream Assessment Quantification	**Unit**	**Points**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**
Outfall	per outfall	2	2	4	1	2	4	8	9	18	4	8
Suspected Illicit Discharge or Hot Spot Locations	per location	8	2	16	1	8	0	0	0	0	0	0
WQ Retrofit/Restoration Candidates	per location	1	1	1	2	2	0	0	1	1	3	3
Infrastructure Investigations Required	per location	1	0	0	1	1	0	0	1	1	2	2
Severe Bank Erosion	per location	1	0	0	0	0	1	1	0	0	0	0
Inadequate Buffers	per 5% of reach	5	0	0	5	25	14	70	10	50	1	5
Road Crossings	per location	1	3	3	1	1	4	4	3	3	1	1
Channelized Segments	per 5% of reach	1	0	0	10	10	15	15	14	14	1	1
Public Ownership of the Stream Corridor	per 10% of reach	1	10	10	0	0	0	0	1	1	10	10
Livestock Encroachment or High Waterfowl Populations	per location	5	0	0	0	0	0	0	0	0	1	5
Threatened Infrastructure	per location	3	1	3	0	0	0	0	3	9	3	9
Trash Accumulation In Stream	per location	5	0	0	0	0	0	0	0	0	0	0
Stream Condition Subtotal (RCH)	from RCH sheet.	80	80	-10	75	-9	42	-5	34	-4	59	-7
Buffer/Floodplain Condition Subtotal (RCH)	from RCH sheet.	80	77	-10	74	-9	25	-3	18	-2	71	-9
Reach Total	**No. of Reaches**	5	**17**		**30**		**90**		**91**		**28**	
Subwatershed Total			**256**									
Impervious Cover Classification	Sensitive, Impacted, Non supporting, Urban	8,6,4,2	**8**									
Pollutant Load			**4**									
Total Score			**7**									
RANK												



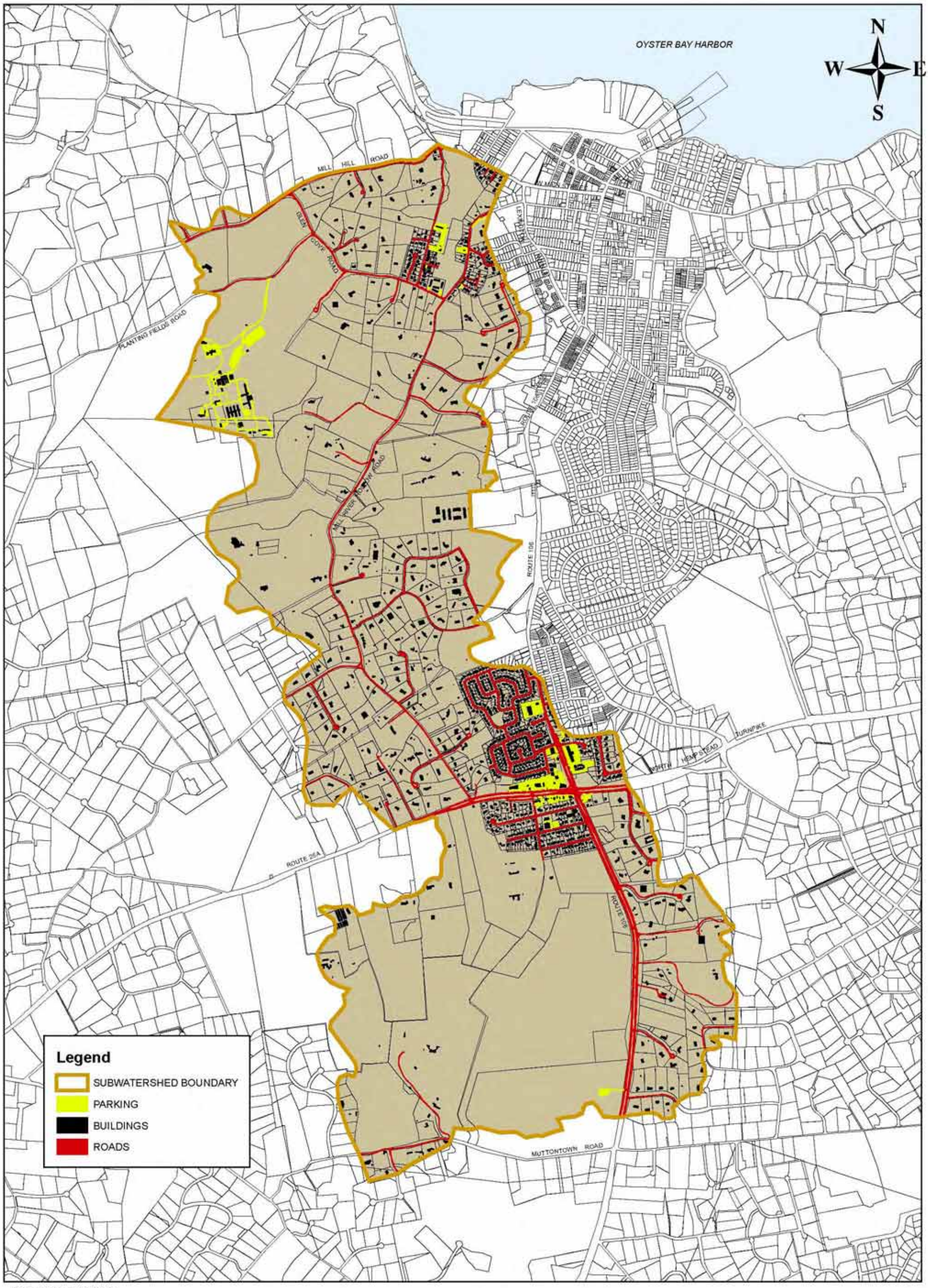
SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-1
NASSAU COUNTY STORMWATER MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
DRAINAGE INFRASTRUCTURE
MILL RIVER SUBWATERSHED



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

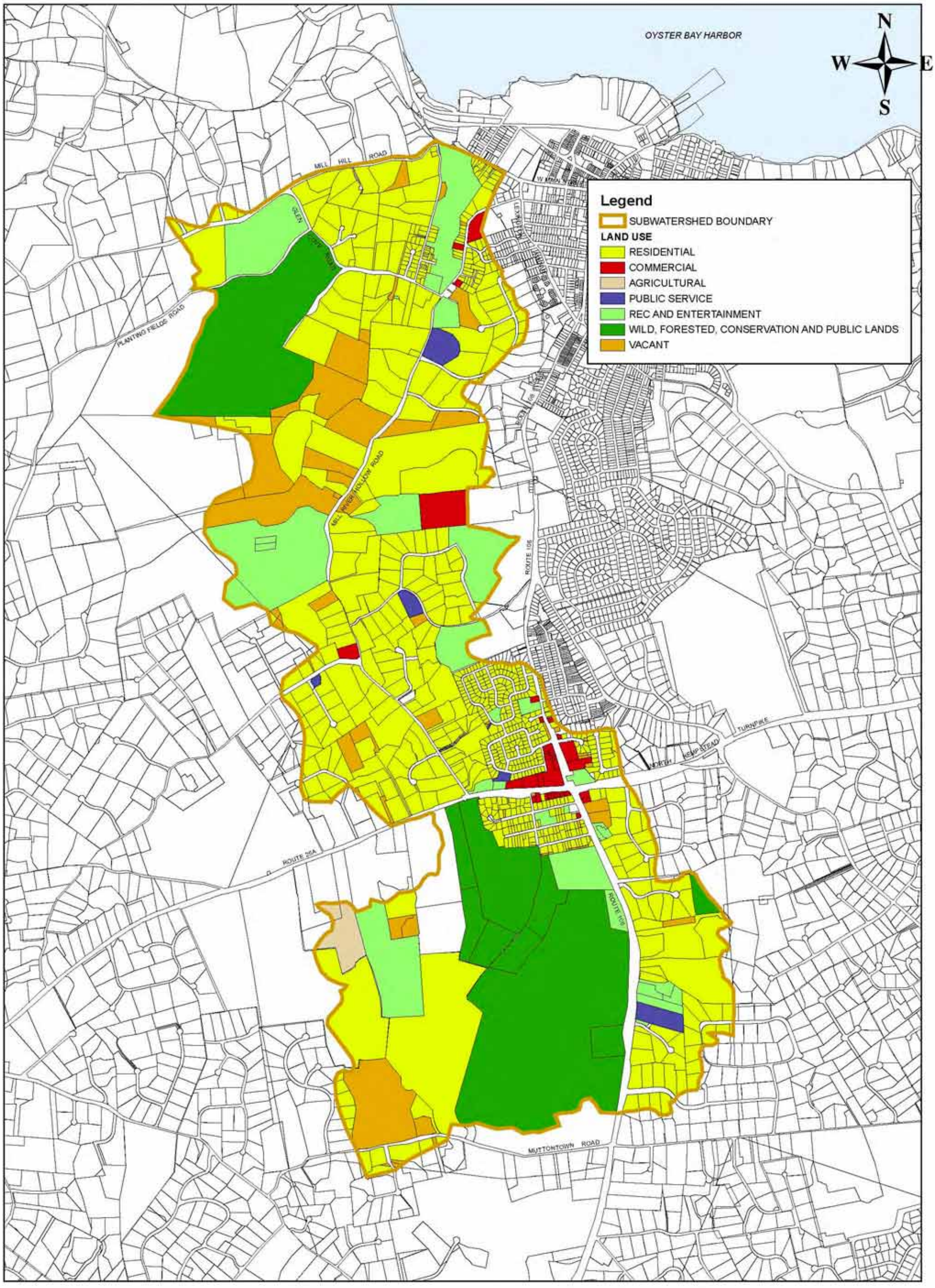
MAP 2-2
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
CONTOURS
MILL RIVER SUBWATERSHED



SOURCE: NCGIS

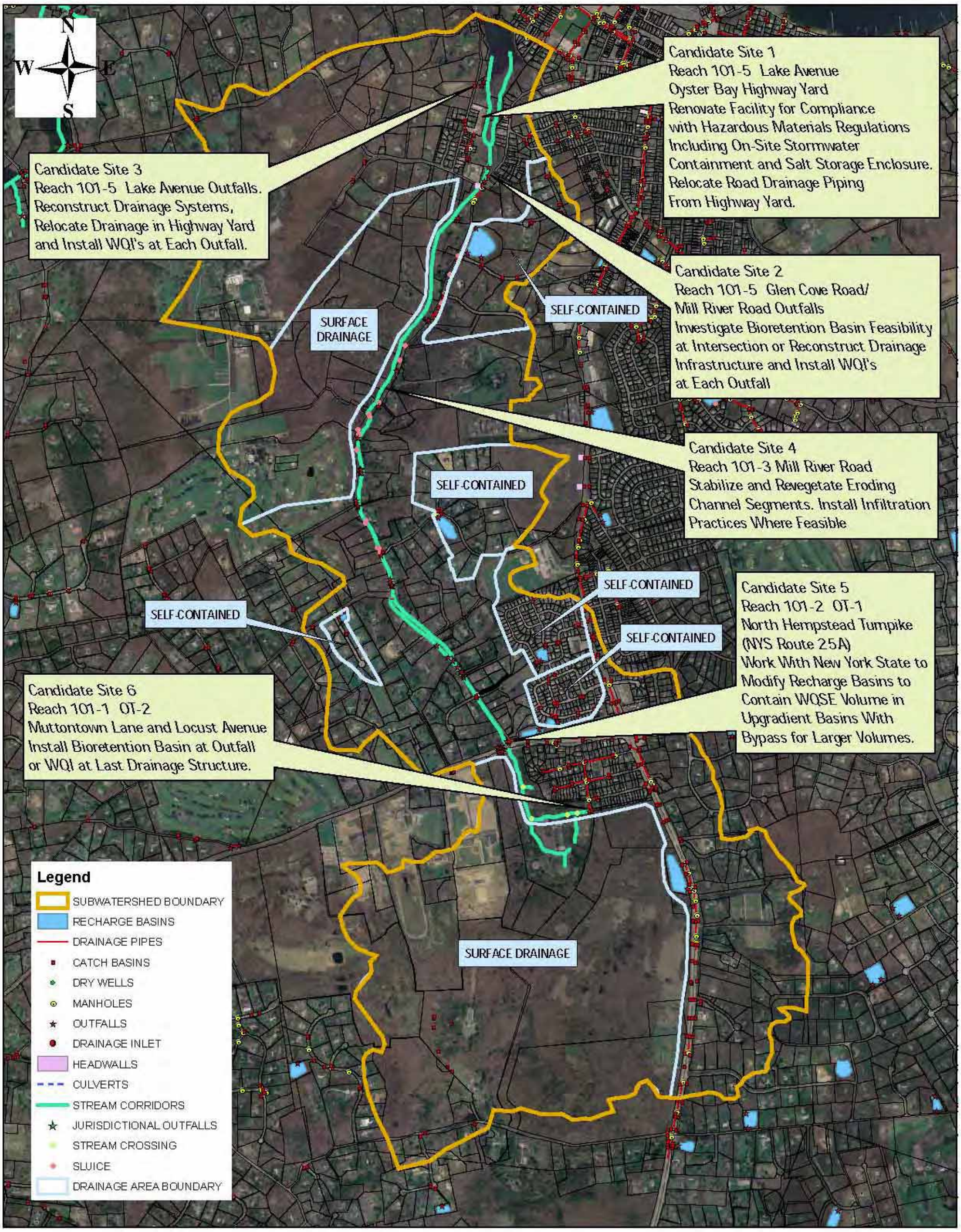
MAP 2-3
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
IMPERVIOUS AREAS
MILL RIVER SUBWATERSHED

0 1,000 2,000 4,000 6,000 8,000 Feet



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-4
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
LAND USE
MILL RIVER SUBWATERSHED



MAP 3-1
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
SMP CANDIDATE SITE MAP
MILL RIVER SUBWATERSHED

Cashin Associates, P.C.
ENGINEERING • PLANNING • CONSTRUCTION MANAGEMENT

0 1,000 2,000 4,000 6,000 8,000 Feet

Nassau County
Stormwater Management Program

MILL RIVER SUBWATERSHED STORMWATER RUNOFF IMPACT ANALYSIS AND CANDIDATE SITE ASSESSMENT REPORT

APPENDIX A – FIELD DATA

CASHIN ASSOCIATES, P.C.
Engineering • Planning • Construction Management