



Nassau County Stormwater Management Program



FRANCIS POND SUBWATERSHED STORMWATER RUNOFF IMPACT ANALYSIS AND CANDIDATE SITE ASSESSMENT REPORT

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Engineering • Planning • Construction Management



**Nassau County
Stormwater Management Program**

**Francis Brook Subwatershed
Stormwater Runoff Impact Analysis**

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1. INTRODUCTION

The Francis Pond Stormwater Runoff Impact Analysis (Analysis Report) has been prepared in accordance with the Nassau County Stormwater Management Program *Stormwater Runoff Impact Analysis Procedures Manual* (Procedure 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, subbasin, 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 water 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, Kentucky 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 then 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 6 documents that pertained to work conducted in the Francis Pond 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 Francis Pond 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 Francis Pond subwatershed is located within the Town of Oyster Bay in the northern portion of Nassau County. The entire Francis Pond waterbody is categorized as freshwater. The Francis Pond waterbody is comprised of a series of ponds and wetland including Beaver Lake, Shu Swamp, Lower Frances Pond, and Upper Francis Pond that are connected by creek segments that extend to south to Valley Road. The waterbody generally runs through a mix of wetland and forested areas. From Valley Road south to Chicken Valley Road runoff is carried along the road shoulders to the creek. The creek also receives drainage from storm drainage infrastructure along the west side of Shu Swamp. The Kentuck Brook subwatershed flows into Beaver Lake along the western shoreline northeast of Kaintuck Lane. A series of weirs and culverts are located along the entire length of the waterbody.

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

The Francis Pond subwatershed is approximately 2 miles long, beginning at Route 107 (Cedar Swamp Road) and ending at Mill Neck Creek, just north of Feeks Lane. The Francis Pond subwatershed encompasses approximately 4,793 acres that potentially contribute runoff that could eventually enter the waterbody. The watershed is approximately 8,000' wide. Some northern sections of the subwatershed appear to be self-contained and no longer contribute runoff to the waterbody. See Section 3 for a description of the areas assessed to be self-contained. The subwatershed is 67%

residential land use and 31% “other”. The “other” category includes parks and community services. There is no commercial or industrial land use in the watershed. Of the 1,093 residences in the subwatershed, 864 or 79% are larger than one acre in size.

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 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 Francis Pond 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 Francis Pond, 0% 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 Francis Pond subwatershed is 261 acres of the 4,793 total subwatershed acres. This represents 5% of the subwatershed. Based on the 5% impervious figure, Francis Pond 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 subwatershed management goals for sensitive waterbodies are to maintain the biodiversity and channel stability.

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 majority of the subwatershed's TSS level contribution is derived from its roadways and large residential areas.

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 lawn areas drain to the waterbodies and waterfowl contribute TP and TN to the Francis Pond waterbodies.

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 Francis Pond waterbodies.

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. Roadways are the main contributor of hydrocarbons within the Francis Pond subwatershed. 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. Floatable debris level did not appear to be an issue in the Francis Pond subwatershed. Minor littering was observed in very few locations.

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 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. Francis Pond was assessed by traveling upstream from the mouth of the river at Mill Neck Creek. On the data sheets, the banks are described as left (west) and right (east) looking downstream.

The stream assessment for Francis Pond was conducted on January 3, 2007 to January 4, 2007. 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. Francis Pond was the fourth stream assessed by this methodology and was assigned identification number 103.

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. Francis Pond was assigned three reaches based on stream crossings and land use. Reach 103-1 is the northern-most segment and Reach 103-3 is the southern segment. The reaches were assigned identification numbers starting with xxx-1 at the subwatersheds downstream end.

The following paragraphs are a summary of the data collected on the assessment sheets. Francis Pond is located at the northern end of the subwatershed and is approximately two

miles long with a branch in Shu Swamp Preserve in Reach 103-2. Francis Pond flows north into Mill Neck Creek. The creek's riparian zone is dominated by forested wetland areas and large residential yards.

Reach 103-1 encompasses all of Beaver Lake and was identified as having 10 outfalls. OT-1 is identified as a 24-inch concrete pipe which appears to drain from the residential developments to the west of Beaver Lake. Further investigation may be needed to verify the flow source. OT-3 thru OT-8 are identified as sluices that drain runoff from Feeks Lane directly into Beaver Lake. OT-9 and OT-10 were both identified as possible illicit discharges. They outfalls to be draining from an ice skating facility located at the southern end of Beaver Lake. The ice skating facility also appears to stockpile melting ice and construction debris near the lake shore. Further investigation of this site may be necessary to determine if these land uses are possible contributors to pollutant loads such as oil and grease and total suspended solids. Along the eastern shore of Beaver Lake a horse pasture extend to the lake shore. Grazing practice along shorelines is a contributor to fecal coliform loads and nitrogen loads in waterbodies. The overall stream condition for this reach was assessed to be within the suboptimal to optimal range because of its favorable in-stream habitat and floodplain connection. The overall buffer and floodplain condition was assessed to be within the poor to marginal range due to significant floodplain encroachment and inadequate floodplain vegetation due to various land development such as cultivated residential yards, roadways, horse grazing and the ice skating facility.

Reach 103-2 is extends from Beaver Pond south to the intersection of Frost Mill Road and Beaverbrook Road. The field assessment identified a single outfall, OT-1, located just south of Shu Swamp Preserve. OT-1 is described as a 24-inch tile pipe with a trickle flow draining from an unknown source. Further investigation of this site may be necessary with respect to the flow source. The overall stream condition was assessed to be within the optimal range due to the well maintained area in Shu Swamp Preserve and ideal vegetative protection. The overall buffer and floodplain condition was assessed to be

within the optimal range due to little or no floodplain encroachment and adequate vegetated buffer width. Several outfalls were identified on Nassau County GIS data including two outfalls from the drainage infrastructure systems located on the west side of Shu Swamp. These outfalls were not field located and require further investigation. It appears that the sites may have the potential to site SMPs. Two additional outfalls shown on the NCGIS data are located along Oyster Bay Road north of Duck Pond Road. These outfalls appear to be connected to road catch basins that drain via natural swale areas to the swamp.

Reach 103-3 extended south from Frost Mill Road and to the waterbody headwaters located in the vicinity of Valley Road. This reach consists of Lower Francis Pond and Upper Francis Pond and two small branches extending south and south west from Upper Francis Pond. The segments are connected through various culverts and weirs and are predominantly surrounded by forested areas. This reach was identified as having 5 outfalls. OT-1 is a 24" pipe outfall from road catch basins that discharge into the right bank of Upper Francis Pond. OT-2 is located just north of Chicken Valley Road on the left bank of Upper Francis Pond and is identified as a 15-inch tile pipe with a trickle flow, discharging from an unknown source. This site also appears to have an excessive amount of algae growth and orange staining. Further investigation may be necessary at this site with respect to the flow source. OT-3 is a concrete swale that carries road runoff into the southern end of Upper Francis Pond. OT-4 is a 15-inch pipe that discharges into the south end of Upper Francis Pond. This outfall may be connected to road catch basins, but the connection could not be field verified. OT-5, located just south of Oyster Bay Road near a private driveway east of Beaverbrook Rd., was identified as a 3-inch plastic pipe with a valve. A possible area of concern is a culvert located under Chicken Valley Road exhibiting severe erosion issues. This condition may lead to possible future road damage. Further investigation of this site may be necessary. Overall stream condition for this reach was assessed in the optimal range due to ideal in-stream habitats and vegetative

protection. The overall buffer and floodplain condition was assessed in the optimal range also due to little or no floodplain encroachment and ideal floodplain vegetation.

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

Francis Pond was scored a 4 placing the creek in the Optimal/Sensitive condition. Optimal/Sensitive streams are estimated to have low levels of impervious cover and pollutant loads. Francis Pond is in optimal condition for the most part with the exception of certain isolated areas in Reach 103-1. These areas show signs of floodplain encroachment and possible illicit discharges. 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 than a watershed with a score of 11. However, even watersheds with low scores 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 watersheds that were analyzed for this report include 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
Creek/Pond - 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.
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/Mill Neck Creek	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 and Mill Neck Creek and their tidal tributaries priority waterbodies 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 western portion of Mill Neck Creek 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 and Mill Neck Creek 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 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 Francis Pond subwatershed is dominated by low-density land use with areas of preserved land and parkland. The subwatershed was assessed to be 5% impervious and analysis determined that Francis Pond was a sensitive stream with stable channels, little buffer encroachment an extensive vegetative cover. Several potential "hot spots" or illicit discharges were identified in the vicinity of the creek. Hot spots are land uses that are known to have high levels of materials such as oil, grease, automotive or marine parts, dumpsters, gas tanks, or other hazardous 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 Francis Pond 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 numerous recharge basins and areas of drainage infrastructure have been installed at the upper limits of the Francis Pond subwatershed. Particular locations where recharge basin appear to contain the storm runoff from subdivisions are south of North Hempstead Turnpike (NYS route 25A) and at the center of the subwatershed between North Hempstead Turnpike and Chicken Valley Road. 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 outfall to the waterbodies. The systems identified include two piped drainage systems that outfall to the west side of Shu Swamp and numerous individual catch basins and leaching structures located along the subwatershed roads. Several of these small individual structures 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. These areas have significant wooded buffers and extremely limited development 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, in addition to ultra-urban retrofits if suitable locations for other SMP's are not available or feasible.

3.3. SMP IMPLEMENTATION CANDIDATE SITES

Francis Pond Subwatershed has several potential parcels 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 at outfalls OT-1 and OT-2 in Reach 1 at the ice skating facility at the eastern end of Kaintuck Lane. The outfalls appear to discharge storm runoff from the building and roads. In addition, piles of melting ice and construction debris were located in close proximity to the pond. SMPs should be used to retain the site runoff on site and buffers should be increased to prevent stockpiling of materials along the shoreline.

Candidate Site 2 are the outfall located on the west side of Shu Swamp that were not located during the field assessment. It appears that these pipe outfall from the most extensive drainage systems in the subwatershed discharge into the Shu Swamp wetlands. The installation of filtering system such as bioretention basin upland of the wetland would reduce pollutant loads.

Candidate Site 3 is Reach 3 OT-3. The concrete swale contributes runoff to Upper Francis Pond. The installation of a SMP filtering technique such as a bioretention basin could remove pollutant from runoff at this location.

Candidate Site 4 are the areas in Reach 3 where several catch basin systems located on Chicken Valley Road, Glen Cove Oyster Bay Road and Oyster Bay Road have outfalls to Upper Francis Pond, including OT-1 and OT-4 and two Reach 2 outfalls that were not

field located. Installation of catch basin inserts would remove pollutants from the runoff in a concentrated area.

Nonstructural SMP's that can aid in reducing the pollutants that enter Bailey Creek from lands in the watershed 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

<u>Francis Pond (ID No. 103)</u>					
COUNTY FILE # (BROWN / BLACK BOOK)		OLD COUNTY FILE # (BLUE BOOK)		MUNICIPALITY FILE # (RED BOOK)	
1895-7					
1900-7					
415-5					
472-2					
2454-3 REQ.					
2359-6					

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

Name of Subwatershed: Francis Pond (ID No. 103)

Tributary to:	Mill Neck Creek
Adjacent Land Use:	Low Density Residential

Impervious Information

	Area		Building Area		Parking Lot Area		Length of Roads		Number of Residences
Residential	3,205	Acres	100	Acres	X		X		1,093
Commercial	1	Acres	0.1	Acres	0	Acres	X		
Industrial	0	Acres	0	Acres	0	Acres	X		
Roadway (Pavement)	118	Acres	X		X		X		
Other (Parks, Municipal, (ROW-Pvmt), Etc.)	1,469	Acres	12	Acres	19	Acres	X		
Total Subwatershed	4,793	Acres	113	Acres	19	Acres	247,316	LF	

Residential Lots	Quantity in Subwatershed
43,561 +	864
21,781 - 43,560 SF	41
10,891 - 21,780 SF	60
5,446 - 10,890 SF	98
0 - 5,445 SF	30
Total Number	1,093

Assumed Percentage of Roadway With Sidewalks (%)	0
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 : Capiella and Brown, 2001		
WVA Table 4: Average Driveway Areas in the Chesapeake Bay Region		

Average Residential Driveway Area Calculation				
Subwatershed:	Francis Pond (ID No. 103)			
Tributary to:	Mill Neck Creek			
Residential > 1 acre - 3212 SF	Units	864	Acres	8.6
Residential > 1/2 acre to ≤ 1 acre - 2,073 SF	Units	41	Acres	0.4
Residential > 1/4 acre to ≤ 1/2 acre - 1,152 SF	Units	60	Acres	0.6
Residential > 1/8 acre to ≤ 1/4 acre - 652 SF	Units	98	Acres	1.0
Residential ≤ 1/8 acre - 432 SF	Units	30	Acres	0.3
Total Acres Driveways Impervious	Units	1,093	Acres	11

Sidewalk Area Calculation	
Subwatershed:	Francis Pond (ID No. 103)
Tributary to:	Mill Neck Creek
Linear feet of road	247,316
Assumed percentage with Sidewalks	0
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:	Francis Pond (ID No. 103)	
Tributary to:	Mill Neck Creek	
Adjacent Land Use:	Low Density Residential	
Total Subwatershed Area	Acres	4,793
Impervious areas		
Buildings Area	Acres	113
Roads Area	Acres	118
Parking Lot Area	Acres	19
Sidewalks Area - See Table	Acres	0
Driveway Area Total - See Table	Acres	11
TOTAL IMPERVIOUS AREA	Acres	261
TOTAL % IMPERVIOUS	%	5%
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, Capiella 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	Francis Pond (ID No. 103)								
Tributary To	Mill Neck Creek								
Land Use		Residential	Commercial	Industrial	Roadway	Other	TOTAL		
Contributory Area	Acres	3,205.2	0.6	0.0	118.2	1,469.1	4,793.1		
Impervious Area	Acres	100.3	0.1	0.0	118.2	31.6	250.2		
Impervious Area	%	3.1	23.0	0	100.0	2.1	5.2		
Water Quality Storm Event Volume	WQv-acre-feet	25.1	0.0	0.0	11.2	10.2	46.5		
Water Quality Storm Event Volume	WQv-Cubic Feet	1,091,382.7	681.7	0.0	489,218.0	443,665.1	2,024,947.6		
Annual Rainfall	inches	42.0	42.0	42.0	42.0	42.0	42.0		
Annual Runoff	inches	3.0	9.7	1.9	35.9	2.6	3.7		
Total Nitrogen (TN)	coefficient mg/l	2.2	2.0	2.5	3.0	2.0		SEVERITY PTS.*	TOTALS
	lbs	4,708.8	2.7	0.0	2,878.3	1,740.2	9,330.0	3.0	27,990.0
Total Suspended Solids (TSS)	coefficient mg/l	100.0	75.0	150.0	120.0	54.5			
	lbs	214,037.3	100.3	0.0	115,132.0	47,420.3	376,689.8	4.0	1,506,759.4
Total Phosphorus (TP)	coefficient mg/l	0.4	0.2	0.4	0.5	0.3			
	lbs	856.1	0.3	0.0	479.7	226.2	1,562.4	2.0	3,124.7
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	7.6	0.0	0.0	0.7	2.0	10.3	6.0	61.7
Floatable Debris	coefficient CF/AC	5.0	8.0	5.0	8.0	5.0			
	CF	16,025.9	4.9	0.0	945.8	7,345.7	24,322.2	1.0	24,322.2
Oil and Grease	coefficient mg/l	3.3	5.0	4.0	8.0	3.0			
	lbs	7,063.2	6.7	0.0	7,675.5	2,610.3	17,355.7	5.0	86,778.4
							429,270.3		1,649,036.4
								SCORE	344.0

SOURCE:

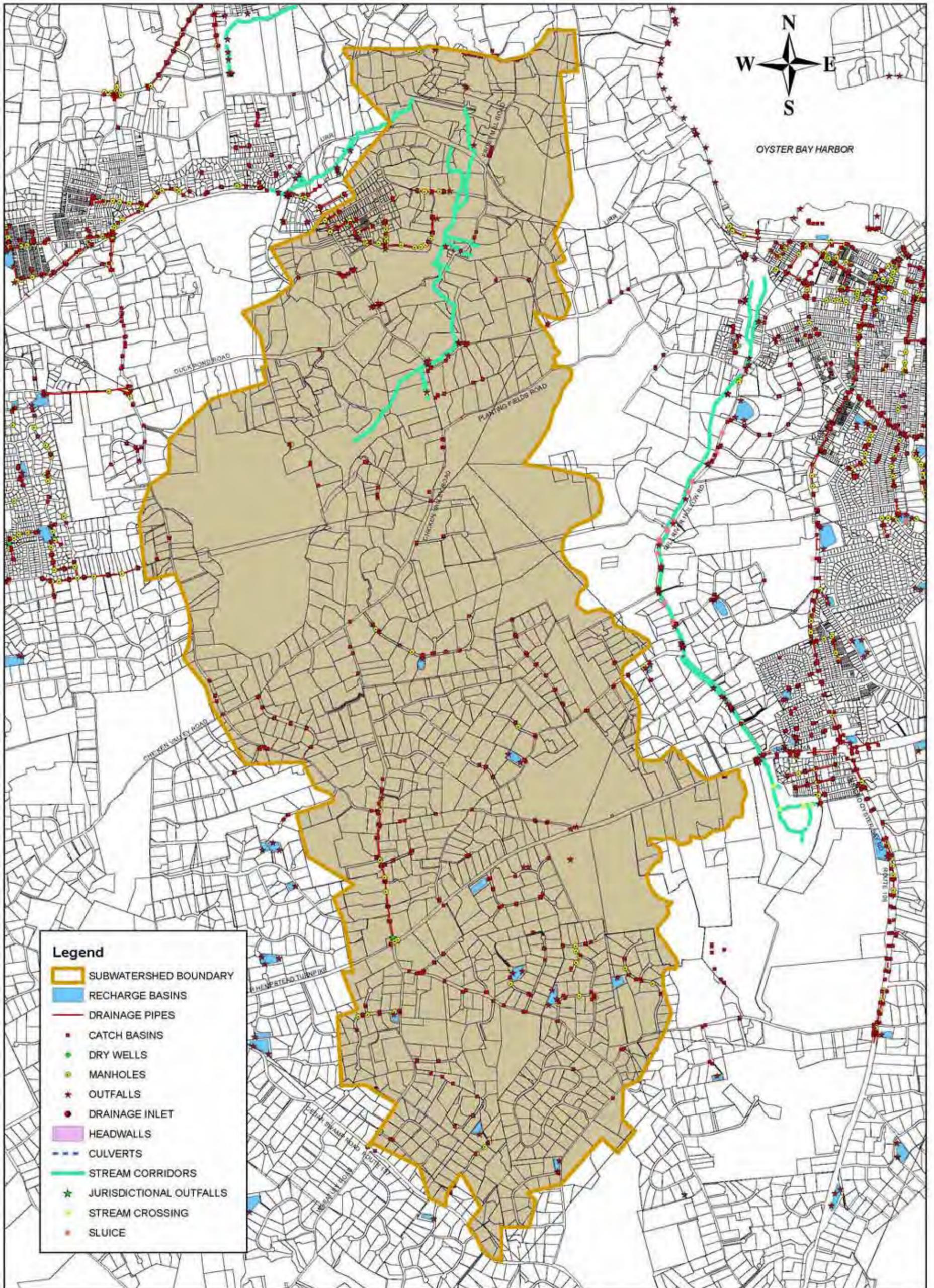
"C" Valve Source; See Table

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

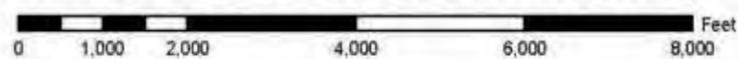
**Nassau County Stormwater Management Program
Stormwater Runoff Impact Analysis
Subwatershed Comparative Analysis
Table 2-5**

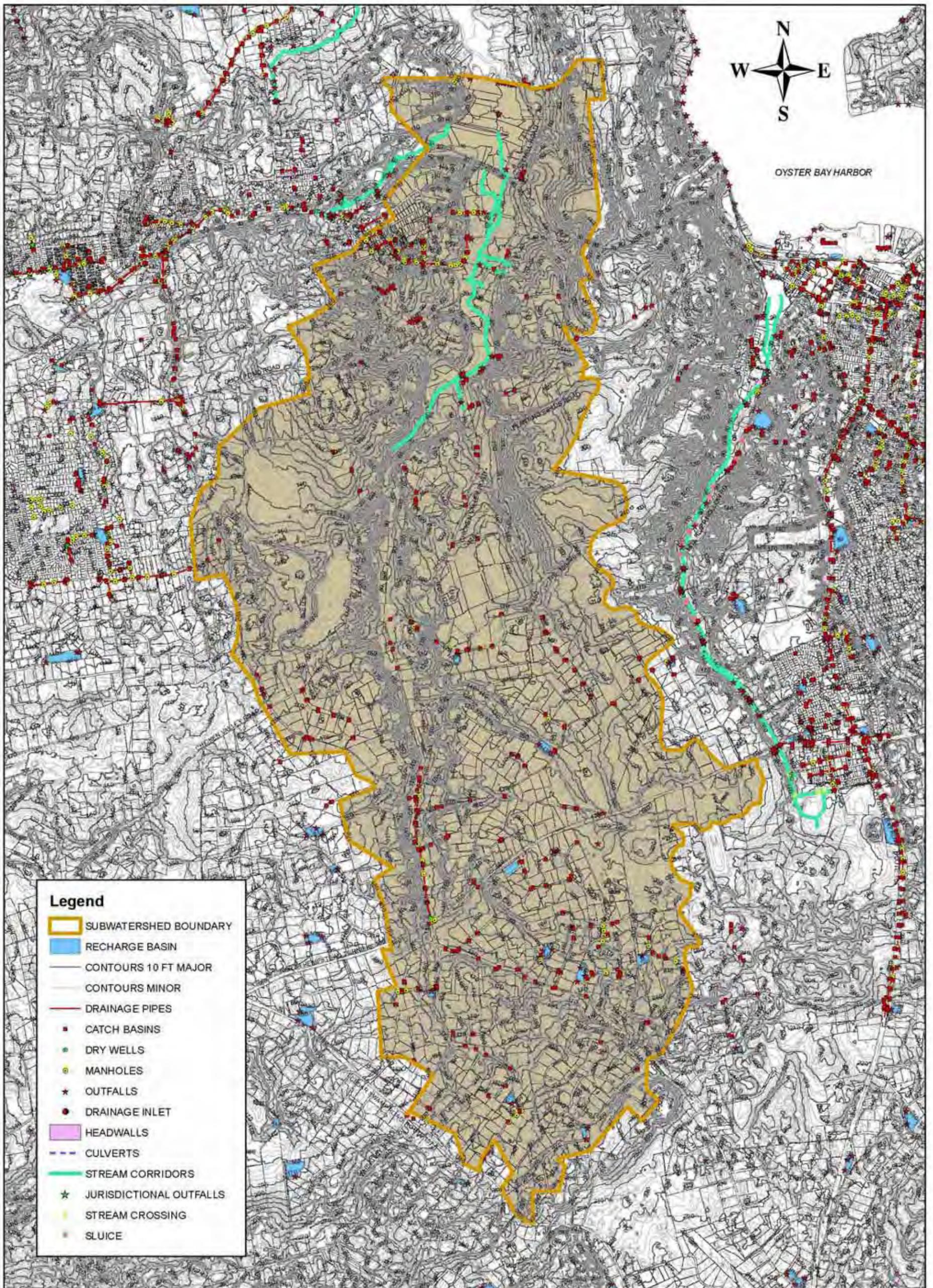
	Unit Criteria	Scoring Criteria	Francis Pond (ID No. 103)					
			103-1		103-2		103-3	
			Qty	Qty x Pts	Qty	Qty x Pts	Qty	Qty x Pts
Stream Assessment Quantification	Unit	Points						
Outfall	per outfall	2	10	20	4	8	5	10
Suspected Illicit Discharge or Hot Spot Locations	per location	8	2	16	2	16	0	0
WQ Retrofit/Restoration Candidates	per location	1	2	2	2	2	2	2
Infrastructure Investigations Required	per location	1	1	1	1	1	1	1
Severe Bank Erosion	per location	1	0	0	0	0	0	0
Inadequate Buffers	per 5% of reach	5	11	5	0	0	0	0
Road Crossings	per location	1	1	1	1	1	2	2
Channelized Segments	per 5% of reach	1	0	0	1	1	0	0
Public Ownership of the Stream Corridor	per 10% of reach	1	5	5	10	10	0	0
Livestock Encroachment or High Waterfowl Populations	per location	5	2	10	0	0	0	0
Threatened Infrastructure	per location	3	2	6	1	3	1	3
Trash Accumulation In Stream	per location	5	1	5	0	0	0	0
Stream Condition Subtotal (RCH)	from RCH sheet.	80	68	-9	78	-10	78	-10
Buffer/Floodplain Condition Subtotal (RCH)	from RCH sheet.	80	41	-5	78	-10	78	-10
Reach Total	No. of Reaches	3	57		23		-2	
Subwatershed Total			78					
Impervious Cover Classification	Sensitive, Impacted, Non supporting, Urban	8,6,4,2	8					
Pollutant Load			3					
Total Score			4					
RANK								



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

MAP 2-1
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
DRAINAGE INFRASTRUCTURE
FRANCIS POND SUBWATERSHED

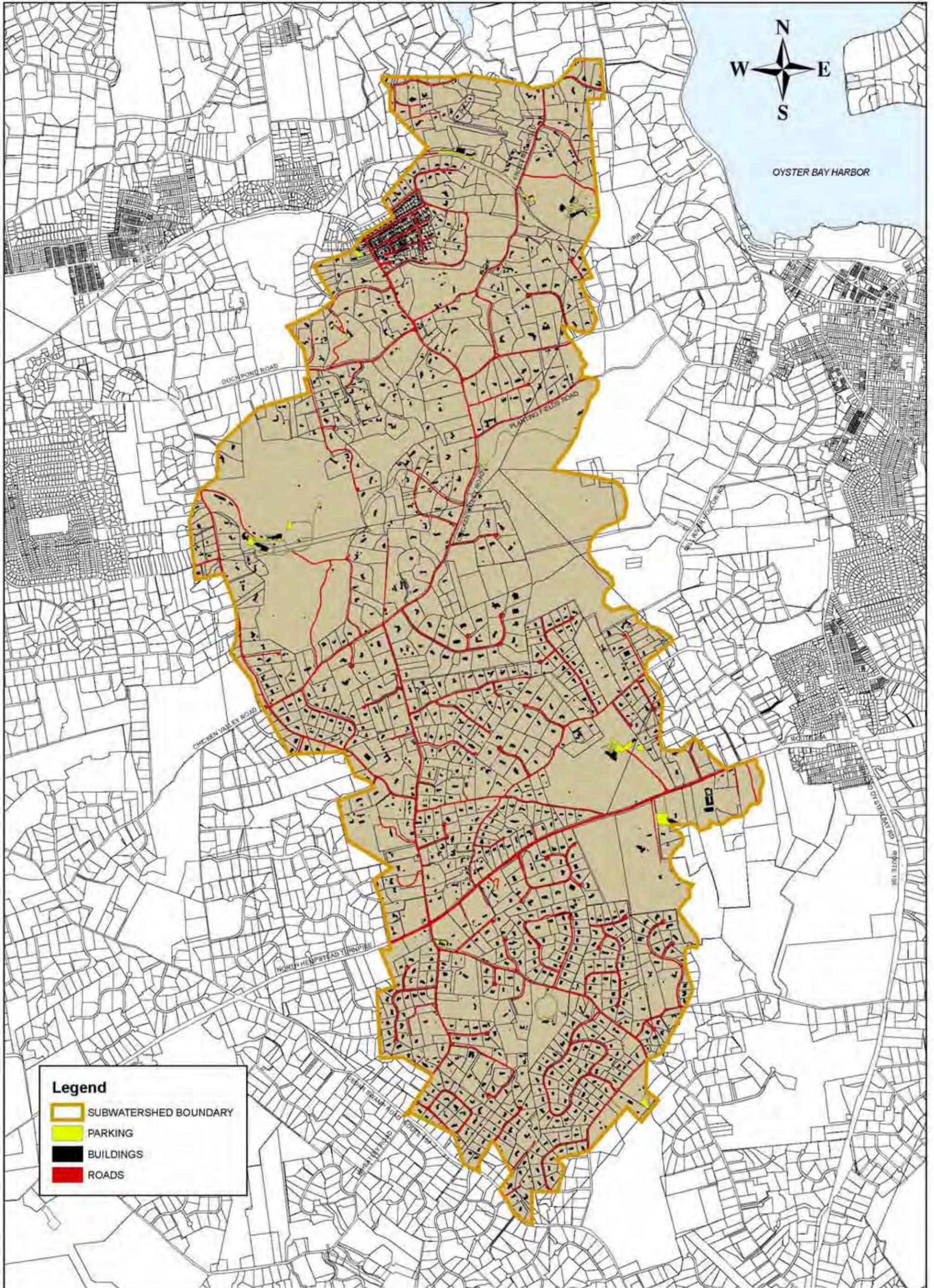




SOURCE: NCGIS

MAP 2-2
 NASSAU COUNTY STORMWATER
 MANAGEMENT PROGRAM
 STORMWATER RUNOFF IMPACT ANALYSIS
 CONTOURS
 FRANCIS POND SUBWATERSHED

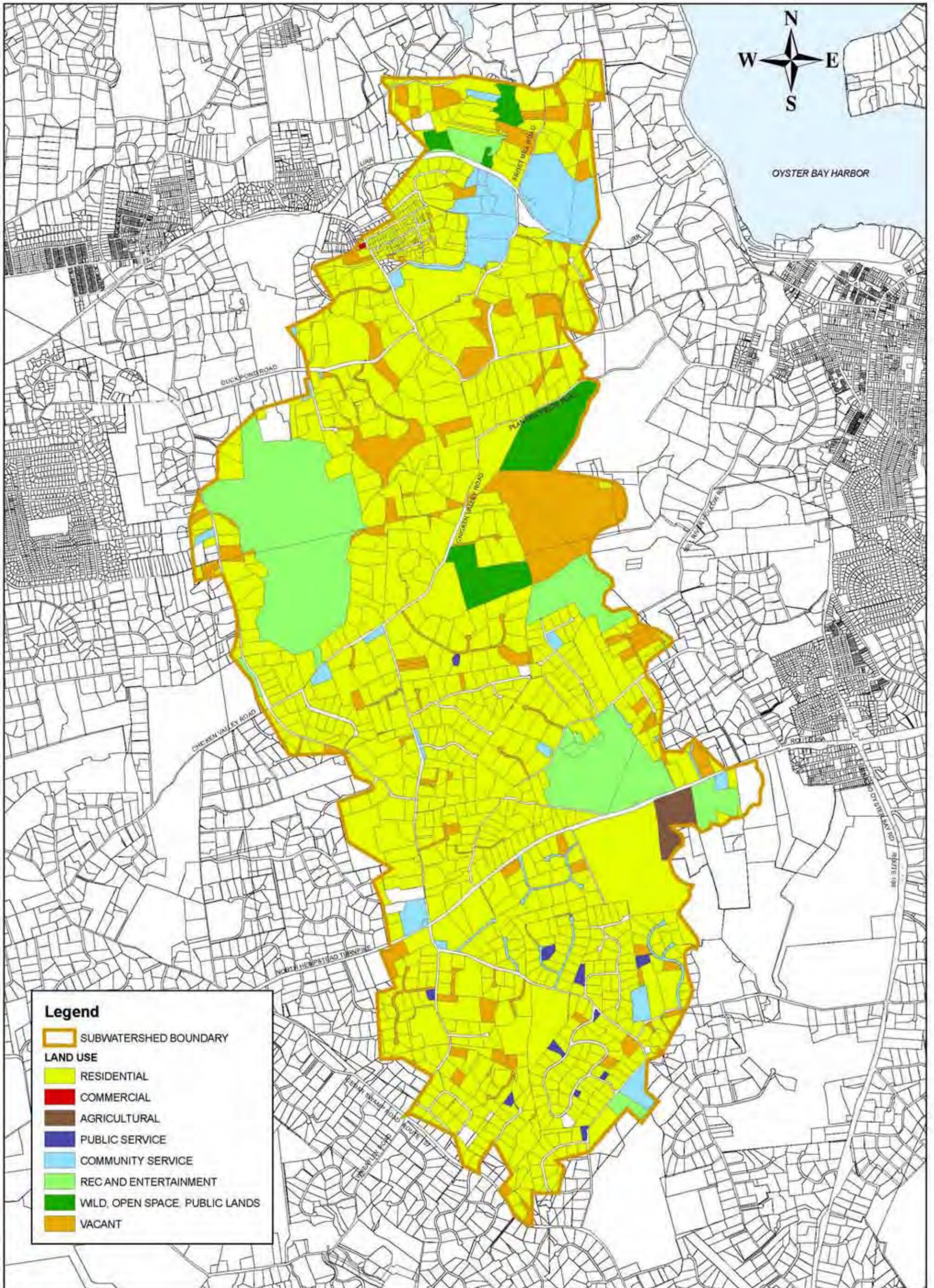
0 1,000 2,000 4,000 6,000 8,000 Feet



SOURCE: NCGIS

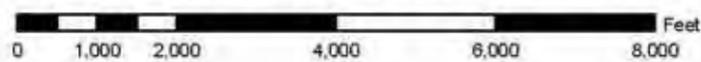
MAP 2-3
 NASSAU COUNTY STORMWATER
 MANAGEMENT PROGRAM
 STORMWATER RUNOFF IMPACT ANALYSIS
 IMPERVIOUS AREAS
 FRANCIS POND SUBWATERSHED

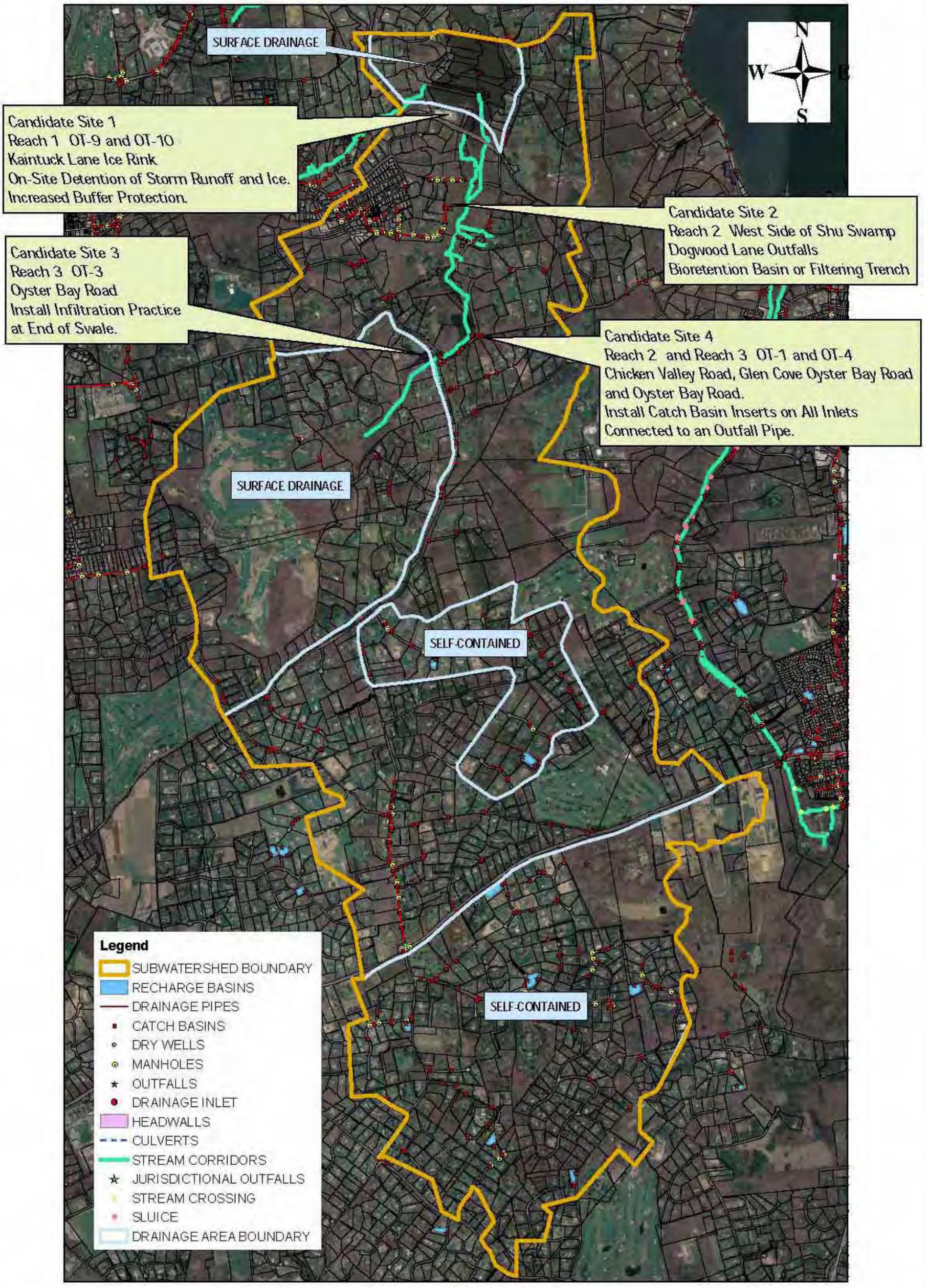
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SOURCE: NCGIS AND CASHIN ASSOC. P.C.

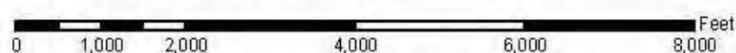
MAP 2-4
NASSAU COUNTY STORMWATER
MANAGEMENT PROGRAM
STORMWATER RUNOFF IMPACT ANALYSIS
LANDUSE
FRANCIS POND SUBWATERSHED





SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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





**Nassau County
Stormwater Management Program**



**FRANCIS POND SUBWATERSHED
STORMWATER RUNOFF IMPACT
ANALYSIS AND CANDIDATE SITE
ASSESSMENT REPORT**

APPENDIX A – FIELD DATA



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