Nassau County
Stormwater Management Program

BELLMORE CREEK SUBWATERSHED
Stormwater Runoff Impact Analysis AND CANDIDATE SITE ASSESSMENT REPORT

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Bellmore Creek Subwatershed
Stormwater Runoff Impact Analysis

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1. INTRODUCTION

The Bellmore Creek 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 Procedures 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 *Stormwater Runoff Impact Analysis 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 East Bay watershed is located between the Meadowbrook Parkway and the Wantagh Parkway on the south shore. Subwatersheds are the tributaries that drain to the watersheds. For East Bay, the tributaries include East Meadow Brook, Simmond Creek, Cedar Swamp Creek, Newbridge Creek, and Bellmore Creek.

The subwatershed assessment included review of available subwatershed data including Nassau County Geographic Information System (NCGIS) mapping, Town of Hempstead (TOH) draft GIS 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 wais 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. The TOH GIS data was added to the NC GIS data.

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 106 documents that pertained to work conducted in the Bellmore Creek subwatershed. The maps were provided to a printing sub-consultant for scanning into PDF 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 added to a new GIS layer in accordance with Nassau County mapping protocols.

The Town of Hempstead is currently mapping their drainage infrastructure and incorporating the data into their GIS system. The Town provided their preliminary GIS data files for the Bellmore Creek subwatershed. These files were incorporated into the NCGIS data.

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 converted 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 Bellmore Creek 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 subwatersheds' size, land uses, boundary, and length of water body. 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 Bellmore Creek subwatershed is located within the Town of Hempstead in the southern portion of Nassau County. For this Analysis Report, the subwatershed is defined as extending north from Merrick Road, limiting the analysis to the freshwater segment of the creek. The tidal segment is located south of Merrick Road. Bellmore Creek is comprised of three main branches and has series of lakes and ponds. All of the branches and ponds receive runoff from extensive drainage infrastructure systems. Bellmore Creek flows south into East Bay.

The geographic limits of the Bellmore Creek subwatershed were defined through review of the NC and TOH GIS data, topographic maps, plans of existing municipal drainage infrastructure, and field assessment. Map 2-2 shows subwatershed topography along with existing drainage infrastructure. The subwatershed boundary was reviewed as part of this study, and was found to be consistent with the previously defined subwatershed limits.

The current Bellmore Creek subwatershed encompasses 2966 acres that contribute runoff that eventually enters Bellmore Creek. The Bellmore Creek subwatershed has been mapped to exclude most areas that can be defined as self-contained. When an area contains storm runoff in on-site drainage infrastructure, that area is described as self-contained. The original watershed has been reduced in size by the construction of

these self-contained areas. Self-contained areas generally have recharge basins and/or drainage infrastructure that contain storm runoff volumes from roads, subdivision developments, and commercial and industrial site and allow the collected runoff to infiltrate to groundwater.

The Bellmore Creek subwatershed extends 4.5 miles north from Merrick Road and is generally located between Bellmore Avenue and Wantagh Avenue. Land use within the subwatershed is 50% residential. Of the 9140 residences in the subwatershed, 8675 or 95% are smaller than one-quarter acre in size. Roads account for 15% of the subwatershed. Several major New York State roads extend through the subwatershed including Wantagh Parkway, which runs north-south north through the entire subwatershed, and Sunrise Highway and Southern State Parkway which both extend east-west. Suburban commercial development accounts for 4% of the subwatershed and is located along the main roads including Merrick Road, Sunrise Highway, Wantagh Avenue and Jerusalem Avenue. The remaining 31% of the subwatershed falls into the "other" category. The predominant land uses within that category appear to the parklands and schools. The parklands include recreational facilities and the natural areas surrounding the corridors of the Bellmore Creek reaches and ponds. The school properties include buildings, parking lots and athletic fields.

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 Bellmore Creek 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 driveways 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 Bellmore Creek, 95% 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 Bellmore Creek subwatershed is 1119 acres of the 2966 total subwatershed acres. This represents 38% of the subwatershed. Based on the 38% impervious figure, Bellmore Creek receives a subwatershed classification of non-supporting stream.

Non-supporting streams are dominated by urban stormwater runoff and increased flooding. The streams are generally channels for the conveyance of stormwater runoff

and can no longer support the biological community. The stream channel becomes highly unstable, and many stream reaches experience severe widening, down cutting, and streambank erosion. Pool and riffle structure needed to sustain fish is diminished or eliminated and the substrate can no longer provide habitat for aquatic insects or spawning areas for fish. Water quality is consistently rated as fair to poor, and water recreation is no longer possible due to the presence of high bacterial levels. Streams generally display increases in nutrient loads to downstream receiving waters, even if effective urban BMPs are installed and maintained. The biological quality of non-supporting streams is generally considered poor, and is dominated by pollution-tolerant insects and fish. Although these streams may have potential for partial repair, pre-development biological conditions cannot be achieved. These streams should be managed to prevent bank erosion, improve the stream corridor and improve water quality. The non-supporting subwatershed management goals are to minimize the downstream pollutant levels, alleviate flooding conditions, and improve the aesthetics of the corridor. All of these goals pertain to Bellmore Creek.

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 subwatersheds extensive road system, parking lots and compacted soils on small, older lots contribute to TSS in Bellmore Creek.

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. Small, older lots with yards that drain to the street and directly to the creek and pet wastes contribute TP and TN to Bellmore Creek.

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 wastes and high waterfowl populations contribute to high fecal coliform levels in Bellmore Creek.

Hydrocarbons (Oils and Grease, Petroleum Compounds) – Oils and grease contain an array of hydrocarbon compounds, some of which can be toxic to aquatic life at even 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). The extensive roadway system and commercial parking lots within the Bellmore Creek subwatershed are typical of locations where hydrocarbon concentrations are found to be the highest. 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. Roads through commercial areas within the Bellmore Creek subwatershed contribute to the floatable debris load to Bellmore Creek. In addition, dumping of large debris was also observed in the Bellmore Creek 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. Bellmore Creek was assessed by traveling upstream from the mouth of the river at Oyster Bay Harbor. On the data sheets, the banks are described as left (west) and right (east) looking downstream.

The stream assessment for Bellmore Creek was conducted over eleven days in the period from January 24, 2007 to April 6, 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 with a water resistant storage compartment, 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. Bellmore Creek was the ninth stream assessed by this methodology and was assigned identification number 108.

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. Except for outfalls, a single photograph was considered adequate unless the assessment team decided that an

additional photograph was necessary. 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. No property owners refused access to the stream.

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, branches or long culvert. Bellmore Creek was assigned four reaches based on changes in stream condition and branches. The reaches were assigned identification numbers starting with -1 at the subwatersheds downstream end. The branches were assigned identification number from downstream to upstream and from west to east. Reach 108-1 is westernmost branch and includes Jones Pond. Reach 108-2 includes the series of ponds north of Jones Pond to the north end of Seaman Pond. Reach 108-3 is the central branch that extends from Seaman Pond north along the east side of the Wantagh Parkway to the vicinity of Jerusalem Avenue. The fourth reach, 108-4, is the eastern reach that extends from the east side of Seaman Pond under the Wantagh Parkway and north to Stony Lane near Wantagh

Avenue. The following paragraphs are a summary of the data collected on the assessment sheets.

The reaches range in length from approximately one mile (Reach 108-1) to approximately 2.5 miles (Reach 108-4). A significant portion of the stream corridor is surrounded by public land which provides a buffer to the stream and also provides shade. In locations where residential properties are adjacent to the stream, the buffers are narrower and the stream corridor is impacted by the adjacent land use. Field conditions were recorded on aerial photography. The locations for which data sheets were completed are noted on the aerial photography. Due to the large scale of the subwatershed, the aerial photography was used in lieu of the limited space allotted for this task on the Reach Level Assessment sheets. The photographs are included in Appendix A which is a separately bound document.

REACH 108-1

In Reach 108-1, Jones Pond is surrounded by forested area and the creek runs in a narrow stream corridor. Jones Pond dominates the reach area. The Wantagh State Parkway is located along the east side of the pond. The remainder of the reach is surrounded by predominately residential properties, along with a small number of commercial properties. The following information regarding the condition of the stream in Reach 108-1 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;
- $\geq$ 25% stream shading;
- channel dynamics mostly natural with some channelization with gabion cages, concrete, and various other methods;

- reach accessibility for the most part was fair due to private property, sensitive areas, and various stream crossings; and
- little or no vegetation disruption.

Seventeen outfalls were identified. The outfalls ranged in size from several small 2" and 3" pipes from residential properties to a 60" outfall from an industrial property. The following is a summary of the condition of identified outfalls. Outfalls identified as having dry weather flow may be potential illicit discharges and should be further investigated.

- OT-1 through OT-5 are located along the east side of Jones Pond. The infrastructure connected to several of these outfalls could not be determined. They may be carrying runoff from the Wantagh State Parkway. See photographs 4 through 16.
- OT-6 (15" diameter pipe) is located in the rear of a residential property. The headwall appears to have been undermined and should be inspected to determine collapse potential. See photograph 24.
- Dry weather discharge was observed at OT-7; a 42" pipe that outfalls into the culvert under Lakeview Road.
- OT-8 and OT-9 are open curb inlets from which road runoff falls directly into the stream. The openings allow floatable debris to enter the creek corridor and are also dangerous for bicycle tires. See photographs 36 and 39.
- An excessive amount of orange staining and algae growth was observed in Bellmore Creek from the Lakeview Road stream crossing extending approximately 300 feet north as shown in photographs 42, 43 and 45. The flow may be originating from OT-11, a small residential outfall with dry weather discharge as shown in photograph 48. This outfall should be investigated with respect to potential illicit discharge.
- Dry weather discharge was observed from residential properties at OT-10, OT-12, OT-13 and OT-16.

- A potential illicit discharge from a commercial property was identified at OT-15. Dry weather flow and steam with a slight rancid smell were observed coming from the pipe at this location.

A summary of the results of the remainder of the data sheets are as follows:

- Six stream crossings were identified in Reach 108-1. The southernmost stream crossing, SC-1, extends under Merrick Road, creating a fish barrier to the tidal segment of the creek. SC-2 is a triple barrel box culvert located at Lakeview Road. The western barrel carries the runoff from Reach 108-1. The flow in the two other barrels is suspected to come from the recharge basin south of Sunrise Highway, but requires investigation to confirm this flow source. SC-3 is approximately a 700' long culvert that appears to extend from OT-15 south to below Sunrise Highway and creates a fish passage barrier.
- IB-1 (see photograph 1) shows a construction site with material stockpiles located in close proximity to the Jones Pond shoreline and few, if any, sedimentation or erosion control measures in place.
- The overall trash levels in this reach ranged from suboptimal to marginal condition. The overall reach showed low levels of trash such as bottles, cans, Styrofoam, metals, glass and lighters, etc. Floatable debris appears to accumulate in specific areas by being transported downstream until trapped at these locations or by accumulating from illegal dumping. TR-1 identifies the debris evident along the creek corridor. Photographs 31 through 63 show trash and debris in the stream. The dumped materials observed included tires, bicycles, construction debris, paper, yard waste, cement/lime bags, shopping carts, metals, and plastics.

The overall 108-1 reach condition was assessed to be in the suboptimal range due to the high percentage of stream bank cover by vegetation. The overall buffer and floodplain

condition was assessed to be in the suboptimal range due to the vegetated buffer zone, the mix of habitats, and minor floodplain encroachment.

REACH 108-2

Reach 108-2 extends from the north end of Jones Pond to the north end of Seaman's Pond. Seaman's Pond and Wantagh Pond dominate much of Reach 108-2 and are surrounded by forested and park areas. The ponds are interconnected by creek channels. The Wantagh State Parkway is located along the east side of the ponds. The remainder of the reach is surrounded by residential properties, along with a small number of commercial properties along Wantagh Avenue. The following information regarding the condition of the waterbody in Reach 108-2 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;
- $\geq$ 50% stream shading;
- channel dynamics are mostly natural with very little channelization;
- reach accessibility was fair due to limitations of private property and sensitive areas; and
- little or no vegetation disruption was observed.

Eighteen outfalls were identified. The outfalls ranged in size from several small 4" pipes from residential properties to a 48" outfall that connects to drainage infrastructure from a large residential neighborhood. The following is a summary of the condition of identified outfalls. Outfalls identified as having dry weather flow may be potential illicit discharges and should be further investigated.

- Dry weather discharge was observed at OT-1, OT-7, OT-10, OT-16, OT-17, and OT-18.
- OT-1, which extends toward the Wantagh State Parkway, shows extensive orange staining. See photograph 93.

- OT-2 through OT-7 are all located in the area on the north side of Jones Pond and appear to be broken valves and corroded metal pipes from a water main system. Photographs 95,105, 106, 115, 117 show the conditions in the area where much of the piping is at the ground surface. Excessive orange staining and high algae growth is found throughout the area. A further description on the field condition for this area is included on data sheet UT-1.
- A possible illicit discharge was identified at OT-14, where a utility building on the right creek bank has a pipe leading directly into the stream. See photographs 144-146.
- The remainder of the outfalls are connected to drainage infrastructure from the Wantagh State Parkway to the east or the residential neighborhoods to the west.

A summary of the results of the remainder of the data sheets follows:

- Five stream crossings were identified in Reach 108-2. SC-1, SC-4 and SC-5 are culverts that carry flow from several small eastern tributaries included in Reach 108-4 under the Wantagh Parkway and into the ponds. SC-2 is a 200' long culvert that extends under Sunrise Highway and Wantagh Parkway ramps. SC-3 is a road that acts as a dam separating Wantagh Pond from Seaman's Pond. Both SC-2 and SC-3 have grade changes that create fish passage barriers. A dam was also identified at the utility building which may be associated with water mains described in the outfalls section for this reach. The dam is shown in photograph 140.
- A Rapid Trash Assessment for the entire reach shows low levels of trash deposited along the creek banks. No evidence of dumping was observed.

The overall reach 108-2 stream condition was assessed to be in the optimal range due to the high percentage of stable in-stream habitat, vegetated stream bank cover and stable banks and remaining floodplain. The overall buffer width and floodplain condition was assessed to be in the optimal range due to the vegetated buffer width, the mix of habitats, and lack of floodplain encroachment.

REACH 108-3

Reach 108-3 extends from the north end of Seaman's Pond along the west side of the Wantagh State Parkway up to Jerusalem Avenue. The immediate creek corridor is wooded and the surrounding area consists of residential properties. Several school and park properties are located within close proximity to the creek. The following information regarding the condition of the waterbody in Reach 108-3 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;
- $\geq$ 75% stream shading;
- channel dynamics mostly natural with some various forms of channelization toward the north end of the reach;
- reach accessibility is typically difficult due to private property, material stockpiling areas, and sensitive areas; and
- little or no vegetation disruption.

Forty-eight outfalls were identified. The outfalls ranged in size from 4" to 48" in diameter. The following is a summary of the condition of the identified outfalls. Outfalls identified as having dry weather flow may be potential illicit discharges and should be further investigated.

- Of the 48 outfalls, 17 (OT-1, OT-2, OT-9, OT-10, OT-24 through OT-36) are connected to the Southern State Parkway and the Wantagh Parkway road system which is under New York State jurisdiction. Seven (six asphalt sluiceways and one pipe outfall, OT-14 through OT-20) are from a private water company property located on the north side of Jerusalem Avenue. The remaining outfalls are from residential neighborhoods and local roads (OT-3, OT-5 through OT-7, OT-11 through OT-13, OT-21 through OT-23, and OT-37 through OT-44).

- Dry weather discharge was observed at OT-1, OT-3, OT-12, OT-13 and OT-31.
- The creek near OT-8 had brownish foam on the surface, with a slight sewer smell, flagging the location as a potential illicit discharge. Trash was also evident in the area. This location is shown in photograph 203.
- Several discharges were observed at the water company property at Jerusalem Avenue. Discharge at the OT-17 and OT-18 sluiceways (Photographs 234-237) appeared to be caused by specific water valve/main pumping activity (Photograph 227). The water from the valve entered the creek after running across the asphalt yard. OT-20 had dry weather discharge with orange staining, coming from the water company property as shown on photographs 243-245.
- OT-37 (shown in photographs 308-310) and OT-39 (shown in photographs 314 and 315) have severely cracked and deteriorated headwalls and undermined aprons.

A summary of the results of the remainder of the data sheets follows:

- Twelve stream crossings were identified in Reach 108-3. SC-1 extends under the Wantagh State Parkway and carries Reach 108-4 flow into Reach 108-3 just north of Seaman's Pond. SC-5 is a pedestrian bridge with a dam structure that maintains depth in Forest City Park pond. SC-6 through SC-10 are a series of 40' to 200' length culverts that carry the creek beneath the Southern State Parkway and the Wantagh State Parkway. The remainder of the stream crossings are box or pipe culverts under the local streets.
- Several channel modification (CM) locations were also noted. CM-1 is located adjacent to the water utility property where the stream channel and sidewalls have been concrete-lined. Location CM-2 is south of the Southern State Parkway, where gabion baskets have been used to confine the flow. From the southern boundary of the reach to the Wantagh Parkway is natural channel with vegetated banks. From the Wantagh Parkway north, the creek channel is a grassed channel with some concrete

hardening evident. This segment had no dry flow and appears to function only as a storm drain channel.

- A Rapid Trash Assessment for the entire reach shows high levels of trash deposited along the creek banks and evidence of dumping, including a large amount of persistent materials that are a threat to aquatic life. Evidence of toxic materials, such as vehicle batteries and chemical containers, was observed. Trash at several of the more severe areas appears to have accumulated from illegal dumping of large items. At other locations floatable debris appears to have collected after being transported downstream. Major locations where floatable debris appears to collect or where dumping was evident include along Beltagh Avenue from the school on the west bank north to Jerusalem Avenue and Holiday Park Drive. At TR-1 (photo 170), yard waste dumping on the stream bank was identified. At TR-2 (photos 178-192), an excessive amount of both typical debris and dumped trash including shopping carts, chemical containers, outdoor furniture, and wood pallets were observed. At TR-3, construction debris was identified. TR-4 (photos 223-226) appeared to have collected high levels floatable debris. In the channel adjacent to the water utility property (TR-5), orange MPT (maintenance and protection of traffic) barrels and a recently used paint roller (photo 239) were observed. Trash accumulation identified on TR-6 (photographs 249-250) is near the weir in Forest City Park. TR-7 and TR-8 identified floatable debris and discarded traffic signs that appear to be from the adjacent parkways.

The Reach 108-3 overall stream condition was assessed to be in the optimal range due to the high percentage of in-stream habitat, vegetated stream bank cover and stable banks and remaining floodplain. The overall buffer width and floodplain condition was assessed to be in the suboptimal range because of the narrowed buffer width, lack of standing water in wetland habitats and minor floodplain encroachments.

REACH 108-4

Reach 108-4 extends from the east side of Seaman's Pond under the Wantagh Parkway north to Stony Lane above North Jerusalem Avenue. The immediate creek corridor is

wooded in the southern segment with less vegetation and cover to the north. The creek has running water from the vicinity of the Southern State Parkway south. North of the Southern State Parkway the creek functions solely as a drainage channel. The majority of the surrounding area consists of residential properties, with commercial use along Wantagh Avenue. Several school properties and parks are located within close proximity to the creek. A USGS Gauging Station is located in the southern segment of Reach 108-4. The following information regarding the condition of the waterbody in Reach 108-4 was noted:

- dominant substrate was sand and gravel;
- water clarity was naturally colored with some attached and floating aquatic plants;
- occasional signs of fish life;
- $\geq$ 50% stream shading; and
- channel dynamics mostly natural in the southern segment of the reach, with various forms of channelization from the mid-section to the northern limits of the reach.

Sixty-three outfalls were identified in this reach. The outfalls ranged in size from 4" in diameter to a 50"x 36" ellipse. The following is a summary of the condition of the identified outfalls. Outfalls identified as having dry weather flow may be potential illicit discharges and should be further investigated.

- Of the 63 outfalls, 12 (OT-14 through OT-16, OT-19, OT-41, OT-51 through OT-56, OT-58) are part of the drainage systems from schools and parks. Six outfalls (OT-4 through OT-6, OT-42, OT-43, and OT-48) are connected to the Southern State Parkway and the Wantagh Parkway system which are under New York State jurisdiction. Twenty-seven outfalls are from the residential neighborhoods and local roads (OT-1, OT-2, OT-7 through OT-9, OT-11, OT-13, OT-17, OT-22, OT-27 through OT-30, OT-33, OT-35, OT-37 through OT-40, OT-45 through OT-47, OT-49, OT-50, OT-57, OT-59, and OT-63). Sixteen outfalls (OT-12, OT-18 through OT-21,

OT-23 through OT-26 OT-31, OT-32, OT-34 and OT-60 through OT-62) are located behind commercial properties along Wantagh Avenue. In many cases, the outfalls appear to connect to the commercial buildings or properties. In some cases, the connection may be to the Wantagh Avenue drainage infrastructure.

- Dry weather discharge was observed at OT-2, OT-8, OT-9, OT-11, and OT-13.
- OT-36 is shown on photographs 425-428. The Town of Hempstead road maintenance yard is adjacent to the stream corridor, with a stockpile of road salt/ice melt at the top of the left stream bank. The storage is not in compliance with hazardous materials regulations. White staining is visible, leading directly from the pile location into the stream.

Several outfalls are in deteriorated condition including:

- OT-45 is completely overrun by vegetation. This outfall is barely visible (photograph 451);
- OT-31 has a tree growing from a damaged headwall (photograph 413);
- OT-48 shows signs of erosion and undermining (photograph 465);
- OT-46 has excessive sedimentation near the outlet, possibly caused by a flow obstruction (photo 454); and
- OT 62 is collecting runoff from a gas station and parking lot (photograph 506).

A summary of the results of the remainder of the data sheets follows:

- Ten stream crossings were identified in Reach 108-4. SC-6 is a 140’ length box culvert that runs beneath the Southern State Parkway. Several of the stream crossings are pedestrian bridges. Six of the stream crossings, SC-3 through SC-5, SC-7, SC-8 and SC-10) are multiple pipe culverts under the local streets. In addition, at OT-14 a concrete apron across the creek creates a potential fish passage barrier.

- Except for the southern segment of this reach south of Waterbury Drive, the creek channel has been modified to a uniform cross section.
- Impacted Buffers were identified through a large portion of this reach where the creek runs in a narrow channel with low grass banks on either side. Along the east side of the creek, behind the residences on Waterbury Drive and Jennie Road, the banks are vegetated with low grasses with a worn dirt path. See photographs 367 to 374. Unvegetated earth along the path may be subject to erosion. At several of the locations where commercial properties are adjacent to the creek, uncurbed parking lots are in close proximity to the creek and, where vegetated, the vegetation is low grasses. On school and park properties, the channel and banks are also low grasses.
- The Rapid Trash Assessment for the entire reach identified medium to high levels of trash, such as bottles, cans, Styrofoam, metals, glass, etc. Evidence of dumping included construction debris, vehicle batteries, tires, spray cans, chemical containers, lawnmowers, lighters, clothing, and commercial waste. In addition, a large number of bowling balls (in excess of 20) are scattered along the entire reach. In several locations, residents appear to dump excess yard waste in the stream corridor immediately behind their properties. A summary of the seven major areas where floatable debris appears to collect or where dumping was identified follows:
  - Trash accumulation identified on TR-1, TR-2, TR-4, TR-5 and TR-6 includes floatable debris that may come from the Wantagh Parkway and illegal dumping from commercial properties on Wantagh Avenue and adjacent residential properties.
  - At TR-2 large amounts of trash accumulate upstream of trees that have fallen across the creek. See photographs 359-361.
  - TR-3 is located at the uncurbed rear of a commercial property located along the eastern stream bank on Wantagh Avenue. As shown in photograph 389, steel drums are stored or abandoned along the fence line in close proximity to the creek at this location. Several of the containers are open and appear to contain food

grease. There are also numerous pieces of broken glass and plastic bottles scattered in the area.

- TR-4 and TR-5 are located behind the commercial properties just north of TR-3. Floatable debris and some dumping, including numerous bowling balls were observed throughout the area.
- At TR-7, located behind a commercial building, illegal dumping of large amounts of trash bags, clothing, and large debris is evident. See photographs 500, 501, and 504-505.

The Reach 108-4 overall stream condition was assessed to be in the suboptimal range because the optimal condition of the stable banks and remaining floodplain was offset by the lower scores of the in-stream habitat and vegetative cover. The overall buffer width and floodplain condition was assessed to be in the suboptimal to marginal range due to the narrowed vegetative buffer width, lack of mature vegetation and varied habitats, and minor floodplain encroachments.

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

Bellmore Creek was scored a 39, placing this creek in the Marginal/Non-supporting category. Marginal/non-supporting creeks are estimated to have been extensively impacted by high levels of impervious cover and significant pollutant loads. 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.

The Marginal/non-supporting category appears to match the existing conditions of some segments of the creek; however several locations appear to be much higher or lower when considered separately. The southern ponds and Reach 3 from the north end of the ponds to Southern State Parkway appear to have wooded buffer areas and preserved lands along the corridor. These areas appear to be in better condition that the score would make it appear. The northern segment of Reach 1, Reach 3 and most of Reach 4 has less extensive to minimal buffers and in locations the creek has been severely channelized. These segments have been extensively impacted by the surrounding land use and stormwater drainage systems.

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 river and 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.
Lake	A	The best usage of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and are or will be considered safe and satisfactory for drinking water 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.
East Bay	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 East Bay and its tributaries, including Bellmore Creek, 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 impairment have been identified as silt, sediments, phosphorus and pathogens from urban and storm runoff. East Bay and its tributaries are NYSDEC uncertified shellfishing areas. Uncertified shellfishing areas are lands where the NYSDEC has prohibited shellfish harvesting for food uses in accordance with NYSDEC regulation 6 NYCRR Part 41.

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 Bellmore Creek subwatershed is dominated by high density residential and commercial land use. The creek corridor itself is dominated by preserved land. The impervious cover assessment determined that the subwatershed is 38% impervious and that Bellmore Creek is a non-supporting creek with severe degradation from urbanization. Vegetated buffers along the creek corridor have been preserved in many locations, but numerous potential 'hot spots' or illicit discharges that may drain to the creek were identified. Hot spots are land uses that are known to have high levels of various materials including oil, grease, auto or marine parts, dumpsters, gas tanks or other hazardous materials. Illicit discharges are location where storm runoff or unpermitted discharges outfall directly into the creek corridor or into infrastructure that discharges into or will eventually reach the creek.

No self–contained areas, such as subdivision or roads, were identified in this subwatershed. Some commercial properties may be self-contained, particularly those that have been more recently developed, but individual on-site drainage systems were not reviewed for this report. Outfalls from commercial properties were documented whenever located. As existing properties are redeveloped, the drainage infrastructure should be reviewed and modified to contain storm runoff on-site.

Along much of the length of the creek corridor, surface runoff drains toward the creek. Many of these areas have vegetated buffers that reduce and filter the runoff. Other locations have reduced buffer width and cultivated grass cover. This is generally true of the school and commercial areas located along the creek corridor. These buffers may provide opportunity to locate SMP's. The buffers can also be revegetated with tall grasses or dense vegetative cover that will reduce bank erosion and prevent surface runoff from carrying pollutants to the creek.

The subwatershed is connected to the Bellmore Creek through either surface flow or drainage infrastructure. Locations that drain to recharge basins have been removed from the watershed by Nassau County or the Town of Hempstead in connection with previous mapping work. The drainage infrastructure and area topography are shown on Map 2-2.

SMP's that can treat pollutants found in runoff from roads and high-density residential areas 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. Due to wide larger buffer areas and available land, Bellmore Creek does provide opportunity to site SMP's requiring larger land areas such as ponds, wetlands or bioretention basins. In addition, some of the upstream segment of the creek may offer opportunity to provide detention SMP's.

3.3. SMP IMPLEMENTATION CANDIDATE SITES

There are numerous locations within the Bellmore Creek subwatershed that offer opportunities to site SMP's. The limited flow at individual outfall, when compared to the large size of the entire watershed, makes the identification of specific outfalls that will have a noticeable effect on the stream quality difficult to determine. In lieu of identifying specific individual candidate sites, the following is a discussion of potential structural and non-structural SMP's and general types of candidate sites. These practices should be considered for possible future use in this subwatershed as deemed necessary.

As the subwatershed has road, commercial and residential land uses, pollutants of concern include sediments, trash, hydrocarbons (oil and grease), nitrogen, phosphorus and bacteria. SMP's should address each of these pollutants if possible.

Nassau County should discuss the development SMP'S for the numerous outfalls that carry state road runoff into Bellmore Creek with New York State. The impacts from these outfalls represent a large portion of the pollutant loading to the creek.

Numerous schools are located along Bellmore Creek as well as along other creeks on the south shore. Schools (which are NYSDEC non-regulated MS4's) should be encouraged to develop programs to enhance the vegetated buffers along the creek shoreline and to identify locations where runoff from school properties is discharging to the creek. School properties may have available land area to site infiltration or filtering practices. If not already in place, Nassau County should work with schools to develop Integrated Pest Management (IPM) programs to reduce fertilizer and pesticide use on school properties, particularly those locations where lawn areas drain to the creek.

Numerous commercial properties along Wantagh Avenue in Reach 4 were identified as having pipe outfalls to Bellmore Creek. As these properties are redeveloped, the drainage infrastructure should be assessed and the drainage system redesigned to contain the water quality storm volume (at a minimum) on-site. The creek channel in the northern segment of Reach 4 also offers opportunities to create a dry swale or wet swale to filter pollutants from runoff.

The creek should be further investigated for illicit discharges and "hot spots". Locations for illicit discharges and hot spot concerns were identified along Merrick Road, Bellmore Avenue, Sunrise Highway, Wantagh Avenue, Jerusalem Avenue and Jerusalem Road. Along these roads, commercial uses include auto repair shops, service stations, gas stations, parking lots and car washes. Specific locations along the creek that appear to be "hot spots" include a water company facility located on north side of Jerusalem Avenue west of the Wantagh Parkway and a Town Public Works yard located north of Jerusalem Avenue and west of Wantagh Avenue. The water company should be encouraged to redesign the facility yard to contain storm runoff on site. The Public Works yard should be assessed and upgraded as necessary to ensure compliance with hazardous materials regulations requiring that sand and salt storage areas be covered and prohibiting discharge

of the materials off-site. Previous sections of this report include a discussion of locations where dry weather flow was observed.

Generally, the outfalls along the northern segments of Reaches 1, 2 and 3 have limited buffer areas and ultra-urban SMP's may be better suited for siting in these locations. The southern segments of Reaches 1, 3, and 4, along with all of Reach 2, have wider buffer space that may allow for siting of traditional SMP practices such as wetlands and infiltration and filtering practices.

Non-structural SMP's that can aid in reducing the pollutants that enter Bellmore Creek include:

- Increased street sweeping;
- Public education on fertilizer and chemical use and disposal;
- Public education on the importance of buffers between cultivated lawns and waterbodies;
- Public education on the importance of vegetative cover to prevent soil erosion;
- Public education on the proper storage and disposal of various materials for commercial property owners including the auto shops and gas stations discussed earlier; and
- Public education regarding the impacts of dumping and trash disposal on area roads and along the creek corridor.

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

Bellmore Creek (ID No. 108)					
COUNTY FILE # (BROWN / BLACK BOOK)		**OLD COUNTY FILE #** (BLUE BOOK)		**MUNICIPALITY FILE #** (RED BOOK)	
3026-5	4045-1	1694-2	500-3	111-2	
L2-29-1	1861-2	4053-7	1369-5	4391-1	
500-5	2040-1	2127-2	ENV. 36-1355	7397-1	
1683-6		332-6	460-5	1031-8	
1541-6		33-6	1636-5	1005-11	
1113-4		2200-1	1235-2	1260-2	
4517-1		1001-15	2197-2	1573-2	
1300-4		1203-8	691-13	7366-1	
1539-7		1680-3	122-8	1095-3	
500-8		1636-4	1936-9	7273-1	
1666-2		1164-4	1951-2	7248-2	
L-46-1		2130-1	1698-1	ENV. 19-824	
1981-3		4115-1	89-6	1283-7	
3087-6		1203-1	1406-2	1642-2	
1952-4		2121-1	1591-8	7213-3	
500-11		1222-10	ENV. 33-1256	7308-1	
7009-1		1636-3	1754-1	256-7	
4182-1		1600-7	1946-1	1051-4	
4083-1		1493-9	ENV. 33-1261	7212-1	
L4-22		1111-2	670-6	7211-3	
1039-1		87-4	500-4		
L4-6-1		303-8			
1141-3		303-9			
L4-6-8		529-6			
75-Y-30		308-7			
1300-3		525-1			
529-6		1504-9			
1918-7		1135-3			
4040-1		412-7			
39-Y-1		1025-7			
308-7		1872-6			

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

Name of Subwatershed: Bellmore Creek (ID No. 108)

Tributary to:	**East Bay**
Adjacent Land Use:	**High Density Residential**

Impervious Information

	Area		Building Area		Parking Lot Area		Length of Roads		Number of Residences
Residential	1,493	Acres	320	Acres					9,140
Commercial	116	Acres	34	Acres	48	Acres			
Industrial	2	Acres	0.1	Acres	0.3	Acres			
Roadway (Pavement)	434	Acres							
Other (Parks, Municipal, (ROW-Pvmt), Etc.)	920	Acres	36	Acres	65	Acres			
Total Subwatershed	2,966	Acres	390	Acres	114	Acres	516,969	LF	

Residential Lots	Quantity in Subwatershed
43,561 +	0
21,781 - 43,560 SF	20
10,891 - 21,780 SF	445
5,446 - 10,890 SF	7,885
0 - 5,445 SF	790
Total Number	9,140

Assumed Percentage of Roadway With Sidewalks (%)	95
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:	**Bellmore Creek (ID No. 108)**			
Tributary to:	East Bay			
Residential > 1 acre - 3212 SF	Units	0	Acres	0.00
Residential > 1/2 acre to ≤ 1 acre - 2,073 SF	Units	20	Acres	0.20
Residential > 1/4 acre to ≤ 1/2 acre - 1,152 SF	Units	445	Acres	4.41
Residential > 1/8 acre to ≤ 1/4 acre - 652 SF	Units	7,885	Acres	78.20
Residential ≤ 1/8 acre - 432 SF	Units	790	Acres	7.83
Total Acres Driveways Impervious	Units	9,140	Acres	91

Sidewalk Area Calculation	
Subwatershed:	**Bellmore Creek (ID No. 108)**
Tributary to:	East Bay
Linear feet of road	516,969
Assumed percentage with Sidewalks	95
Sidewalk Width	4
Sides Sidewalk	2
Total Acres Sidewalk	90
Calculation : LF of road x % with sidewalks x 4 ft w x 2 sides	

Impervious Area Calculation		
SubWatershed:	**Bellmore Creek (ID No. 108)**	
Tributary to:	East Bay	
Adjacent Land Use:	High Density Residential	
Total Subwatershed Area	Acres	2,966
Impervious areas		
Buildings Area	Acres	390
Roads Area	Acres	434
Parking Lot Area	Acres	114
Sidewalks Area - See Table	Acres	90
Driveway Area Total - See Table	Acres	91
TOTAL IMPERVIOUS AREA	Acres	**1,119**
TOTAL % IMPERVIOUS	%	**38%**
Classification	**4**	

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

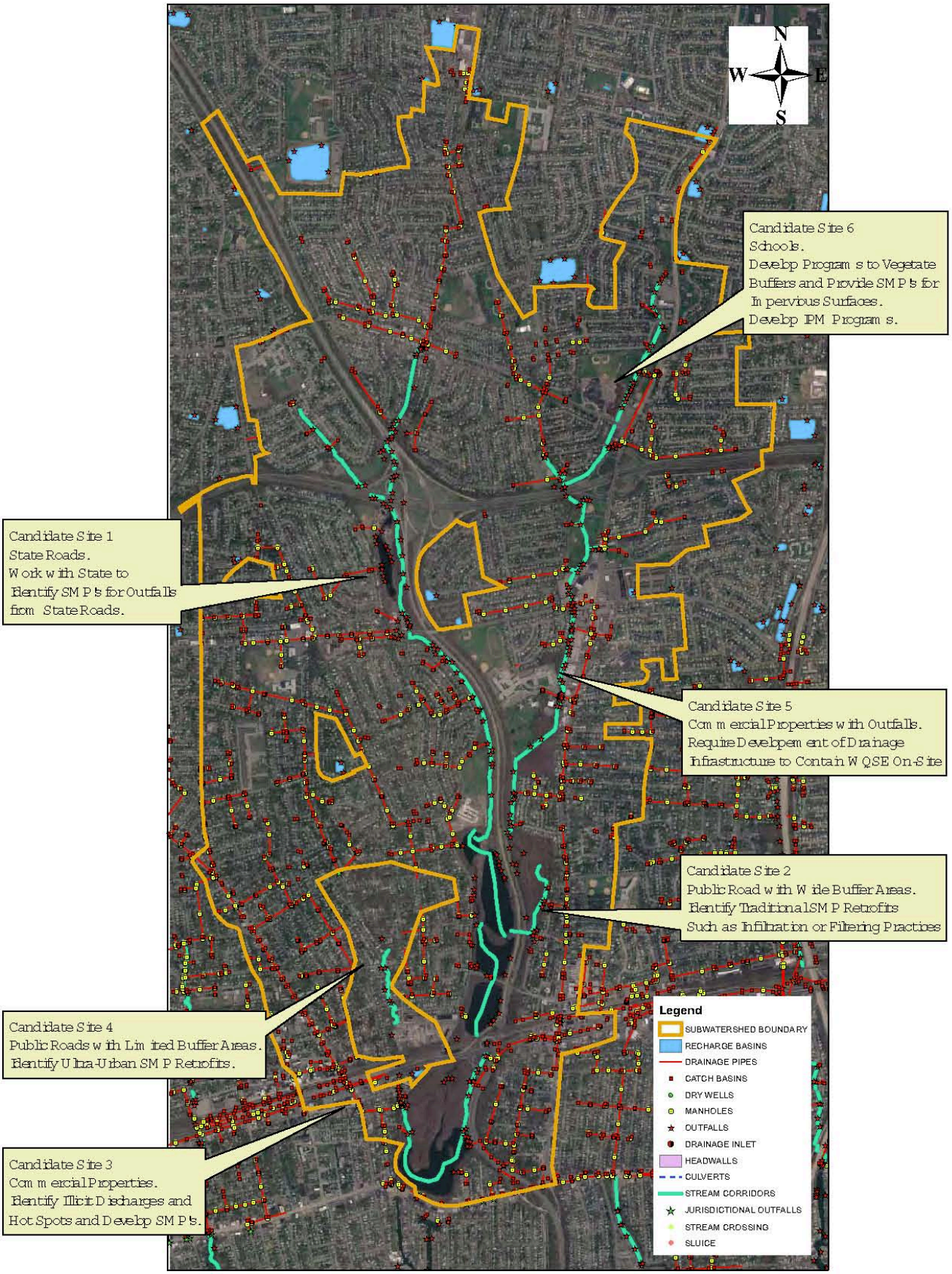
Subwatershed		**Bellmore Creek (ID No. 108)**							
Tributary To		East Bay							
Land Use		**Residential**	**Commercial**	**Industrial**	**Roadway**	**Other**	**TOTAL**		
Contributory Area	Acres	1,493.3	116.0	2.2	434.5	920.0	**2,965.9**		
Impervious Area	Acres	320.4	82.1	0.4	434.5	100.9	**938.3**		
Impervious Area	%	21.5	70.8	18.9	100.0	11.0	31.6		
Water Quality Storm Event Volume	WQv-acre-feet	36.3	8.0	0.0	41.3	13.7	99.3		
Water Quality Storm Event Volume	WQv-Cubic Feet	1,581,404.4	346,927.1	2,080.0	1,798,006.5	595,863.8	4,324,281.8		
Annual Rainfall	inches	42.0	42.0	42.0	42.0	42.0	42.0		
Annual Runoff	inches	9.2	26.0	8.3	35.9	5.6	12.7		
Total Nitrogen (TN)	coefficient mg/l	2.2	2.0	2.5	3.0	2.0		SEVERITY PTS.*	TOTALS
	lbs	6,823.0	1,360.8	10.2	10,578.5	2,337.2	**21,109.7**	3.0	63,329.0
Total Suspended Solids (TSS)	coefficient mg/l	100.0	75.0	150.0	120.0	54.5			
	lbs	310,138.2	51,028.4	611.9	423,140.8	63,687.7	**848,607.0**	4.0	3,394,428.1
Total Phosphorus (TP)	coefficient mg/l	0.4	0.2	0.4	0.5	0.3			
	lbs	1,240.6	136.1	1.6	1,763.1	303.8	**3,445.2**	2.0	6,890.4
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	11.0	0.9	0.0	2.7	2.7	**17.3**	6.0	103.7
Floatable Debris	coefficient CF/AC	5.0	8.0	5.0	8.0	5.0			
	CF	7,466.3	927.8	10.9	3,475.9	4,600.0	**16,480.7**	1.0	16,480.7
Oil and Grease	coefficient mg/l	3.3	5.0	4.0	8.0	3.0			
	lbs	10,234.6	3,401.9	16.3	28,209.4	3,505.7	**45,367.9**	5.0	226,839.5
							935,027.8		**3,708,071.4**
SOURCE:									
"C" Valve Source; See Table								**SCORE**	**1,250.2**

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	Bellmore Creek (ID No. 108)							
			108-1		108-2		108-3		108-4	
Stream Assessment Quantification	**Unit**	**Points**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**	**Qty**	**Qty x Pts**
Outfall	per outfall	2	17	34	18	36	48	96	63	126
Suspected Illicit Discharge or Hot Spot Locations	per location	8	2	16	1	8	4	32	2	16
WQ Retrofit/Restoration Candidates	per location	1	4	4	2	2	2	2	6	6
Infrastructure Investigations Required	per location	1	1	1	0	0	1	1	2	2
Severe Bank Erosion	per location	1	1	1	0	0	0	0	0	0
Inadequate Buffers	per 5% of reach	5	5	25	0	0	1	5	1	5
Road Crossings	per location	1	5	5	5	5	12	12	6	6
Channelized Segments	per 5% of reach	1	4	4	0	0	10	10	15	15
Public Ownership of the Stream Corridor	per 10% of reach	1	7	7	5	5	6	6	8	8
Livestock Encroachment or High Waterfowl Populations	per location	5	1	5	1	5	0	0	1	5
Threatened Infrastructure	per location	3	2	6	0	0	3	9	5	15
Trash Accumulation In Stream	per location	5	1	5	1	5	8	40	7	35
Stream Condition Subtotal (RCH)	from RCH sheet.	80	55	-7	78	-10	80	-10	61	-8
Buffer/Floodplain Condition Subtotal (RCH)	from RCH sheet.	80	60	-8	68	-9	59	-7	44	-6
Reach Total	**No. of Reaches**	4	**99**		**48**		**196**		**226**	
Subwatershed Total			**568**							
Impervious Cover Classification	Sensitive, Impacted, Non supporting, Urban	8,6,4,2	**4**							
Pollutant Load			**13**							
Total Score			**39**							
RANK										

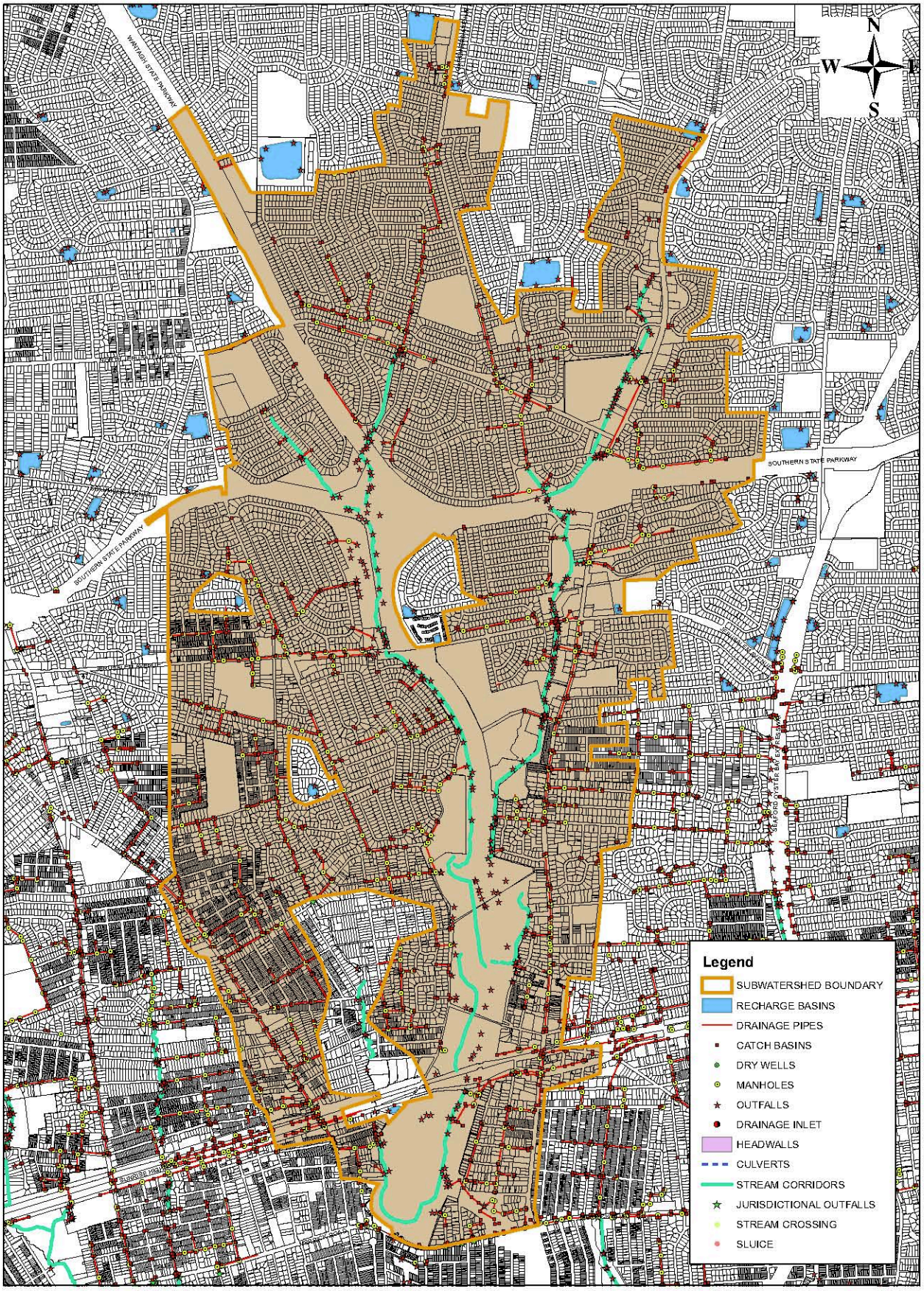


SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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

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

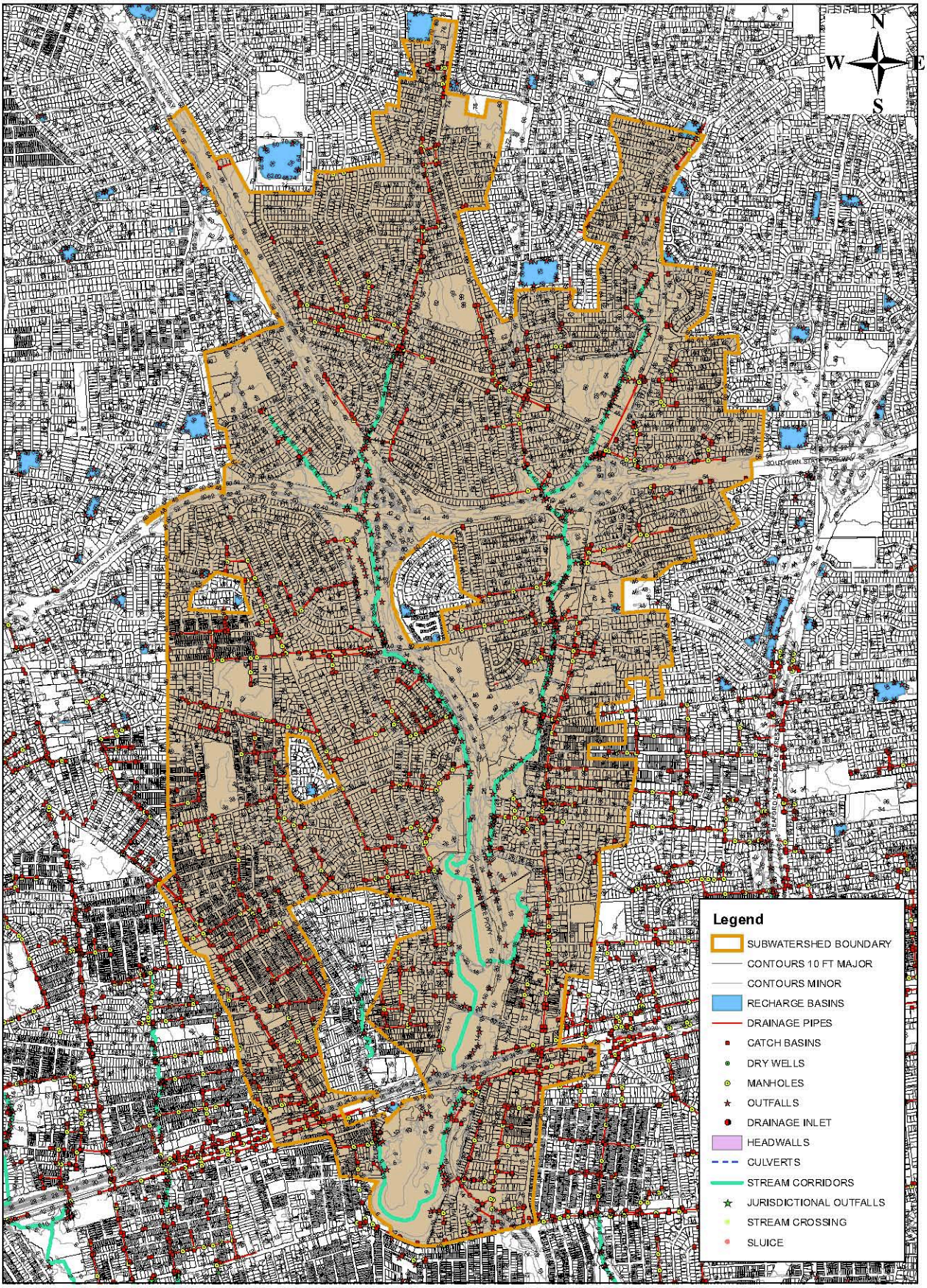
0 1,050 2,100 4,200 6,300 8,400 Feet



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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

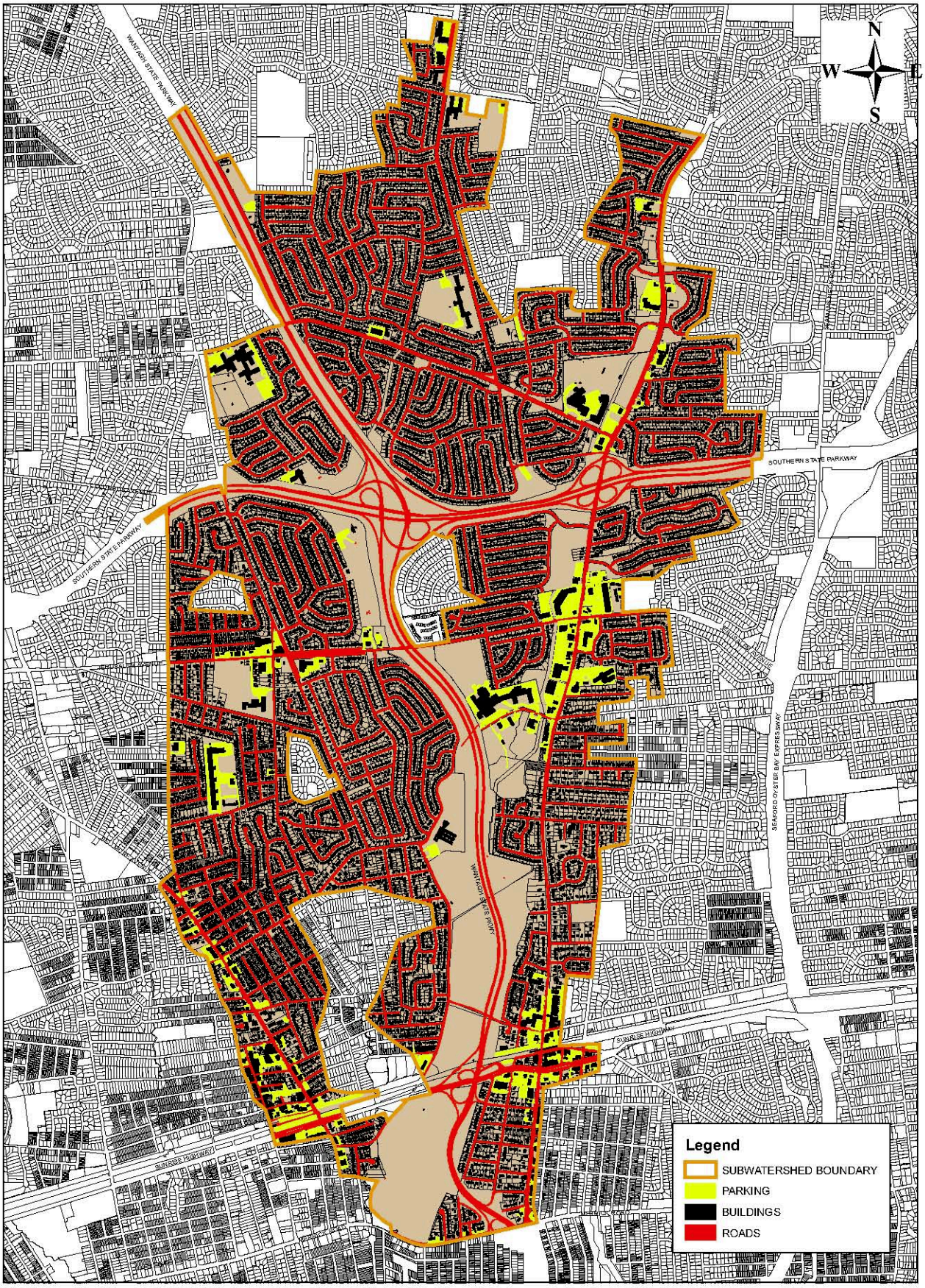
0 1,000 2,000 4,000 6,000 8,000 Feet



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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

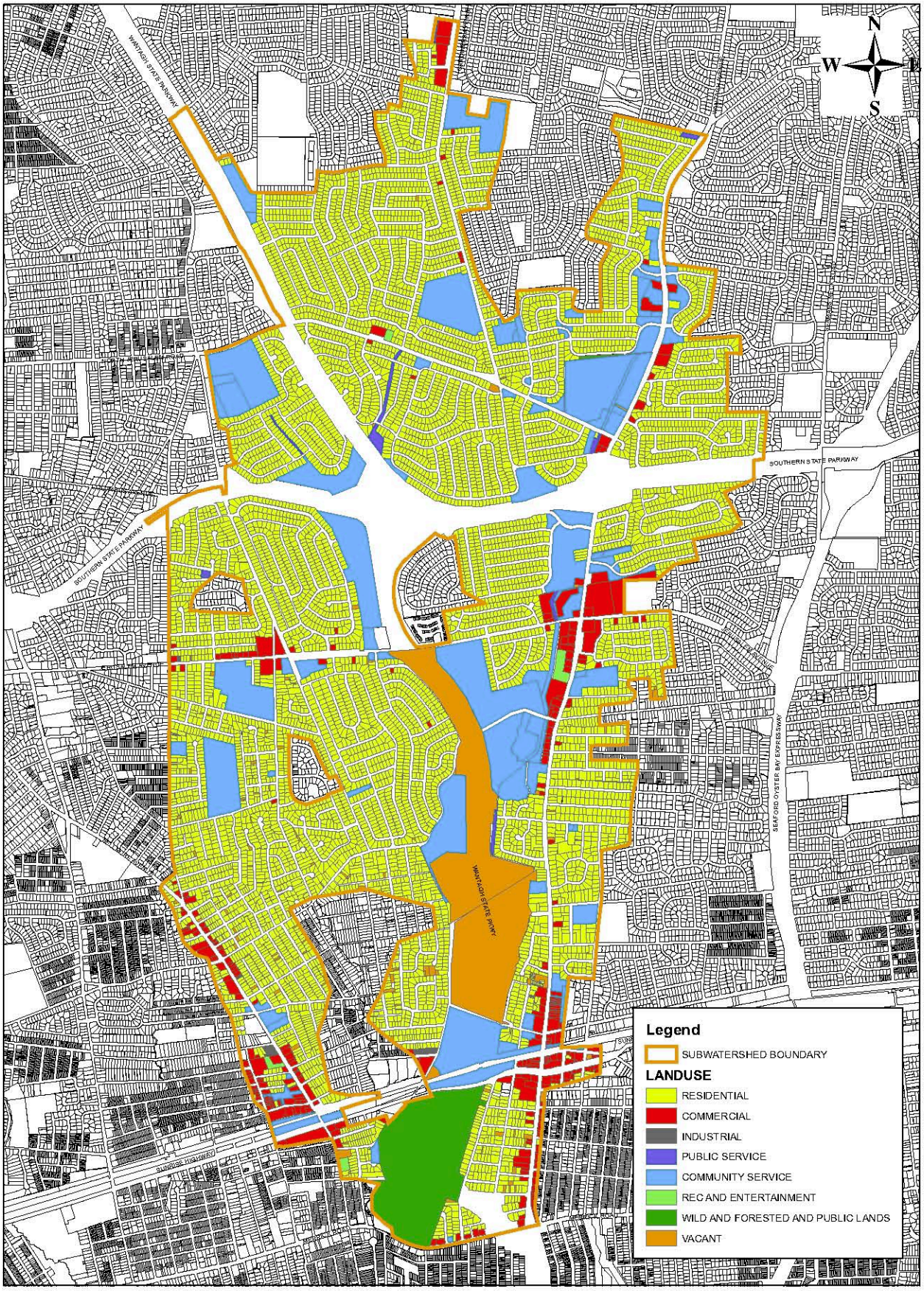
0 1,000 2,000 4,000 6,000 8,000 Feet



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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

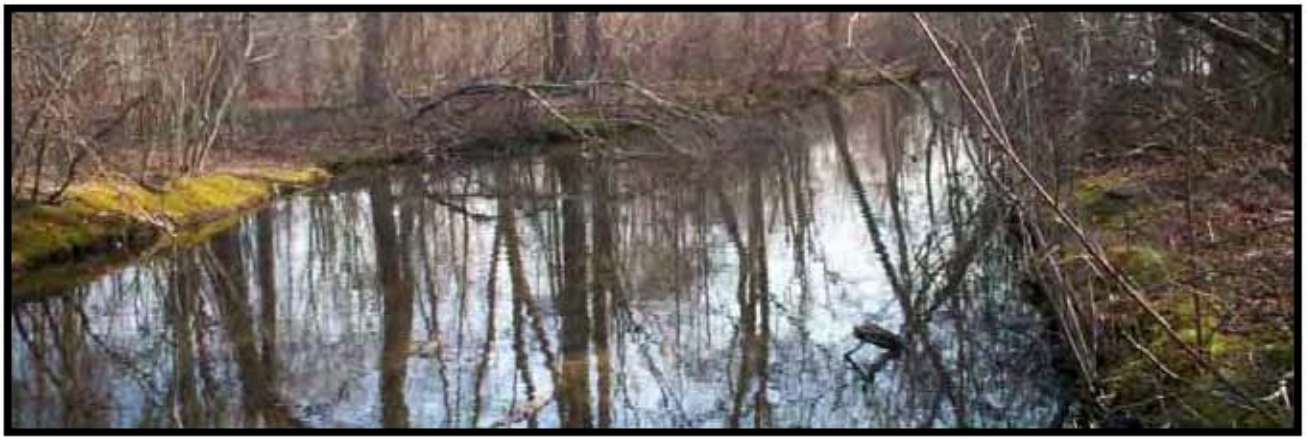
0 1,000 2,000 4,000 6,000 8,000 Feet



SOURCE: NCGIS AND CASHIN ASSOC. P.C.

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

Nassau County
Stormwater Management Program



BELLMORE CREEK SUBWATERSHED STORMWATER RUNOFF IMPACT ANALYSIS AND CANDIDATE SITE ASSESSMENT REPORT

APPENDIX A – FIELD DATA

Volume 1

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Engineering • Planning • Construction Management