HISTORICAL PERSPECTIVES INC.

New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

OPRHP No. 10PRO2085

LPC No. 07DEP063R

New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

OPRHP No. 10PRO2085

LPC No. 07DEP063R

Prepared For:

AKRF
440 Park Avenue South, 7th Floor
New York, N.Y. 10016

and

DEP Bluebelt Program
59-17 Junction Boulevard
Flushing, NY 11373

Prepared By:

Historical Perspectives, Inc.
P.O. Box 3037
Westport, CT 06880

Authors:
Julie Abell Horn, M.A., R.P.A.
Dawn Louise Brown

March 2011

MANAGEMENT SUMMARY

SHPO Project Review Number (if available): **10PRO2085**

Involved State and Federal Agencies: **DEP**

Phase of Survey: **Phase IA Archaeological Documentary Study**

Location Information
- Location: **Multiple locations, Oakwood Beach Watershed.**
- Minor Civil Division: **08501, Staten Island**
- County: **Richmond**

Survey Area
- Length: **varies**
- Width: **varies**
- Number of Acres Surveyed: **Total footprint of five BMPs is ca. 89 acres**

USGS 7.5 Minute Quadrangle Map: **Arthur Kill and The Narrows**

Archaeological Survey Overview
- Number & Interval of Shovel Tests: **N/A**
- Number & Size of Units: **N/A**
- Width of Plowed Strips: **N/A**
- Surface Survey Transect Interval: **N/A**

Results of Archaeological Survey
- Number & name of precontact sites identified: **None**
- Number & name of historic sites identified: **None**
- Number & name of sites recommended for Phase II/Avoidance: **None**

Report Authors(s): **Julie Abell Horn, M.A., R.P.A. and Dawn Louise Brown, Historical Perspectives, Inc.**

Date of Report: **March 2011**

EXECUTIVE SUMMARY

The New York City Department of Environmental Protection (DEP) has developed a drainage plan for the storm water management of the Oakwood Beach Watershed in Staten Island, New York. The Oakwood Beach Watershed is approximately 1,329 acres in size and generally defined by Great Kills Park (part of the Gateway National Recreation Area) and Tanglewood Drive to the west, Cotter Avenue to the north, New Dorp Lane to the east, and Lower Bay to the south. A portion of the Oakwood Beach drainage area, west of the Willowbrook Parkway right-of-way, is tributary to the Oakwood Beach Bluebelt, but outside the area of the proposed drainage plan amendments. The Oakwood Beach drainage area and the tributary to the Oakwood Beach Bluebelt are shown on Figure 1. For the purposes of this study, only the main drainage area, referred to in this report as the Oakwood Beach Watershed, will be addressed. The proposed storm water management plan is composed of storm sewers to collect runoff and Best Management Practices (BMPs) at the points where runoff discharges into the wetlands. A new outfall connecting the BMPs to Lower Bay is proposed at BMP OB-1, and two existing outfalls are proposed to be supplemented with new barrels (5 to 8 feet in width) placed adjacent to the existing barrels. These existing outfalls are located at Tysens Lane and Ebbitts Street. The location of the overall watershed, the five proposed BMP locations, and the new and existing outfalls within the watershed are shown in Figures 1-2. The individual BMPs are further shown in Figures 3a-c and 4a-d. Figures 3a-c represent the most conservative estimate of BMP footprint areas, whereas Figures 4a-d are, in some cases, more tightly restricted to proposed impact areas. For this report, the more conservative BMP footprints as shown on Figures 3a-c were the ones that were studied and are presented on subsequent figures. The BMPs proposed for the watershed are listed in the following table.

Oakwood Beach BMP Descriptions						
BMP	**Size (ac)**	**Location**	**Drainage Area (ac)**	**Description**	**Function / Objective**	**Ownership / Jurisdiction**
OB-1: Kissam Avenue	28.2	Southeast of Mill Road, between Kissam Avenue and Fox Lane	66.4	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt / NYC Department of Parks and Recreation (DPR) Parkland
OB-2: Tysens Lane	27.9	Northeast of Kissam Avenue, southwest of end of Milton Avenue	455.0	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DPR Parkland
OB-3: Riga Street	28.3	Southwest of Aviston Avenue, between Riga Street and Brook Avenue	263.6	Extended Detention Wetland, forebays at sewer discharges	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt
OB-4: Ithaca Street	1.4	Unbuilt Adelaide Avenue Right-of-Way between Hylan Boulevard and Falcon Avenue	182.8	Pocket wetland at Hylan Blvd outfall and forebays at other sewer discharges with Stream Stabilization	Velocity attenuation, improved conveyance and stream corridor restoration	DEP Bluebelt
OB-5: North Railroad Avenue	3.2	Willowbrook Parkway Right-of-Way at Staten Island Railroad viaduct	25.4	Stormwater Basin Retrofit and Channel Restoration	Stormwater detention, velocity attenuation, improved conveyance and stream corridor restoration	NYSDOT/ DPR

BMP installations, both within and outside of streetbeds and right-of-ways, will include below-grade impacts. Since the proposed project is located in New York City and subject to both City Environmental Quality Review (CEQR) and the State Environmental Quality Review Act (SEQRA), impact assessment guidance from the *New York City Environmental Quality Review Technical Guidance Manual* (CEQR Technical Manual 2010) will be used in the preparation of an environmental review. The environmental review process, including an evaluation of

archaeological sensitivity by the New York City Landmarks Preservation Commission (LPC) and the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) was initiated in 2010. As a function of the standard coordination for a Draft Environmental Impact Statement, both the LPC and OPRHP requested a research based study, known as a Phase IA Archaeological Documentary Study, to fully assess the archaeological sensitivity of the impact areas of the three watersheds: Oakwood Beach, New Creek and South Beach (4/14/10 and 4/29/10, respectively).

Historical Perspectives, Inc. (HPI) has been contracted by AKRF to complete the requested Phase IA Archaeological Documentary Study for the Oakwood Beach Watershed and BMP sites. This study was prepared to comply with the standards of the OPRHP and the LPC (New York Archaeological Council 1994; NYSOPRHP 2005; LPC 2002; CEQR 2010). Where guidelines for the archaeological evaluation and report format of the LPC and the NYSOPRHP varied, those of the LPC, which specifically address New York City conditions and resources, took precedent. The Area of Potential Effect (APE) is defined as the area that could be affected by project development. Since project plans have not been finalized as of this writing, the APE includes the entire footprint of each proposed BMP site and the proposed outfall sites. Typically, the BMP final designs will restrict actual construction impacts to more limited areas. However, this comprehensive approach provides the most sensitive input for planning purposes. The total Oakwood Beach Watershed area also is addressed in terms of general history and archaeological sensitivity.

The Phase IA study concluded that the proposed BMP OB-2 site contains a discrete area of precontact archaeological sensitivity. The remaining portions of this proposed BMP, as well as all of the proposed BMP OB-1, BMP OB-3, BMP OB-4, and BMP OB-5 sites contain no precontact archaeological sensitivity. None of the proposed BMP locations contain historic period archaeological sensitivity. The Phase IA study also concluded that the supplemental Tysens Lane outfall, within the undeveloped land between Roma Avenue and Cedar Grove Avenue, contains precontact archaeological sensitivity. The remainder of the supplemental Tysens Lane outfall corridor, as well as the proposed new outfall at BMP OB-1 and the supplemental Ebbitts Street outfall contain no precontact archaeological sensitivity. None of the proposed new or supplemental outfall locations contain historic period archaeological sensitivity. Assessment of both precontact and historic period archaeological sensitivity for the Oakwood Beach Watershed as a whole was undertaken at a general level, but disturbance across the watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions. At this time, there are no additional proposed BMPs defined for the Oakwood Beach Watershed; any further consideration of new sites as part of this project would need to be addressed separately.

Based on these conclusions, HPI recommends that a program of Phase IB archaeological testing be conducted on that portion of the proposed BMP OB-2 site designated as having a high archaeological sensitivity for precontact resources, as shown in Figure 11, if this area will experience subsurface impacts as part of the BMP construction. HPI also recommends that a program of Phase IB archaeological testing be conducted in the proposed location of the supplemental outfall at Tysens Lane, within the undeveloped land between Roma Avenue and Cedar Grove Avenue. All archaeological testing should be conducted according to applicable archaeological standards (New York Archaeological Council 1994, NYSOPRHP 2005; LPC 2002; CEQR 2010). Professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team. No further archaeological investigations are recommended for the remainder of the proposed site of BMP OB-2, and all of the proposed sites of BMP OB-1, BMP OB-3, BMP OB-4, and BMP OB-5. Last, no further archaeological investigations are recommended for the remaining sections of the proposed new and supplemental outfalls.

TABLE OF CONTENTS

FIGURES

PHOTOGRAPHS
(see Figures 4a-c for locations)

1. OB-1, Fox Lane, view to the east.
2. OB-1, Old Mill Road, view to the southeast.
3. OB-1, from Oakwood Beach, view to the northwest.
4. OB-1, Kissam Avenue, view to the northwest.
5. OB-2, from Oakwood Beach, view to the north.
6. OB-2, Kissam Avenue, view to the north.
7. OB-2, Hett Avenue, view to the south.
8. OB-2, Milton Avenue, view to the northeast.
9. OB-3, Riga Street, view to the southwest.
10. OB-3, Grayson Street, view to the south.
11. OB-4, Hylan Boulevard, view to the east.
12. OB-5, Currie Avenue and Fairbanks Avenue, view to the northwest.
13. OB-5, N. Railroad Avenue and Riedel Avenue, view to the west (note storm drainage pipe).
14. OB-5, N. Railroad Avenue and Riedel Avenue, view to the west.

I. INTRODUCTION

DEP has developed a drainage plan for the storm water management of the Oakwood Beach Watershed in Staten Island, New York. The Oakwood Beach Watershed is approximately 1,329 acres in size and generally defined by Great Kills Park (part of the Gateway National Recreation Area) and Tanglewood Drive to the west, Cotter Avenue to the north, New Dorp Lane to the east, and Lower Bay to the south. A portion of the Oakwood Beach drainage area, west of the Willowbrook Parkway right-of-way, is tributary to the Oakwood Beach Bluebelt, but outside the area of the proposed drainage plan amendments. The Oakwood Beach drainage area and the tributary to the Oakwood Beach Bluebelt are shown on Figure 1. For the purposes of this study, only the main drainage area, referred to in this report as the Oakwood Beach Watershed, will be addressed. The proposed storm water management plan is composed of storm sewers to collect runoff and Best Management Practices (BMPs) at the points where runoff discharges into the wetlands. A new outfall connecting the BMPs to Lower Bay is proposed at BMP OB-1, and two existing outfalls are proposed to be supplemented with new barrels (5 to 8 feet in width) placed adjacent to the existing barrels. These existing outfalls are located at Tysens Lane and Ebbitts Street. The location of the overall watershed, the five proposed BMP locations, and the proposed new and existing outfalls within the watershed are shown in Figures 1-2. The individual BMPs are further shown in Figures 3a-c and 4a-d. Figures 3a-c represent the most conservative estimate of BMP footprint areas, whereas Figures 4a-d are, in some cases, more tightly restricted to proposed impact areas. For this report, the more conservative BMP footprints as shown in Figures 3a-c were the ones that were studied and are presented on subsequent figures. The BMPs proposed for the watershed are listed in the following table.

Oakwood Beach BMP Descriptions

BMP	Size (ac)	Location	Drainage Area (ac)	Description	Function / Objective	Ownership / Jurisdiction
OB-1: Kissam Avenue	28.2	Southeast of Mill Road, between Kissam Avenue and Fox Lane	66.4	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt / DPR Parkland
OB-2: Tysens Lane	27.9	Northeast of Kissam Avenue, southwest of end of Milton Avenue	455.0	Extended Detention Wetland	Stormwater detention, water quality enhancement and wetland enhancement	DPR Parkland
OB-3: Riga Street	28.3	Southwest of Aviston Avenue, between Riga Street and Brook Avenue	263.6	Extended Detention Wetland, forebays at sewer discharges	Stormwater detention, water quality enhancement and wetland enhancement	DEP Bluebelt
OB-4: Ithaca Street	1.4	Unbuilt Adelaide Avenue Right-of-Way between Hylan Boulevard and Falcon Avenue	182.8	Pocket wetland at Hylan Blvd outfall and forebays at other sewer discharges with Stream Stabilization	Velocity attenuation, improved conveyance and stream corridor restoration	DEP Bluebelt
OB-5: North Railroad Avenue	3.2	Willowbrook Parkway Right-of-Way at Staten Island Railroad viaduct	25.4	Stormwater Basin Retrofit and Channel Restoration	Stormwater detention, velocity attenuation, improved conveyance and stream corridor restoration	NYSDOT/ DPR

BMP installations, both within and outside of streetbeds and right-of-ways, will include below-grade impacts. Since the proposed project is located in New York City and subject to both City Environmental Quality Review (CEQR) and the State Environmental Quality Review Act (SEQRA), impact assessment guidance from the *New York City Environmental Quality Review Technical Guidance Manual* (CEQR Technical Manual 2010) will be used in the preparation of an environmental review. The environmental review process, including an evaluation of

archaeological sensitivity by the New York City Landmarks Preservation Commission (LPC) and the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) was initiated in 2010. As a function of the standard coordination for a Draft Environmental Impact Statement, both the LPC and OPRHP requested a research based study, known as a Phase IA Archaeological Documentary Study, to fully assess the archaeological sensitivity of the impact areas of the three watersheds: Oakwood Beach, New Creek and South Beach (4/14/10 and 4/29/10, respectively).

Historical Perspectives, Inc. (HPI) has been contracted by AKRF to complete the requested Phase IA Archaeological Documentary Study for the Oakwood Beach Watershed and BMP sites. This study was prepared to comply with the standards of the OPRHP and the LPC (New York Archaeological Council 1994; NYSOPRHP 2005; LPC 2002; CEQR 2010). Where guidelines for the archaeological evaluation and report format of the LPC and the NYSOPRHP varied, those of the LPC, which specifically address New York City conditions and resources, took precedent. The HPI project team consisted of Julie Abell Horn, M.A., R.P.A., who undertook the majority of the research, and wrote the majority of the report; Dawn Louise Brown, who conducted the site visits and wrote portions of the report, and Cece Saunders, M.A., R.P.A. who assisted with the research, managed the project, and provided editorial and interpretive assistance.

The Area of Potential Effect (APE) is defined as the area that could be affected by project development. Since project plans have not been finalized as of this writing, the APE includes the entire footprint of each BMP site. Typically, the BMP final designs will restrict actual construction impacts to more limited areas. However, this comprehensive approach provides the most sensitive input for planning purposes. The total Oakwood Beach Watershed area also is addressed in terms of general history and archaeological sensitivity.

II. METHODOLOGY

This study entails review of various resources. Because the proposed BMP sites consist of land that was undeveloped during the nineteenth century, many standard resources normally consulted to meet LPC standards were not necessary, as described below.

- Primary and secondary sources concerning the general precontact period and history of Staten Island and specific events associated with the project site were reviewed at the New York Public Library, the Staten Island Historical Society, and using online resources.
- Historic maps and aerial photographs were reviewed at the New York Public Library, the Staten Island Historical Society, the Staten Island Museum, the Staten Island Topographical Bureau, and using various online websites. These maps and photographs provided an overview of the changing shoreline, the topography, and a chronology of land usage and ownership. While all maps and photographs that were consulted for this report are cited, due to the volume of materials, only a selection of these images is presented in this report.
- Deeds, tax assessment records, federal census records, and city directories, which are standard resources consulted as part of a documentary study, were not reviewed for this project because the proposed BMP sites were not developed during the nineteenth century.
- There are no Department of Building records for most of the proposed BMP locations because these sites do not contain buildings.
- Information about previously recorded archaeological sites and surveys in the area was compiled from data available at the NYSOPRHP, which includes data files from the New York State Museum (NYSM), and the LPC.
- DEP, Hazen and Sawyer, and AKRF provided various survey maps and site data for the property, including block and lot listings for each proposed BMP. Most of the proposed BMPs have been assigned block and lot numbers by the City of New York. There are no visible distinctions between these block and lots within the undeveloped acreage and the city's numbering system has minimal utility for this study. A table that lists the block and lots included in each proposed BMP (BMP OB-3 and BMP OB-4 are listed as BMP OB-3) is provided as Appendix A.
- DEP also provided Phase II environmental studies for the proposed sites of BMP OB-1 and BMP OB-3/4, which include soil borings. The soil borings are included as Appendices B and C. No Phase II environmental studies were available for the proposed sites of BMP OB-2 or BMP OB-5.

- AKRF provided project descriptions. Text generated by AKRF is included within various sections of this report.
- Last, site visits to the proposed sites of the BMPs were conducted by Dawn Louise Brown of HPI on December 6-7, 2010 to assess any obvious or unrecorded subsurface disturbance (Photographs 1-14; Figures 4a-c).

III. CURRENT CONDITIONS AND ENVIRONMENTAL SETTING

The following text discusses the Current Conditions and Environmental Setting for the watershed as a whole, and individually by BMP locations.

A. Current Conditions

Oakwood Beach Watershed Area

As noted in the Introduction, the Oakwood Beach Watershed is generally defined by Great Kills Park (part of the Gateway National Recreation Area) and Tanglewood Drive to the west, Cotter Avenue to the north, New Dorp Lane to the east, and Lower Bay to the south. It is approximately 1,329 acres in size and there are about 60.9 acres of DEP Bluebelt property (including both Bluebelt lands that have been acquired and the lands to be acquired). The Bluebelt properties are located primarily in the lower elevations of the watershed, south of Hylan Boulevard and north and east of DEP's Oakwood Beach Wastewater Treatment Plant (WWTP). There is also substantial DPR parkland in the watershed particularly along the waterfront and including a large wetland parcel situated between Kissam Avenue and Tysens Lane which is part of the City's Great Kills Park, covering the Lower Bay shoreline along the watershed. In addition, DPR manages the mapped (but unbuilt) segment of the Willowbrook Parkway right-of-way which extends across the watershed south to Hylan Boulevard. Because the parkway right-of-way remains on the official City map, the New York State Department of Transportation (NYSDOT) has jurisdiction over the right-of way as well. The Staten Island Railway runs east to west across the northern portion of the watershed along land under the jurisdiction of the Metropolitan Transportation Authority (MTA). A railway line crosses the parkway right-of-way in the vicinity of the intersection of North Railroad and Riedel Avenues.

Land uses within the watershed are predominantly residential and open space with commercial uses along the major thoroughfares, such as Hylan Boulevard. Reflecting this land use pattern, most of this watershed is zoned for low-density residential uses with commercial zoning districts mapped principally along the Boulevard. In the northwestern portion of the watershed, one area is also within the Staten Island Special Natural Area District (NA-1) while another is covered by the Special South Richmond Development District (SSRDD). Those two special zoning districts are zoning overlay districts, so designated to manage development and protect natural resources such as wetlands, woods and natural topographic features.

BMP OB-1

The proposed site of BMP OB-1 would be located on City property that includes Bluebelt lands (to be acquired) as well as some land currently under the jurisdiction of the DPR. The proposed BMP site is bounded approximately by Kissam Avenue to the east, Fox Lane to the west, Mill Road to the north, and the Lower Bay shoreline (which is DPR parkland, part of the City's Great Kills Park) to the south. It lies on level ground, the wetlands are low-lying and slow moving water is visible. This proposed BMP site is dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms.

The edges of the wetlands along Fox Lane are being used for parking by residents (Photograph 1). A portion along the edge of the proposed BMP site, south of Old Mill Road appeared disturbed with mounding and large amounts of debris (Photograph 2). No obvious disturbance could be viewed from the Oakwood Beach vantage point (Photograph 3). However, at the end of Kissam Road is a large raised manhole (Photograph 4).

BMP OB-2

The proposed site of BMP OB-2, measuring approximately 27.9 acres, is immediately adjacent to Oakwood Beach. BMP OB-2 would be located on DPR property that is bounded approximately by Mill Road to the north (and the

rear yards of the developed properties fronting on Mill Road), residential properties to the east (and the rear yards of the developed properties primarily fronting on Tysens Lane, Milton Avenue, and Roberts Drive), and residential properties to the west (and the rear yards of properties that front along Kissam Avenue). The southern boundary is the City parkland property line (part of Great Kills Park). It lies on level ground, the wetlands are low-lying and slow moving water is visible. This proposed BMP is dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms. An area rising several feet above the marshland extends into the northern side of the proposed BMP from Old Mill Road, and contains non-wetland vegetation.

No obvious disturbance could be viewed from the Oakwood Beach vantage point (Photograph 5).The edges of the wetlands along Kissam Ave. are relatively undisturbed, although there was evidence of a recent brush fire (Photograph 6). However, a portion of this area is used for the dumping of debris and cars. The view from Hett Avenue also appears undisturbed (Photograph 7). However, at the end of Milton Avenue there appears to be a raised berm to contain the wetlands, revealing construction that may have disturbed the edges of the wetlands (Photograph 8). Construction debris was also present at this location.

BMP OB-3

The proposed site of BMP OB-3, measuring approximately 28.3 acres, is immediately adjacent to Great Kills Park. BMP OB-3 would be located on Bluebelt property, some of which is in the process of being acquired for DEP Bluebelt purposes. The site is bounded by residential properties to the northwest (the rear yards of the developed properties fronting on Brook Avenue and Grayson Avenue), Aviston Street to the northeast, residential properties to the southeast (to the rear yards of properties that front along Lynn Street, Amherst Street, Riga Street), and the western boundary is Great Kills Park, part of Gateway National Recreation Area. The proposed BMP site is on level ground, the wetlands are low-lying and water is not visible. This proposed BMP is dominated by *phragmites*, which is a common reed associated with disturbed wetland landforms.

No obvious disturbance could be viewed from Riga Street, however, residents have utilized dry areas to park cars (Photograph 9). The edges of the wetlands along Grayson Street have some disturbance with mounding and the dumping of debris (Photograph 10).

BMP OB-4

The proposed site of BMP OB-4, measuring approximately 1.4 acres, is bounded by Hylan Boulevard to the north and extends south along the mapped, but unbuilt, Adelaide Avenue right-of-way to Falcon Avenue where the straight man-made drainage ditch makes a 90-degree turn west. To the east lie residential/commercial properties associated with Hylan Boulevard and Medina Street. The proposed site of BMP OB-3 and residential properties lie to the south. More residential properties and Ithaca Street are located to the west. This proposed BMP has no visible water and no wetlands vegetation. There is a man-made drainage ditch containing considerable debris, deciduous trees, and brush. It is in a highly developed neighborhood.

The proposed site of BMP OB-4 is heavily disturbed with mounding and debris readily visible (Photograph 11). Large chunks of asphalt are evident, too. A manhole cover indicates underground utilities or drainage control feature.

BMP OB-5

The proposed site of BMP OB-5, measuring approximately 3.2 acres, is located on property within the Willowbrook Parkway right-of-way (which is land under the jurisdiction of DPR and the New York State Department Transportation [NYSDOT]) and bounded by residential properties to the east and west, stretching from Savoy Street in the north to the existing stream in the right-of-way to the south. The parkway was never built, and although it remains a mapped right-of-way measuring 200-300 feet in width, DPR has taken over management of the corridor and developed a trail system along its length. The site of the proposed BMP is located within residential neighborhoods and is crossed overhead by the Staten Island Railroad viaduct. The proposed BMP is bordered to the north by Savoy Street, to the east by Currie Avenue and Riedel Avenue, to the south by Hylan Boulevard (a large main thoroughfare), and to the west by Taro Street and Hasbro Street.

The area near the intersection of Currie Avenue and Fairbanks Avenue appears disturbed with mounding and the dumping of debris (Photograph 12). Additionally, the site of the proposed BMP contains a man-made basin that may be a stormwater pond (Photograph 13) at the intersection of Railroad Avenue and Riedel Avenue, and eroded informal and intermittent stream channels, both upstream and downstream of this pond (Photograph 14). There is an informal swale that runs through the property near Fairbanks Avenue, and which turns into a more defined channel that extends to Hylan Boulevard on the south. The proposed BMP is wooded, dominated by deciduous trees and brush.

New and Supplemental Outfalls

The proposed new outfall would be located on the southeast side of BMP OB-1, and would empty into the Lower Bay. The outfall is proposed to be constructed under the tidal creek and berm before daylighting on the sandy beach.

The two proposed supplemental outfalls would be located adjacent to existing outfalls at Tysens Lane and Ebbitts Street. These existing outfalls are located under streetbeds and beaches, with the exception of a section of the Tysens Lane outfall between Roma Avenue and Cedar Park Avenue that is undeveloped and covered in vegetation.

B. Topography and Hydrology

The following discussion outlines the topography and hydrology for the overall Oakwood Beach Watershed, and for the individual proposed BMPs and outfalls. Of note, topographic maps on Staten Island use several different elevation datums. Borough of Richmond Datum is 3.192 feet above the U.S.C.S. Sandy Hook Datum, and is the datum used on the series of 1911 Borough of Richmond Topographical maps cited below and shown as Figures 10a-c). Modern survey maps (Figures 4a-d) use the NAVD Datum, which is 2.112 feet higher than the Borough of Richmond Datum. Thus, the difference between elevations on these two sets of maps is approximately 2 feet. When elevations are noted in the discussion, below, the appropriate datum is given in parentheses.

Oakwood Beach Watershed Area

The Oakwood Beach Watershed contains various topographic features, depending on location. The upper, or northwestern portion of the watershed is dominated by Staten Island's terminal moraine ridge, with elevations near 100 feet above sea level. The lower, or southeastern portion of the watershed is located on a low, flat coastal plain. Several small streams bring runoff towards Lower Bay; these converge into a common outlet channel, which is located near the Oakwood Beach WWTP. A portion of the watershed is at very low elevation—within five feet or less of mean high tide in some areas. This low-lying area is primarily in the vicinity of Mill Road, Fox Lane, Kissam Avenue, and other adjacent streets.

Runoff within the watershed flows south into Lower Bay via three drainage systems. One is the West Branch, which generally originates within the Willowbrook Parkway right-of-way and continues south into Great Kills Park where flows from a stream channel and storm sewer, both in the parkway right-of-way, combine. That combined flow empties into another channel that begins at Hylan Boulevard and then runs west as the West Branch of the lower watershed and eventually empties into Lower Bay near the Oakwood Beach WWTP. Another drainage system is the East Branch which begins in the park property east of Kissam Avenue. This East Branch stream, paralleling the Lower Bay shoreline, flows south and west to a tide gate that is located immediately south of the Oakwood Beach WWTP. This tide gate controls the inflow of tidal waters from Lower Bay, thereby preventing inland flooding during high tide events. Lastly, a smaller subwatershed exists in the central area of the Oakwood Beach Watershed, drained by a wide channel that starts in Hylan Boulevard and the mapped but unbuilt Adelaide Avenue. That channel, obviously man-made because of its straightness and the 90-degree turns, runs in the bed of Adelaide Avenue until it makes one of those turns and runs in the bed of Falcon Avenue. Finally, after another 90-degree turn, the straight channel runs along the boundary of Great Kills Park (part of the Gateway National Recreation Area) and links up with the West Branch just north of the WWTP. The upper portion of the Oakwood Beach Watershed borders the Willowbrook Parkway right-of-way which extends for approximately 1.25 miles, between Hylan Boulevard on the south and Richmond Road on the north. The Parkway was never built, and DPR has developed a public trail system that runs the length of this stretch. For most of this length, the right-of-way is

between 200 and 300 feet in width. It is largely vegetated, undeveloped, and crossed only by Amboy Road/Savoy Street and the elevated Staten Island Railroad.

BMP OB-1

The proposed site of BMP OB-1 is located on level, marshy terrain, generally at or just above sea level. Comparison of historic topographical maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10a]) shows that the proposed BMP has been primarily marshland at least since the nineteenth century. This marshland extends along the shoreline of Oakwood Beach. Bass Creek, which during the nineteenth century ran from Great Kills to just south of what is now Fox Lane, was the perennial drainage around which these marshlands formed. The topographical map from 1911 (Figure 10a) shows that there was a small hummock of land that rose about two feet above the level of the marshland in the south-central section of the proposed BMP. As shown in Figure 4a, today there are areas of the proposed BMP that have been clearly graded and filled, resulting in unnatural mounded topography rising from the wetlands.

BMP OB-2

The proposed site of BMP OB-2 is located on level, marshy terrain, generally at or just above sea level. Comparison of historic topographical maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10a]) shows that the proposed BMP has been primarily marshland at least since the nineteenth century. This marshland extends along the shoreline of Oakwood Beach. Bass Creek, which during the nineteenth century ran from Great Kills to just south of what is now Fox Lane, was the perennial drainage around which these marshlands formed. The topographical map from 1911 (Figure 10a) shows that there was a peninsular hummock of land that rose about two feet above the level of the marshland extending into the northern side of the proposed BMP from Old Mill Road. Modern aerial maps, as well as Figure 4b, appear to show that this hummock still exists within the proposed BMP.

BMP OB-3

The proposed site of BMP OB-3 is located on mostly level ground generally at or just above sea level. The modern U.S.G.S. map (Figure 2) shows that the entire proposed BMP falls within an area mapped as between 0-10 feet above sea level. Comparison of historic topographical maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10b]) shows that the majority of the proposed BMP has been marshland at least since the nineteenth century. This marshland surrounds a drainage known on historic maps as Mill Creek, which in its natural state ran through the proposed BMP, entering Great Kill to the south. Some portions of the proposed BMP along the eastern and western sides, however, contain areas that were at one time elevated just above the marshland. The topographical map from 1911 (Figure 10b) shows that there were hummocks of land that rose about two feet above the level of the marshland extending from what is now Brook Avenue east into the proposed BMP, and from what is now Riga Street west into the proposed BMP. Modern aerial maps and Figure 4c appear to show that some of this raised topography may still exist within the proposed BMP, although it is unclear to what degree it has been modified from its original state. Figure 4c does show that large areas of the proposed BMP contain unnatural topography that is evidence of earthmoving.

BMP OB-4

The proposed site of BMP OB-4 is located in an area that historic maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10b]) consistently show as former marshland, generally at or just above sea level. This marshland is in proximity to a drainage known on historic maps as Mill Creek, which in its natural state ran through adjacent proposed BMP OB-3, entering Great Kill to the south. During the twentieth century, proposed BMP OB-4 was graded and filled, as shown in Figure 4c.

BMP OB-5

In its natural state, the proposed site of BMP OB-5 traversed a range of topographic conditions, including mostly level terrain nearest to what is now Hylan Boulevard, to more sloped conditions moving north towards Amboy Road (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10c]).

Portions of the proposed BMP near the northern end once exhibited a trough-like topography. As noted in the preceding Current Conditions section, there are several intermittent drainages that run through or cross this proposed BMP, and which have been altered or rerouted in the past to varying degrees. These drainages course southeasterly, ultimately empting into the Mill Creek wetlands southeast of Hylan Boulevard.

During the 1960s, when the site of proposed BMP OB-5 was slated to become a leg of the Willowbrook Parkway, aerial maps show that the entire proposed BMP was cleared of vegetation and the area graded in preparation for the new highway. Comparison of modern topographical maps (e.g. Figures 2 and 4d) with earlier maps (e.g. Borough of Richmond 1911 [Figure 10c]) suggests that there has been considerable land manipulation within this proposed BMP and that the existing topography largely has been artificially created.

New and Supplemental Outfalls

The proposed new outfall is located in an area that has historically been marshland and sandy beach, generally at or just above sea level. Comparison of historic topographical maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10a]) shows that this proposed location was marshland and sandy beach since at least the nineteenth century.

The proposed supplemental outfalls at Tysens Lane and Ebbitts Street have inland areas that historically were elevated above the surrounding marshland, as shown in Figure 10d. However, comparison with historic topographical maps (e.g. U.S.C.S. 1856 [Figure 6], Bien and Vermeule 1891 [Figure 9], Borough of Richmond 1911 [Figure 10d]) shows that during the mid nineteenth century, the shoreline extended several hundred feet further into the bay, so that the ends of the existing outfalls in Lower Bay are actually in areas that were once on firm ground. Leng and Davis (1930, Vol. 1:24) note that between 1850 and 1881, the shoreline in this area moved inland about 350 feet.

C. Geology

The majority of the Oakwood Beach Watershed sits within the inner lowland subprovince of the Coastal Plain Province. As described by Boesch (after Wolfe 1977 and Isachsen et al. 1991),

> Generally this province is a broad, low-lying land form that slopes gently towards the Atlantic Ocean. The inner lowland subprovince consists of generally level to gently undulating terrain that is between 20 and 50 feet in elevation. Most of the inner Coastal Plain is underlain with gently southeastward dipping, unconsolidated marine and fluvial deposits of clay, silt, sand, and gravel of Late Cretaceous and Tertiary age. Large areas are also covered with interglacial fluvial deposits of Quaternary age. The Piedmont Lowlands and the portion of the inner Coastal Plain present on Staten Island, were greatly affected by the Wisconsin glaciation. Glacial drift covers most of these areas north of the terminal moraine of the Wisconsin glaciation. The inner Coastal Plain, in particular, is not much more than a ridge of glacial and glacial outwash sediments that almost completely overly [sic] the Cretaceous and Tertiary layers. The moraine extents [sic] northward roughly from Perth Amboy along the Atlantic shore line (routes of van Duzer Street, Richmond Road, and Amboy Road run, approximately, along the front [or southern] edge of the moraine) crossing the Narrows to Brooklyn where it becomes the Ronkonkoma moraine (Boesch 1994: 3).

The terminal moraine is located just northwest of the Oakwood Beach Watershed, and accounts for the steep topography northwest of Richmond Road.

D. Soils

Figure 5 illustrates the location of the overall Oakwood Beach Watershed, as well as the proposed BMP and outfall locations, on the soil survey map for New York City. The following text discusses soil characteristics for the watershed as a whole, and individually by proposed BMP and outfall locations.

Oakwood Beach Watershed Area

Soils mapped for the overall Oakwood Beach Watershed area can be roughly divided into three groups: land areas closest to the shoreline and Great Kills on the south, those lands within the interior section and generally southeast of the Staten Island Railroad tracks, and the land areas northwest of the railroad tracks, in the upland portion of the watershed.

The soils that are mapped closest to the shoreline and Great Kills consist primarily of natural swamps, tidal marshes, or water, as well as low lying areas, which have been filled to various degrees. Soils here include Ipswich-Pawcatuck-Matunuck mucky peats (6), Laguardia-Ebbets-Pavement & buildings, wet substratum complex (7), Bigapple-Fortress complex (99), Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes (101), and Gravesend and Oldmill coarse sands (268).

The soils that are mapped within the interior section of the watershed area consist of soils formed over glacial outwash and glacial till. Soils here include Pavement & buildings, outwash substratum (3), Wethersfield-Ludlow-Wilbraham complex (262), Branford-Pompton complex (270), Pavement & buildings-Flatbush-Branford complex (274), and Pavement & buildings-Greenbelt-Cheshire complex (324).

The soils that are mapped within the western or upland portion of the watershed consist of soils formed over glacial till plains, hills, or moraines. Soils here include Pavement & buildings-Foresthills-Wethersfield complex (260), Wethersfield-Ludlow-Wilbraham complex (262), Wethersfield-Foresthills-Pavement & buildings complex (280), and Wotalf-Todthill-Pavement & buildings complex (344).

BMP OB-1

The entire footprint of proposed BMP OB-1 is mapped as Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The different soil series that make up this mapping unit are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh

Key: Soils: Lo-Loam, Sa-Sand

In 2009 Louis Berger Associates (LBA) conducted a Phase II Environmental Site Investigation in the area now known as the proposed site of BMP OB-1, but which was then called "Section B." The site they investigated was slightly larger than the present proposed BMP footprint, and extended to the edges of Fox Lane, Kissam Avenue, and Old Mill Road, except in locations where land was privately owned and contained structures.

As part of the Phase II investigations, a total of 35 soil borings were completed in February 2009. The logs are included as Appendix B. These borings were located on a rough grid spaced over the site. Depth of the borings ranged from 2-10 feet below ground surface (ft bgs), and halted after reaching the bottom of the fill layer, or the peat layer, which was encountered first. The following summary of soil conditions is taken directly from the LBA report.

> Non-native fill, generally consisting of yellowish brown, silty sand with some medium to fine gravel was observed along the northwestern and northeastern boundaries of the Site, close to roadways and residential properties. The fill material observed existed from grade to depths ranging from approximately 1-4 ft bgs in borings advanced in these areas (i.e. at B-SB-02, B-SB-03, B-SB-04, and B-SB-08). Below the fill layer, interpreted native soils were observed to consist of clayey silts and peat layers. Mostly native material was observed throughout the remainder of the Site with some areas of surficial debris interspersed throughout. In borings advanced throughout the interior of the Site and closer to the southeastern boundary, lithology was mainly comprised of peat and clayey-silts from ground surface. The depth to water ranged from ground surface to approximately 5 ft bgs in the southwestern portion of the Site (LBA 2009:24-25).

It should be noted that areas described as containing fill in the above paragraph are outside the present proposed BMP footprint, in proximity to developed lots along the south side of Old Mill Road. Additionally, all soils were recorded as either moist or wet, suggesting the continued influence of the tidal marshes on the proposed BMP.

Comparison of the soil boring data with the U.S.D.A. mapped soils for the proposed BMP suggests that there are areas of the proposed BMP along its southwestern side, nearest to Fox Lane, that have slightly raised topography and that do not contain peat. Borings here (B-SB-21, 29, 33, and 34) contained upper strata of sand that may correspond to small hummocks shown on historic maps, and as will be described further in the Historic Period Summary section, below.

BMP OB-2

The entire footprint of proposed BMP OB-2 is mapped as Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The different soil series that make up this mapping unit are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh

Key: Soils: Lo-Loam, Sa-Sand

Although no soil borings were available for the proposed site of BMP OB-2, it is assumed that subsurface conditions throughout most of the proposed BMP are similar to those described for the proposed site of BMP OB-1, above. Historic maps also show areas with small hummocks of higher ground rising above the wetlands, which likely contain similar conditions as those described for the proposed site of BMP OB-1.

BMP OB-3

The majority of the proposed site of BMP OB-3 footprint is mapped as Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

A smaller area on the northwestern side of the proposed BMP footprint is mapped as Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The southern edge of the proposed BMP is mapped as Gravesend and Oldmill coarse sands, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping areas of household landfill materials capped by sandy fill of variable thickness (USDA 2005:16).

The different soil series that make up these mapping units are further described in the table, below.

Name	**Soil Horizon Depth**	**Color**	**Texture, Inclusions**	**Slope %**	**Drainage**	**Landform**
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains
Gravesend Series	*A* 0-2 in *Bw* 2-8 in *C1* 8-20 in *2C2* 20-80 in	10YR 3/1 2.5Y 6/4 2.5Y 5/2 2.5Y 3/2	CoSa CoSa CoSa ExtCobCoSa	0-8	Well	Anthropogenic landfills
Oldmill Series	*A* 0-2 in *Bw* 2-11 in *C1* 11-18 in *C2* 18-33 in *2C3* 33-65 in	2.5Y 3/2 2.5Y 6/3 2.5Y 6/4 2.5Y 7/6 10YR 2/1	GrlFiSa GrlFiSa GrlFiSa GrlFiSa ExtCobFiSa	0-8	Well	Anthropogenic landfills

Key: Soils: Lo-Loam, Sa-Sand
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

In 2008 LBA conducted a Phase II Environmental Site Investigation in the areas now known as the proposed site of BMP OB-3 and BMP OB-4, but which was then called "Section A." The site they investigated was slightly larger than the present proposed BMP footprints, and extended to the edges of the residential properties bordering the BMPs on the north, east, and west sides.

As part of the Phase II investigations, a total of 50 soil borings and 12 test pits were completed from January through March of 2008. The logs are included as Appendix C. The borings were located on a rough grid spaced over the site, whereas the test pits were specifically located to test areas suspected of containing fill. Depth of the borings ranged from 8-20 feet ft bgs, and depth of the test pits was approximately 5 ft bgs. The following summary of soil conditions is taken directly from the LBA report.

> Non-native fill, generally consisting of silty sand was observed at the north, east, and southeast portions of Section A closest to the residential properties. Native material [soil] was observed at the remainder of Section A with some areas of surficial debris/fill interspersed throughout. The fill material observed existed from grade to depths ranging from approximately 1 foot below ground surface (ft bgs) to 10 ft bgs with the thicker layers observed in the northern portion of Section A (i.e., at A-SB-07, A-SB-08, A-SB-11, and A-SB-16). Fill was generally characterized by a yellowish brown, coarse to fine silty sand, little gravel with various miscellaneous debris throughout; (including brick, concrete, glass, and metal). Directly below the fill layer, interpreted native soil was observed, indicated by gravelly sand and till. Native soil beneath the areas containing fill material was generally characterized by reddish brown coarse to fine sand and some gravel. In the remaining areas where no fill was encountered, native soil was generally characterized as dark brown silty sand up to a depth of approximately 3 ft bgs followed by a clay layer which extended to a depth of approximately 8 ft bgs, underlain by gravelly sand and till. The depth to water ranged from ground surface to approximately 6 ft bgs in the northeastern portion of Section A (LBA 2008:32).

Some of the areas described as containing fill within the proposed site of BMP OB-4, and others are near residential properties on Brook Avenue. Test pits, which were located in the central section of the proposed BMP, in locations where twentieth century aerial photographs showed former roads and structures, also indicated fill. Additionally, all soils were recorded as either moist or wet, suggesting the continued influence of the tidal marshes on the proposed BMP.

Comparison of the soil boring data with the U.S.D.A. mapped soils for the proposed BMP, as well as the twentieth century aerial photographs, suggest that although there were once several natural hummocks within the proposed BMP that rose slightly above the wetlands, today there only may be very small pockets where that natural landform could survive, due to the disturbance from past grading and filling for roads and several structures during the mid-twentieth century.

BMP OB-4

There are three soil types mapped for proposed BMP OB-4. The southeastern end is mapped as Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The central portion is mapped as Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The northwestern portion is mapped as Pavement & buildings-Flatbush-Branford complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas of outwash plains that have been cut and filled for residential use; a mixture of anthropogenic soils and red outwash soils, with up to 80 percent

impervious pavement and buildings covering the surface; located in southern Staten Island (USDA 2005:17).

The different soil series found within the APE are further described in the table, below.

Name	Soil Horizon Depth	Color	Texture, Inclusions	Slope %	Drainage	Landform
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains
Gravesend Series	*A* 0-2 in *Bw* 2-8 in *C1* 8-20 in *2C2* 20-80 in	10YR 3/1 2.5Y 6/4 2.5Y 5/2 2.5Y 3/2	CoSa CoSa CoSa ExtCobCoSa	0-8	Well	Anthropogenic landfills
Oldmill Series	*A* 0-2 in *Bw* 2-11 in *C1* 11-18 in *C2* 18-33 in *2C3* 33-65 in	2.5Y 3/2 2.5Y 6/3 2.5Y 6/4 2.5Y 7/6 10YR 2/1	GrlFiSa GrlFiSa GrlFiSa GrlFiSa ExtCobFiSa	0-8	Well	Anthropogenic landfills
Flatbush Series	*A* 0-13 in *Ab* 13-21 in *Bwb* 21-50 in *2C* 50-79 in	10YR 3/2 10YR 4/3 10YR 5/6 10YR 4/6	FiSaLo SiLo SiLo Sa	0-8	Well	Anthropogenic urban fill plains
Branford Series	*Ap* 0-8 in *Bw1* 8-16 in *Bw2* 16-29 in *BC* 29-32 in *C* 32-72 in	10YR 4/2 10YR 4/4 7.5YR 4/6 7.5YR 4/4 5YR 4/6	Lo Lo GrlLo GrlSaLo SaGrl	0-8	Well	Outwash plains and terraces

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

The proposed site of BMP OB-4 was included in the 2008 LBA Phase II Environmental Site Investigation described for proposed BMP OB-3, above. There were four soil borings located within the proposed BMP OB-4 footprint. These were borings A-SB-06, A-SB-07, A-SB-08, and A-SB-17. The soil boring logs (Appendix C) show a mixture of thick fill and natural soils in this area.

BMP OB-5

There are two soil types mapped for proposed BMP OB-5. The majority of the proposed BMP is mapped as Wethersfield-Ludlow-Wilbraham complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping areas of till plains, relatively undisturbed and mostly wooded; a mixture of well drained, moderately well drained, and poorly drained soils developed in red till; located in Staten Island(USDA 2005:16).

The periphery of the proposed BMP is mapped as Pavement & buildings-Foresthills-Wethersfield complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping areas of urbanized till plains that have been cut and filled for residential use; a mixture of anthropogenic and red till soils, with up to 80 percent impervious pavement and buildings covering the surface; located in Staten Island (USDA 2005:16).

The different soil series found within the APE are further described in the table, below.

Name	**Soil Horizon Depth**	**Color**	**Texture, Inclusions**	**Slope %**	**Drainage**	**Landform**
Foresthills Series	*A* 0-2 in *Bw* 2-15 in *Ab* 15-17 in *BAb* 17-28 in *Bwb* 28-42 in *Cd* 42-60 in	10YR 3/2 7.5YR 4.4 10YR 2/1 7.5YR 4/3 5YR 4/4 5YR 4/6	Lo SiLo Lo Lo Lo Lo	0-8	Well	Anthropogenic fill areas on urbanized till plains
Wethersfield Series	*A* 0-3 in *Bw1* 3-13 in *Bw2* 13-27 in *Cd* 27-65 in	7.5YR 3/2 5YR 4/4 5YR 3/3 2.5YR 4/4	Lo Lo GrlLo GrlLo	0-8	Well	Till plains and hills
Ludlow Series	*Ap* 0-8 in *Bw1* 8-20 in *Bw2* 20-26 in *Cd* 26-65 in	7.5YR 3/2 5YR 4/4 5YR 3/4 2.5YR 3/4	SiLo SiLo SiLo GrlLo	0-8	Moderately well	None given
Wilbraham Series	*A* 0-4 in *Bw1* 4-8 in *Bw2* 8-20 in *Cd* 20-65 in	10YR 3/1 5YR 3/3 5YR 4/4 5YR 3/3	SiLo SiLo SiLo GrlLo	0-8	Poorly	Till plains and hills

Key: Soils: Lo-Loam, Sa-Sand, Si-Silt
Other Grl-Gravelly, V-Very, Co-Coarse, Ext-Extremely, Cob-Cobbly, Fi-Fine

No soil borings were available for proposed BMP OB-5.

New and Supplemental Outfalls

The alignment of the proposed new outfall is mapped as Beaches, described as:

> Nearly level to gently sloping areas of sand or sand and gravel adjacent to the Atlantic Ocean, inundated by saltwater twice each day at high tide. Frequently reworked by wave and wind action, these areas do not support vegetation (U.S.D.A. 2005:11).

The inland portion of the proposed Tysens Lane supplemental outfall is mapped as Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas filled with a mixture of natural soil materials and construction debris over swamp, tidal marsh, or water; a mixture of anthropogenic soils which vary in coarse fragment content, with up to 80 percent impervious pavement and buildings covering the surface (USDA 2005:12).

The portion of the proposed Tysens Lane supplemental outfall closer to Lower Bay is mapped as Ipswich-Pawcatuck-Matunuck mucky peats, described as:

> Low lying areas of tidal marsh that are inundated by salt water twice each day at high tide, with a mixture of very poorly drained soils which vary in the thickness of organic materials over sand (USDA 2005:11).

The terminus of the proposed Tysens Lane supplemental outfall is mapped as Beaches, described above.

The inland portion of the proposed Ebbitts Street supplemental outfall is mapped as Pavement & buildings-Flatbush-Branford complex, 0 to 8 percent slopes, described as:

> Nearly level to gently sloping urbanized areas of outwash plains that have been cut and filled for residential use; a mixture of anthropogenic soils and red outwash soils, with up to 80 percent impervious pavement and buildings covering the surface; located in southern Staten Island (USDA 2005:17).

The portion of the proposed Ebbitts Street supplemental outfall closer to Lower Bay is mapped as Pavement & buildings, wet substratum-Laguardia-Ebbets complex, 0 to 8 percent slopes, described above.

The terminus of the proposed Ebbitts Street supplemental outfall is mapped as Beaches, described above.

The different soil series for the proposed outfalls are further described in the table, below.

Name	**Soil Horizon Depth**	**Color**	**Texture, Inclusions**	**Slope %**	**Drainage**	**Landform**
Ipswich Series	*Oe1* 0-20 in *Oe2* 20-40 in *Oa* 40-72 in	10YR 4/3 2.5Y 3/2 5Y 4/1	Mucky peat Mucky peat Mucky peat	0	Very poorly	Tidal marsh
Pawcatuck Series	*Oe1* 0-8 in *Oe2* 8-24 in *2C* 24-72 in	5Y 3/1 2.5Y 4/1 N 4/	Mucky peat Mucky peat LoSa	0	Very poorly	Tidal marsh
Matunuck Series	*Oe* 0-8 in *C1* 8-72 in	10YR 2/1 2.5Y 4/1	Mucky peat Sa	0	Very poorly	Tidal marsh
Laguardia Series	*Ap* 0-8 in *Bw* 8-26 in *C* 26-79 in	10YR 4/3 10YR 4/3 10YR 4/3	GrlSaLo VGrlCoSaLo VGrlCoSaLo	0-8	Well	Anthropogenic urban fill plains
Ebbets Series	*A* 0-4 in *Bw* 4-8 in *C* 8-60 in	10YR 3/2 10YR 4/4 10YR 4/4	Lo GrlSaLo GrlSaLo	0-8	Well	Anthropogenic urban fill plains
Flatbush Series	*A* 0-13 in *Ab* 13-21 in *Bwb* 21-50 in *2C* 50-79 in	10YR 3/2 10YR 4/3 10YR 5/6 10YR 4/6	FiSaLo SiLo SiLo Sa	0-8	Well	Anthropogenic urban fill plains
Branford Series	*Ap* 0-8 in *Bw1* 8-16 in *Bw2* 16-29 in *BC* 29-32 in *C* 32-72 in	10YR 4/2 10YR 4/4 7.5YR 4/6 7.5YR 4/4 5YR 4/6	Lo Lo GrlLo GrlSaLo SaGrl	0-8	Well	Outwash plains and terraces

Key: Soils: Lo-Loam, Sa-Sand
Other Grl-Gravelly, Fi-Fine, Str-Stratified

IV. BACKGROUND RESEARCH/HISTORICAL OVERVIEW

A. Precontact Summary

For this report, the word precontact is used to describe the period prior to the use of formal written records. In the western hemisphere, the precontact period also refers to the time before European exploration and settlement of the New World. Archaeologists and historians gain their knowledge and understanding of precontact Native Americans on Staten Island from three sources: ethnographic reports, Native American artifact collections, and archaeological investigations.

The Paleo Indian Period (c. 10,500 B.C. - c. 8000 B.C.) represents the earliest known human occupation of Staten Island. Approximately 14,000 years ago the Wisconsin Glacier retreated from the area leading to the emergence of a cold dry tundra environment. Sea levels were considerably lower than modern levels during this period (they did not reach current levels until circa 5,000 B.C., in the Early to Middle Archaic Period). As such, Staten Island was situated much further inland from the Atlantic Ocean shore than today, and was characterized by higher ground amid glacial lakes and rivers (Boesch 1994). The material remains of the Paleo Indians include lithic tools such as Clovis-type fluted projectile points, bifacial knives, drills, gravers burins, scrapers, flake cores, and flake tools, although sites generally are represented by limited small surface finds. The highly mobile nomadic bands of this period specialized in hunting large game animals such as mammoth, moose-elk, bison, and caribou and gathering plant foods. It has been theorized that the end of the Paleo-Indian Period arose from the failure of over-specialized, big-game hunting (Snow 1980:150-157). Based on excavated Paleo-Indian sites in the Northeast, there was a preference for high, well-drained areas in the vicinity of streams or wetlands (Boesch 1994). Sites have also been found near lithic sources, rock shelters and lower river terraces (Ritchie 1980). Paleo-Indian materials have been recovered at several sites on Staten Island including Port Mobil, the Cutting site, Smoking Point and along the beach in the Kreischerville area. One isolated fluted point was reportedly found in the Great Kills Park area.

During the Archaic Period (c. 8000 B.C. - 1000 B.C.) a major shift occurred in the subsistence and settlement patterns of Native Americans. Archaic period peoples still relied on hunting and gathering for subsistence, but the emphasis shifted from hunting large animal species, which were becoming unavailable, to smaller game and collecting plants in a deciduous forest. The settlement pattern of the Archaic people consisted of small bands that occupied larger and relatively more permanent habitations sites along the coast of Staten Island, its estuaries and streams and inland areas (Boesch 1994). Typically such sites are located on high ground overlooking water courses. This large period has been divided up into four smaller periods, the Early, Middle, Late and Terminal Archaic.

The environment during the Early Archaic (c. 8000 B.C. - 6000 B.C.) displayed a trend toward a milder climate and the gradual emergence of a deciduous-coniferous forest with a smaller carrying capacity for the large game animals of the previous period (Ritchie and Funk 1971). The large Pleistocene fauna of the previous period were gradually replaced by modern species such as elk, moose, bear, beaver, and deer. New species of plant material suitable for human consumption also became abundant. The increasing diversification of utilized food sources is further demonstrated by a more complex tool kit. The tool kit of the Early Archaic people included bifurcated or basally notched projectile points generally made of high quality stone. Tool kits were more generalized than during the Paleo-Indian period, showing a wider array of plant processing equipment such as grinding stones, mortars and pestles. Although overall evidence of Early Archaic sites on Staten Island is sparse, there are some significant Early Archaic component sites from this period, including the Old Place, Hollowell, Charleston Beach, Wards Point, Travis, and Richmond Hill sites (Ritchie and Funk 1971; Boesch 1994).

The archaeological record suggests that a population increase took place during the Middle Archaic Period (c. 6000 - c. 4000 B.C.). This period is characterized by a moister and warmer climate and the emergence of an oak-hickory forest. The settlement pattern during this period displays specialized sites and increasing cultural complexity. The exploitation of the diverse range of animal and plant resources continued with an increasing importance of aquatic resources such as mollusks and fish (Snow 1980). In addition to projectile points, the tool kits of Middle Archaic peoples included grinding stones, mortars, and pestles. Such artifacts have been found throughout Staten Island, including the Old Place and Wards Point sites (Boesch 1994).

Late Archaic people (c. 4000 - c. 1000 B.C.) were specialized hunter-gatherers who exploited a variety of upland and lowland settings in a well-defined and scheduled seasonal round. The period reflects an increasingly expanded

economic base, in which groups exploited the richness of the now established oak-dominant forests of the region. It is characterized by a series of adaptations to the newly emerged, full Holocene environments. As the period progressed, the dwindling melt waters from disappearing glaciers and the reduced flow of streams and rivers promoted the formation of swamps and mudflats, congenial environments for migratory waterfowl, edible plants and shellfish. The new mixed hardwood forests of oak, hickory, chestnut, beech and elm attracted white-tailed deer, wild turkey, moose and beaver. The large herbivores of the Pleistocene were rapidly becoming extinct and the Archaic Indians depended increasingly on smaller game and the plants of the deciduous forest. The projectile point types attributed to this period include the Lamoka, Brewerton, Normanskill, Lackawaxen, Bare Island, and Poplar Island. The tool kit of these peoples also included milling equipment, stone axes, and adzes. A large number of Late Archaic Period sites have been found on Staten Island. These include the Pottery Farm, Bowman's Brook, Smoking Point, Goodrich, Sandy Brook, Wort Farm, Old Place, and Arlington Avenue sites (Boesch 1994).

During the Terminal Archaic Period (c. 1700 B.C. - c. 1000 B.C.), native peoples developed new and radically different broad bladed projectile points, including Susquehanna, Perkiomen and Orient Fishtail types. The use of steatite or stone bowls is a hallmark of the Terminal Archaic Period. Sites on Staten Island from the Terminal Archaic Period include the Old Place, Pottery Farm, Wards Point, and Travis sites (Boesch 1994).

The Woodland Period (c. 1000 B.C. - 1600 A.D.) is generally divided into Early, Middle and Late Woodland on the basis of cultural materials and settlement-subsistence patterns. Settlement pattern information suggests that the broad based strategies of earlier periods continued with a possibly more extensive use of coastal resources. The Early Woodland was essentially a continuation of the tool design traditions of the Late Archaic. However, several important changes took place. Clay pottery vessels gradually replaced the soapstone bowls during the Early Woodland Period (c. 1000 B.C. to A.D 1). The earliest ceramic type found on Staten Island is called Vinette 1, an interior-exterior cordmarked, sand tempered vessel. The Meadowood-type projectile point is a chronological indicator of the Early Woodland Period.

Cord marked vessels became common during the Middle Woodland Period (c. A.D. 1 to c. 1000 A.D.). Jacks Reef and Fox Creek-type projectile points are diagnostic of the Middle Woodland. Another characteristic projectile point of the early to Middle Woodland Period is the Rossville type, named for the site at Rossville where it predominated. It is believed to have originated in the Chesapeake Bay area and is found in New Jersey, southeastern New York and southern New England (Lenik 1989:29). The Early and Middle Woodland periods display significant evidence for a change in settlement patterns toward a more sedentary lifestyle. The discovery of large storage pits and larger sites in general has fueled this theory. Some horticulture may have been utilized at this point but not to the extent that it was in the Late Woodland period.

In the Late Woodland period (c. 1000 A.D. - 1600 A.D.), triangular projectile points such as the Levanna and Madison types, were common throughout the Northeast, including Staten Island (Lenik 1989:27). Made both of local and non-local stones, brought from as far afield as the northern Hudson and Delaware River Valleys, these artifacts bear witness to the broad sphere of interaction between groups of native peoples in the Northeast. Additionally, during this period collared ceramic vessels, many with decorations, made their appearance.

Woodland Period Native Americans in Staten Island and surrounding regions shared common attributes. The period saw the advent of horticulture and with it, the appearance of large, permanent or semi-permanent villages. Plant and processing tools became increasingly common, suggesting an extensive harvesting of wild plant foods. Maize cultivation may have begun as early as 800 years ago. The bow and arrow, replacing the spear and javelin, pottery vessels instead of soap stone ones, and pipe smoking, were all introduced at this time. A semi-sedentary culture, the Woodland Indians moved seasonally between villages within palisaded enclosures and campsites, hunting deer, turkey, raccoon, muskrat, ducks and other game and fishing with dug-out boats, bone hooks, harpoons and nets with pebble sinkers. Their shellfish refuse heaps, called "middens," sometimes reached immense proportions of as much as three acres (Ritchie 1980:80, 267). Habitation sites of the Woodland Period Indians increased in size and permanence. A large number of Woodland Period archaeological sites have been found on Staten Island in a variety of environmental settings. A favored setting for occupation during this period was well-drained ground near stream drainages and coastal waterways. One such site, dating to the Middle Woodland period and including net and fabric impressed pottery, was discovered within DEP Bluebelt property overlooking Lemon Creek and was excavated in 2009 and 2010 (HPI 2009a, 2009b, 2010a, 2010b).

During the early Contact period (1500 to 1700 A.D.) there was a continuation of the Late Woodland settlement patterns of the coastal Algonquians. By the 17th century the Dutch settlers of lower New York were in frequent contact with the many Native Americans who lived in the vicinity. Historic accounts describe both peaceful and violent interchanges between these two groups (Brasser 1978, Flick 1933). Through at least the 1650s, Native Americans known as the Raritans occupied portions of Staten Island and New Jersey's Raritan Valley (Ruttenber 1872). The Raritans were but one of many native groups which as a whole were known as the Delaware Indians by the European settlers. As the European population increased, and internecine warfare due to increased competition for trade with the Europeans intensified, the Raritans, and the Delaware in general, retreated inland away from the eastern coast. By the 1800s their migration had scattered them across the Mid West and even into Canada (Weslager 1972), where they have continued living to the present day. Journal accounts by European explorers, settlers and travelers describe Native settlements and lifeways. However, only a few Historic Contact Period sites have been found on Staten Island. Sites include those at Wards Point, Old Place, Corsons Brook, Travis, New Springfield, and at the PS56R Site in Woodrow (Boesch 1994; HPI 1996).

B. Previously Recorded Archaeological Sites and Surveys

Records on file at the OPRHP and the New York State Museum (NYSM) as well as the Boesch (1994) *Archaeological and Sensitivity Assessment of Staten Island, New York* indicate that there have been a number of both precontact period archaeological sites and historic period archaeological sites documented within the Oakwood Beach Watershed. They are listed in the table, below. Of note, NYSM site locations and descriptions often are vague, due to the fact that many of these sites were documented based on non-professional records (such as information from local landowners, avocational collectors, or historic accounts); descriptions and distances of these sites from the project site are given based on available mapping and other data, but should not be considered definitive. Some sites have had different numbers and names applied to them over time; all known appellations are listed in the first column.

Site # and Name	Location	Time Period	Site Type
Boesch F STD-Court The Courthouse	Amboy Road and Richmond Road area	Unknown Precontact	Unknown
Boesch J STD-OW Old Wagon Road	Richmond Road area	Unknown Precontact	Unknown
NYSM 8481	Approx. intersection of Guyon Ave. and Lynn St.	Unknown Precontact	Camp
NYSM 4628 Boesch 60	Approx. area between New Dorp Lane, Old Mill Road, Tysens Lane and shoreline	Unknown Precontact	Traces of occupation
08501.000154 SI-15	New Dorp Beach shore area	20th-century	Concrete and brick foundation
08501.000153 SI-14	New Dorp Beach shore area	Mid-20th century	Concrete platform
08501.000129 SI-13	New Dorp Beach shore area	Mid-20th century	Concrete and brick structure
08501.000155 SI-16	New Dorp Beach shore area	Mid-20th century	Concrete foundation
08501.000156 SI-17	Oakwood Beach, near foot of Kissam Ave.	Mid-20th century	Concrete well
08501.000168 SI-4 Lake's Tide Mill and Homestead	Great Kills Park, Oakwood Beach Sewage Treatment Plant area	Ca. 1709-1723	Grist mill location, no evidence remaining

There also have been a number of precontact and historic period archaeological sites recorded within one mile of the watershed boundaries, listed in the following table.

Site # and Name	Location	Time Period	Site Type
Boesch 22 Richmond Hill 30-RIC-5-AJA	Richmond Road area	Early Archaic	Lithic scatters and camps
Boesch 98 STD-VM Vanderbilt Mausoleum	Moravian Cemetery	Unknown precontact	Unknown
Boesch L Old Mill Road STD-OM	Old Mill Road near Forest Hill Road	Unknown precontact	Unknown
NYSM 4617 08501.000166 ACP Rich-27 Boesch 83, 86	Large area between Amboy Road and Hylan Blvd and part of Great Kills Park	Unknown precontact	Shell middens, possible camp, no evidence remaining
NYSM 8321	Large area south of Arthur Kill Road near United Hebrew Cemetery	Unknown precontact	Traces of occupation
NYSM 8480	Large area within Moravian Cemetery and Richmond County Country Club	Unknown precontact	Traces of occupation
08501.000158 Vanderbilt Estate SI-1	Miller Field	Pre-1850	Farmhouse complex, no traces evident
08501.000169	Miller Field	Unknown precontact	Isolated cultural remains
08501.000126 SI-8	Miller Field	Ca. 1919-1920	Stone lined irrigation ditch
08501.000127 SI-9 Remains of Administration Building	Miller Field	Ca. 1921	Concrete building remains
08501.000157 SI-19	Miller Field	Mid-20th century	Concrete foundation
08501.000160 SI-3 Britton Cottage	Miller Field	Ca. 1687	Cottage location, no evidence remaining
08501.000161 Niewe Dorp	Miller Field	Ca. 1665	Early Dutch settlement, no evidence remaining
08501.000165 STD-GK Boesch 88	Great Kills Harbor	Late precontact-early historic	Camp location, no evidence remaining
08501.000164 STD-0	Great Kills Park	Unknown precontact	Shell midden and camp
08501.000163 Isolated Fluted Point	Great Kills Park	Paleo-Indian	Isolated fluted point

None of the proposed BMP site footprints overlap any of the previously documented archaeological sites in the above tables. However, several of the archaeological sites are located in close proximity to some of the proposed BMP and outfall locations.

- Site 08501.000156 was mapped near the foot of Kissam Avenue, very close to the proposed sites of BMP OB-1 and BMP OB-2.
- Site NYSM 8481 was mapped as only a few blocks from the proposed sites of BMP OB-1, 2, 3, and 4, although its precise location is vague.
- Site NYSM 4629, another imprecisely located site, was mapped as within several blocks of the proposed site of BMP OB-2.
- Site 08501.000164 was mapped as within one or two blocks from the proposed site of BMP OB-5, although with a somewhat imprecise location.
- Several twentieth-century archaeological sites have been recorded on the New Dorp Beach shore area, just north of the Ebbitts Street outfall. These sites represent remains of the former Seaside Hospital located in this area.

What the previously documented archaeological sites do indicate, however, is that in their natural states, at least some of the proposed BMP and outfall locations had similar landforms to areas where precontact archaeological sites were likely to be situated, based on proximity to drainages and wetlands, which would have provided sustenance for Native American occupants.

In addition to the previously documented archaeological sites, there have been a number of archaeological surveys conducted within the overall watershed boundaries and within a one mile radius of the watershed, submitted to both the NYSOPRHP and the LPC. Several studies addressed beachfront resources along the south shore of Staten Island and Oakwood Beach (Lipson et al. 1978, JMA 1978, U.S.A.C.O.E. 1994, Panamerican Consultants 2005). These studies were located in close proximity to the proposed sites of BMP OB-1, 2, 3, and 4, and overlapped portions of the proposed new and existing outfall locations. The Panamerica 2005 study also included field testing along the Lower Bay shoreline, and that APE crossed the proposed new and existing outfall locations. No archaeological sites were recorded in proximity to the outfall locations, however,

Additionally, HPI recently completed a Phase IA Archaeological Documentary Study for the Cedar Grove Rehabilitation Project (HPI 2011), which included portions of the Tysens Lane existing outfall footprint and bordered the location of the Ebbitts Street existing outfall. HPI concluded that in its natural state, any areas of the Cedar Grove APE on firm ground and that have not sustained disturbance due to either natural or man-made events would have a high precontact sensitivity and would require archaeological testing if these areas would be impacted by subsurface development. The portion of the Tysens Lane proposed supplemental outfall, located between Roma Avenue and Cedar Grove Avenue, contains similar conditions as those described for the Cedar Grove property.

Finally, one archaeological study was completed for a new post office in New Dorp, near Miller Field (Meadows 1983). Additional archaeological resources studies have been conducted within a one mile radius of the Oakwood Beach Watershed, including several that extended along adjacent shoreline areas, and others located at Miller Field (NPS 1982, Mueller and Linck 1991, Hunter Research 2005). The Oakwood Beach WWTP, located just south of the watershed boundaries in Great Kills Park, has also been subjected to a series of archaeological studies (Pickman and Yamin 1984, Greenhouse Consultants 1990a, 1990b), as have various utility alignments connecting to this plant both within the watershed and within a one mile radius. No archaeological sites, other than those noted in the above table, have been recorded as a result of these surveys within the Oakwood Beach Watershed.

C. Historic Period Summary

Oakwood Beach Watershed Area

The Oakwood Beach Watershed includes the neighborhood of New Dorp, which was established near the foot of modern New Dorp Lane in 1671, and was the earliest historic period settlement within the watershed (Leng and Davis 1930). Early roads within the watershed included New Dorp Lane, Amboy Road, Richmond Road, and what is now Old Mill Road, which led from New Dorp Lane to Lake's Mill at the edge of Great Kills. Revolutionary War era maps, such as the 1780-1783 Anglo-Hessian Map, the 1781 Taylor and Skinner map, and McMillen's *A Map of*

Staten Island During the Revolution, 1775-1783 (1933) shows that at this time there was only sparse settlement within the overall watershed area, with structures located along or branching off from the four major roads.

Mid nineteenth-century maps show that development in the watershed progressed slowly through 1860. The 1844 U.S.C.S. map shows that most of the watershed was still farmland or woodland, with only minimal development along major roads. The 1856 U.S.C.S. map (Figure 6) and the 1860 Walling map (Figure 7) confirm the lack of interior development within the watershed, with settlement concentrated along the major arteries. These maps also show the route of the Staten Island Railroad, which officially began service in 1860 from Clifton to Tottenville (Leng and Delavan 1924). The Walling map identifies the hamlet of Egbertville at the crossroads of Amboy Road and Richmond Road. The 1872 Dripps map (Figure 8) and the 1874 Beers map show that while creation of the railroad through the watershed had some impact on development, for the most part land continued to be divided into large parcels owned by a relatively small pool of residents, and that there continued to be few new roads or settlement clusters constructed within the area. The 1891 Bien and Vermeule map (Figure 9) shows conditions in the watershed just prior to consolidation with New York City, and indicates that while some additional roads had been built, much of the area was still sparsely developed.

Development within the Oakwood Beach Watershed increased after 1898, when Staten Island became part of New York City. The 1907 Robinson map and the1917 Bromley map show that new cluster developments were planned as a city grid was projected over the area. However, many of these city streets remained paper roads well into the twentieth century. Aerial photographs show that it was not until the second half of the twentieth century that much of the Oakwood Beach Watershed area was fully developed.

BMP OB-1 and Proposed New Outfall

A review of historic maps indicates that the proposed site of BMP OB-1 and the proposed site of the new outfall have been primarily undeveloped marshland over time. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) all show the area south of Old Mill Road as undeveloped and marshy. Bass Creek is shown running along the shoreline of what is now Oakwood Beach, and emptying into Great Kills at Crook's Point. Marshlands are shown surrounding this creek, and the proposed sites of BMP OB-1 and the new outfall fall within this area.

By the mid-nineteenth century, maps had become more precise. The 1856 U.S.C.S. map (Figure 6) in particular shows that the site of the proposed BMP OB-1and the proposed new outfall were primarily marshland, but that there were also small areas of higher ground within the marshland, and that a roadway crossed through the southwestern side of the proposed BMP, running from Old Mill Road to the waterfront, where there were two structures. This unnamed roadway ran parallel to modern day Fox Lane. The 1860 Walling map (Figure 7) clarifies that the roadway terminated at the "Fish House," which was located right on the beach, approximately 1200 feet southeast of the proposed BMP. This roadway is shown on both the 1872 Dripps map (Figure 8) and the 1874 Beers map. The 1874 Beers map also confirms that there were small areas of higher ground, or hummocks, along this roadway, which were partially within the footprint of the proposed BMP. Presumably the roadway was built to take advantage of these raised hummocks, which anchored the alignment between marshy areas. In 1874, the Beers map indicates that all of proposed BMP OB-1 was owned by H. McRoberts. The proposed outfall location was shown to straddle the marshland and the sandy beach.

Topographical maps made in the 1890s (Bien and Vermeule 1891 [Figure 9]) further show that proposed BMP OB-1, like most of the marshy areas in the region, was crossed by a series of drainage ditches that channeled water into the natural creeks of the area. These maps also showed the general locations of raised hummocks within and adjacent to the marshes, and the roadway leading through the southwestern side of the proposed BMP. Atlases made during the first decades of the twentieth century (e.g. Robinson 1907, Bromley 1917) note that the marshlands were divided into long, narrow lots, which ran from Old Mill Road to the waterfront, and which were owned by various individuals.

The 1911 Borough of Richmond Topographical Survey map (Figure 10a), which remains one of the most detailed series of maps made of Staten Island to date, gives remarkable clarity concerning the topographical features within the proposed site of BMP OB-1. The roadway from earlier maps is shown clearly along the southwestern side of the proposed BMP, as are the outlines of the raised hummocks within and adjacent to the proposed BMP, and the

drainage ditches within the marshy areas, many of which appear to mark property boundaries as well. A small finger of the original line of Bass Creek is shown wending through the southeastern side of the proposed BMP.

During the second quarter of the twentieth century, the first concerted development in the vicinity of proposed BMP OB-1 began to occur. The 1924 New York City Bureau of Engineering aerial photograph shows that by this time, both Kissam Avenue and Fox Lane had been laid out, and sporadic structures had been built along them. The aerial photograph also shows that the informal roadway along the southwestern side of the proposed BMP was still in place, and that a second roadway had been laid out just south of Kissam Avenue, running through the opposite side of the proposed BMP from Old Mill Road to the waterfront. The 1937 Sanborn map sheets indicate it was called Prominard or Promenade Avenue, but had not officially opened. The line of this street is still mapped through the proposed BMP, although aerial photographs (1954, 1966, and 1980) from the second half of the twentieth century (available on www.historicaerials.com) show that over time this roadway, along with the earlier roadway along the southwestern side of the proposed BMP, was abandoned and wetlands were allowed to reclaim much of the area.

BMP OB-2

The proposed site of BMP OB-2 is very similar in location and in landform to proposed BMP OB-1, and as such has much of the same history. During the late eighteenth century maps show that it, too, was undeveloped marshland (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933). The 1856 U.S.C.S. map (Figure 6) illustrates that there was a finger-shaped hummock of land jutting into proposed BMP OB-2 from the northwest, but otherwise the land was completely marshy. The 1860 Walling map (Figure 7), 1872 Dripps map (Figure 8), and 1874 Beers map all show similar conditions, and the 1874 Beers map indicates that this BMP also was part of the parcel owned by H. McRoberts. The 1874 Beers map and the subsequent 1891 Bien and Vermeule map (Figure 9) confirm the same finger-shaped hummock of land extending into the proposed BMP from the northwest.

Twentieth century maps and aerial photographs continue to depict the proposed site of BMP OB-2 as marshland with small areas of raised hummocks. The 1911 Borough of Richmond topographical map (Figure 10a) indicates a similar pattern of drainage ditches coursing through the proposed BMP as in proposed BMP OB-1. The 1907 Robinson map and the 1917 Bromley map both note that ownership, again, was vested primarily in long, narrow strips of land running from Old Mill Road to the waterfront. By 1917, Kissam Avenue had been laid out and a few structures had been built along its route. The 1924 aerial photograph shows that a roadway had been constructed parallel to Kissam Avenue and partially within the southwestern part of the proposed BMP; the 1937 and 1951 Sanborn maps note it as a 40-foot wide unnamed road. Aerial photographs (1954, 1966, and 1980) from the second half of the twentieth century (available on www.historicaerials.com) show that over time this roadway was abandoned and wetlands were allowed to reclaim much of the area.

BMP OB-3

The proposed site of BMP OB-3, like proposed BMP OB-1 and OB-2, shares a history of wetland use. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) show the proposed BMP as undeveloped and situated surrounding a branch of Mill Creek, which emptied into Great Kills to the south. The 1856 U.S.C.S. map (Figure 6) clarifies that although most of the proposed BMP was wetlands, there were several small hummocks of raised land within the proposed BMP, which overlooked the wetlands. These hummocks were located at the terminus of what is now Brook Avenue, as well as at the ends of what are now Lynn Street, Amherst Avenue, and Riga Street. The 1860 Walling map (Figure 7) and the 1872 Dripps map (Figure 8) illustrate the alignment of Mill Creek through the proposed BMP, and show that it continued to be undeveloped. The 1874 Beers map shows that much of the proposed BMP was owned by Mrs. Guyon, a member of the Guyon family for whom Guyon Avenue is named. The Guyon-Clark House, which was one of the earliest structures in the area and stood until 1925 on Guyon Avenue, was located approximately 800 feet from the proposed BMP to the north. The 1874 Beers map and the subsequent 1891 Bien and Vermeule map (Figure 9) confirm the areas of the proposed BMP containing hummocks of land as shown on earlier maps.

Maps and aerial photographs from the first quarter of the twentieth century continue to depict proposed BMP OB-3 as marshland with small areas of raised hummocks. The 1911 Borough of Richmond topographical map (Figure 10b) shows a two-pronged alignment of Mill Creek as well as several large drainage ditches emptying into the creek. Areas surrounding the creek are again shown as hummocks. However, both the 1907 Robinson and the 1917

Bromley maps indicate that at this time, the area between Brook Avenue and Old Mill Road, and including most of proposed BMP OB-3, was proposed as a development called "Oakwood." The 1917 map notes ownership of the area as the Richmond Borough Realty Co. The maps show a grid of paper streets with building lots on them, but no actual structures. Clearly, this development scheme never came to fruition. The 1924 aerial photograph confirms that proposed BMP OB-3 remained devoid of structures at this time.

During the mid-twentieth century, a large drainage ditch was constructed from Hylan Boulevard down the line of Adelaide Avenue (proposed BMP OB-4, described below) to the line of Falcon Avenue, where it made a 90 degree turn and ran straight along the line of Falcon Avenue to the southwestern edge of the BMP, then turned 90 degrees again to rejoin the former channel of Mill Creek. Rerouting a portion of the original water within the proposed BMP and vicinity allowed some of the roadways proposed as part of the city grid in this area to be at least partially built within the proposed BMP during the mid-twentieth century. Aerial photographs from 1954, 1966, and 1980 (available on www.historicaerials.com) show the very distinct new pattern of artificial drainage within the proposed BMP, and the progression of road building along the lines of Amherst Avenue, Lynn Street, Dugdale Street, and portions of several other local roads through the proposed BMP. A structure was located at the intersection of Lynn Street and Merkel Place on the 1954 aerial photograph, which corresponds to one of the small hummocks shown on the earlier maps. The structure may have been short lived, however, as subsequent photographs do not show a structure here. Although some of the roadways proposed for the city grid do appear to have been at least partially constructed, it appears that areas between the roads, which would correspond to individual blocks and lots, generally were not filled in to raise the area up to a standard grade. Aerial photographs from the early twenty-first century (2004, 2006, and 2010) show that over time the roadways were abandoned and wetlands were allowed to reclaim much of the area.

BMP OB-4

The proposed site of BMP OB-4 also falls within an area that historically was marshland. Eighteenth-century maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) show the proposed BMP as undeveloped and situated within marshland surrounding a branch of Mill Creek, which emptied into Great Kills to the south. Nineteenth-century maps including the 1856 U.S.C.S. map (Figure 6), the 1860 Walling map (Figure 7) the 1872 Dripps map (Figure 8), and the 1874 Beers map all show this proposed BMP as undeveloped and/or within marshland. Like proposed BMP OB-3 to the south, this proposed BMP fell within land owned in 1874 by Mrs. Guyon, a member of the Guyon family for whom Guyon Avenue is named. The Guyon-Clark House, which was one of the earliest structures in the area and stood until 1925 on Guyon Avenue, was located approximately 400 feet from the proposed BMP to the northeast. The 1891 Bien and Vermeule map (Figure 9) confirms that the proposed BMP was completely within marshland, and had no raised hummocks within it.

Maps and aerial photographs from the first quarter of the twentieth century continue to depict proposed BMP OB-3 as marshland. The 1911 Borough of Richmond topographical map (Figure 10b) shows that the alignment of Adelaide Avenue had been laid out by this time, although it is unclear if a roadway had actually been built or whether this was a drainage ditch. The 1924 aerial photograph shows the line of the street as a drainage ditch, rather than a street, suggesting the 1911 map was depicting this condition. As noted above for proposed BMP OB-3, both the 1907 Robinson and the 1917 Bromley maps show proposed BMP OB-4 as within the development called "Oakwood," which was never fully realized.

As described above, during the mid-twentieth century, a large drainage ditch was constructed from Hylan Boulevard down the line of Adelaide Avenue to the line of Falcon Avenue, where it made a 90 degree turn and ran straight along the line of Falcon Avenue into proposed BMP OB-3. Aerial photographs from 1954, 1966, and 1980 (available on www.historicaerials.com) show the very distinct artificial drainage running down the length of Adelaide Avenue to Falcon Avenue within the proposed BMP. After 1980, it appears that the drainage ditch was taken out of use and the proposed BMP became wooded. Although the drainage ditch is still visible within the proposed BMP today, at the time of the site visit there was no water running through it.

BMP OB-5

The proposed site of BMP OB-5 is a long, narrow strip of land that was condemned by the City of New York for use as a parkway during the 1950s, but the parkway was never built. Before being graded and filled for use as a

roadway, this proposed BMP appears to have been used as farmland or woodland along much of its length. It is shown as undeveloped on the Revolutionary War era maps (Anglo-Hessian 1780-1783, Taylor and Skinner 1783, McMillen 1933) as well as on the mid nineteenth century maps (U.S.C.S. 1856 [Figure 6] and Walling 1860 [Figure 7]). The only development in the vicinity was the line of the Staten Island Railroad, which opened in 1860, and which passed overhead, Amboy Road at the northwestern terminus of the proposed BMP, and a private road running southeast from Amboy Road and through the proposed BMP. The 1872 Dripps map (Figure 8) shows that the private road ran through property attributed to Seguine, and that there was a structure in or adjacent to the proposed BMP near this drive. The 1874 Beers map clarifies that there were several structures here attributed to Mrs. Guyon, who as noted above was a member of the Guyon family for whom Guyon Avenue is named. The structures appear to be off the proposed BMP footprint. The remainder of the proposed BMP was undeveloped. The 1891 Bien and Vermeule map (Figure 9) shows that the proposed BMP was completely within an upland landform.

The 1911 Borough of Richmond topographical map (Figure 10c) shows that the proposed BMP contained a variety of landforms, including more level areas closer to Hylan Boulevard and steeper sections moving northwest. Several drainages are shown traversing the proposed BMP, as described in the Topography and Hydrology section of this report. Finally, the complex of residential structures shown on earlier nineteenth-century maps clearly is shown to be well outside the proposed BMP footprint, confirming that there was no visible nineteenth-century development within this proposed BMP. The 1907 Robinson map and the 1917 Bromley map attribute ownership of the entire proposed BMP and its vicinity, on both sides of Hylan Boulevard and west of the Staten Island Railroad tracks as far west as Amboy Road, to single individuals. Wm. R. Jones is noted as the owner on the 1907 Robinson map and David J. Tysen is shown to be the owner on the 1917 Bromley map. The 1924 aerial photograph again shows no development within the proposed BMP.

Aerial photographs from the mid-twentieth century (available on www.historicaerials.com) show a relatively slow pace of development within the proposed BMP OB-5 vicinity. The 1954 aerial photograph indicates little to no development within the proposed BMP footprint. As noted in the Topography and Hydrology section of this report, in the 1960s proposed BMP OB-5 was slated to become a leg of the Willowbrook Parkway; the 1966 aerial photograph shows that the entire proposed BMP was cleared of vegetation and the area graded in preparation for the new highway. It is assumed that there was considerable land manipulation within this proposed BMP and that the existing topography largely was artificially created. Today this area, now wooded, contains a walking trail.

Supplemental Outfalls

The Tysens Lane and Ebbitts Street proposed supplemental outfall locations are within areas that historically have been largely undeveloped. A review of the historic maps and aerial photographs described above shows that both of these existing roadways date to the middle twentieth century. Tysens Lane terminates at Roma Avenue, with the remaining corridor as a sewer easement only. The portion of the Tysens Lane outfall between Roma Avenue and Cedar Grove Avenue has never been developed, and the portion from Cedar Grove Avenue to the shoreline is part of the Cedar Grove Beach complex, which was first developed in the 1910s (HPI 2011).

V. CONCLUSIONS

A. Precontact Archaeological Sensitivity and Disturbance Record

From what is known of precontact period settlement patterns on Staten Island, most habitation and processing sites are found in sheltered, elevated sites close to wetland features, major waterways, and with nearby sources of fresh water. The following discussion addresses the general precontact archaeological sensitivity for the Oakwood Beach Watershed and site-specific sensitivity for each of the proposed BMP and outfall locations.

Oakwood Beach Watershed Area

The Oakwood Beach Watershed area has had several precontact archaeological sites recorded within its boundaries, generally concentrated in areas closest to natural water features. However, much of the watershed has never been systematically surveyed for precontact archaeological resources and so survival of as of yet undiscovered sites is unknown. Boesch (1994), in his study of precontact archaeological sensitivity for Staten Island, has assigned a high archaeological sensitivity to areas of the watershed nearest Lower Bay and within natural wetlands. He has assigned

a moderate sensitivity to the area between the natural wetlands near the shoreline inland to Hylan Boulevard, and in some areas west of Amboy Road. Boesch has assigned no, or low precontact archaeological sensitivity in most areas of the watershed between Hylan Boulevard and Amboy Road.

Boesch's study of precontact archaeological sensitivity does not take into account the level of ground disturbance in any given location, which may have destroyed or compromised the integrity of any extant precontact archaeological resources. Disturbance across the Oakwood Beach Watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions. At this time, there are no additional BMPs defined for the Oakwood Beach Watershed; any further consideration of new sites as part of this project would need to be addressed separately.

BMP OB-1 and Proposed New Outfall

The proposed sites of BMP OB-1 and the new outfall are in an area that both the NYSOPRHP GIS and the Boesch (1994) study indicate has a high sensitivity for precontact archaeological resources. This is undoubtedly because the proposed BMP and outfall are located in proximity to natural water sources, and in fact contains a portion of the Bass Creek drainage as well as surrounding marshland.

Those portions of the proposed BMP footprint that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. Although there are areas of the proposed BMP along its southeastern side that historic maps show had slightly raised topography, soil borings and twentieth century aerial photographs suggest that most of these areas have been disturbed from past grading and filling. HPI concludes that any precontact archaeological sensitivity once exhibited by this proposed BMP has diminished due to later disturbance. The remaining drainage and wetlands themselves, including the proposed outfall location, are less likely to contain archaeological resources.

BMP OB-2

The proposed site of BMP OB-2 also is in an area that both the NYSOPRHP GIS and the Boesch (1994) study indicate has a high sensitivity for precontact archaeological resources. Like proposed BMP OB-1, this is undoubtedly because the proposed BMP is located in proximity to natural water sources and contains marshland.

Those portions of the proposed BMP footprint that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. There is a peninsular hummock of land extending into the northern side of the proposed BMP from Old Mill Road. Although there have not been any soil borings conducted within proposed BMP OB-2, it is assumed that this area could contain natural soils with minimal disturbance. HPI concludes that this naturally elevated portion of the proposed BMP has precontact archaeological sensitivity, as shown in Figure 11. The wetlands themselves are less likely to contain archaeological resources.

BMP OB-3

The proposed site of BMP OB-3 is in an area that the NYSOPRHP GIS says is sensitive and the Boesch (1994) study says has a moderate sensitivity for precontact archaeological resources. This is undoubtedly because the proposed BMP is located in proximity to natural water sources, and in fact contains a portion of the original Mill Creek drainage as well as surrounding marshland.

Those portions of the proposed BMP footprint that contain raised hummocks of land immediately adjacent to the drainage and wetlands, if not disturbed, have the greatest likelihood of containing precontact archaeological resources. Although there are areas of the proposed BMP along its eastern and western sides that historic maps show had slightly raised topography, soil borings and twentieth century aerial photographs suggest that most of these areas have been disturbed from past grading and filling for construction of former roads and structures in these areas. HPI concludes that any precontact archaeological sensitivity once exhibited by this proposed BMP has diminished due to later disturbance. The remaining drainage and wetlands themselves are less likely to contain archaeological resources.

BMP OB-4

The proposed site of BMP OB-4 also is in an area that the NYSOPRHP GIS says is sensitive and the Boesch (1994) study says has a moderate sensitivity for precontact archaeological resources. This is undoubtedly because the proposed BMP is located in proximity to natural water sources and in its natural state contained marshland. However, this proposed BMP has been significantly altered from its original condition, the marshlands having been filled and an artificial drainage ditch constructed along its length. HPI concludes that this proposed BMP does not contain any precontact archaeological sensitivity.

BMP OB-5

The proposed site of BMP OB-5 is in an area that both the NYSOPRHP GIS and the Boesch (1994) study indicate has a high sensitivity for precontact archaeological resources. This is undoubtedly because there are several natural drainages crossing the proposed BMP. However, significant disturbance to the proposed BMP in the 1960s, when the land was slated to become the Willowbrook Parkway and the area was stripped of all vegetation and graded in preparation for the highway, has eliminated any precontact archaeological sensitivity in this area. HPI concludes that this proposed BMP does not contain any precontact archaeological sensitivity.

Supplemental Outfalls

The Tysens Lane and Ebbitts Street proposed supplemental outfall locations are in an area that both the NYSOPRHP GIS and the Boesch (1994) study indicate has a high sensitivity for precontact archaeological resources. However, most of the existing outfall locations have been disturbed from roadway and utility construction and no longer retain this sensitivity. The one area that appears to have never been developed is the portion of the Tysens Lane outfall between Roma Avenue and Cedar Grove Avenue. The proposed supplemental outfall will be placed within an expanded sewer easement here. The existing easement is 15 feet wide and the proposed new easement will be 40 feet wide. Although the proposed supplemental outfall will be located in proximity to the existing outfall, which when constructed would have caused disturbance within the pipe trench surrounding it, the increased width of the proposed new easement suggests that there may be undisturbed areas here that may retain a natural landform. Therefore, HPI concludes that the Tysens Lane supplemental outfall footprint within the undeveloped land between Roma Avenue and Cedar Grove Avenue contains precontact archaeological sensitivity.

B. Historic Period Archaeological Sensitivity and Disturbance Record

Oakwood Beach Watershed Area

The Oakwood Beach Watershed area has had few historic period archaeological resources recorded within its boundaries that date before the twentieth century. However, much of the watershed has never been systematically surveyed for historic period archaeological resources and so survival of as of yet undiscovered sites is unknown. Historic period archaeological sites are most likely to be found in proximity to early roadways, such as New Dorp Lane and Amboy Road, and in areas where historic maps show development. It is less likely that historic period archaeological resources would be found in areas that were not settled during the historic era. The possibility that any such sites have survived is dependent on the level of disturbance to the potential resources. Disturbance across the Oakwood Beach Watershed obviously varies according to the level of development and earthmoving that has occurred at any given spot, and would need to be assessed on an individual basis according to site-specific conditions.

BMP OB-1 and Proposed New Outfall

The proposed sites of BMP OB-1 and the new outfall have never had any historic period development within or adjacent to their boundaries, although a nineteenth-century roadway was located along the southwestern side of the proposed BMP. This roadway led from Old Mill Road to the Oakwood Beach waterfront and may still survive in places, although it could not be seen due to vegetation at the time of the field survey. This roadway, if it is extant, likely would not provide any substantive data and therefore HPI concludes that the site of the proposed BMP and new outfall contain minimal historic period archaeological sensitivity.

BMP OB-2

The proposed site of BMP OB-2 has never had any historic period development within or adjacent to its boundaries. HPI concludes that this proposed BMP contains no historic period archaeological sensitivity.

BMP OB-3

The proposed site of BMP OB-3 has never had any historic period development within or adjacent to its boundaries. HPI concludes that this proposed BMP contains no historic period archaeological sensitivity.

BMP OB-4

The proposed site of BMP OB-4 has never had any historic period development within or adjacent to its boundaries. HPI concludes that this proposed BMP contains no historic period archaeological sensitivity.

BMP OB-5

The proposed site of BMP OB-5 appears to have never had any historic period development within its boundaries. Additionally, there was significant disturbance to the area in the 1960s, when the land was slated to become the Willowbrook Parkway and the area was stripped of all vegetation and graded in preparation for the highway. HPI concludes that this proposed BMP contains no historic period archaeological sensitivity.

Supplemental Outfalls

The proposed supplemental outfall locations along Tysens Lane and Ebbitts Street have never had any historic period development. Both roadways date to the middle twentieth century. Development near the terminus of the Tysens Lane outfall within the Cedar Grove Beach Club complex dates to the 1910s. The recent Phase IA Archaeological Documentary Study of the Cedar Grove Beach project site concluded that there was no historic period archaeological sensitivity for the area in proximity to the outfall (HPI 2011).

VI. RECOMMENDATIONS

Based on these conclusions, HPI recommends that a program of Phase IB archaeological testing be conducted on that portion of the proposed BMP OB-2 site designated as having a high archaeological sensitivity for precontact resources, as shown in Figure 11, if this area will experience subsurface impacts as part of the BMP construction. HPI also recommends that a program of Phase IB archaeological testing be conducted in the proposed location of the supplemental outfall at Tysens Lane, within the undeveloped land between Roma Avenue and Cedar Grove Avenue. All archaeological testing should be conducted according to applicable archaeological standards (New York Archaeological Council 1994, NYSOPRHP 2005; LPC 2002; CEQR 2010). Professional archaeologists, with an understanding of and experience in urban archaeological excavation techniques, would be required to be part of the archaeological team. No further archaeological investigations are recommended for the remainder of the proposed site of BMP OB-2, and for all of the proposed sites of BMP OB-1, BMP OB-3, BMP OB-4, and BMP OB-5, Last, no further archaeological investigations are recommended for the remaining sections of the proposed new and supplemental outfalls.

VII. REFERENCES

Anglo-Hessian Map
1780-83 *Plan (No. 31) du Camp Anglo-Hessois dans Staten Island, Baie de New York de 1780 à 1783*. On file at the Staten Island Historical Society.

Beers, F.W.
1874 *Atlas of Staten Island, Richmond County, New York, from official records and surveys; compiled and drawn by F. W. Beers*. J.B. Beers and Co., New York. On file at the New York Public Library.

Bien, Joseph Rudolph and C.C. Vermeule
1891 *Atlas of the Metropolitan District and adjacent country comprising the counties of New York, Kings, Richmond, Westchester and part of Queens in the state of New York, the county of Hudson and parts of the counties of Bergen, Passaic, Essex and Union in the state of New Jersey* ... From original surveys by J.R. Bien and C.C. Vermeule, the U.S. Coast and Geodetic Survey and the Geological Survey of New Jersey. Published by Julius Bien & Co., New York.

Boesch, Eugene J.
1994 *Archaeological Evaluation and Sensitivity Assessment of Staten Island, New York*. Prepared for the New York City Landmarks Preservation Commission.

Borough of Richmond
1911 *Borough of Richmond, Topographical Survey*. New York. On file at the New York Public Library. Individual sheets were published from 1906-1913. 1911 used here for consistency.

Brasser, T. J.
1978 "Early Indian-European Contacts," in *Handbook of North American Indians: Northeast,* vol. 15, B. G. Trigger (ed.), Smithsonian Institution, Washington, D.C..

Bromley, G.W.
1917 *Atlas of the City of New York, Borough of Richmond, Staten Island. From actual surveys and original plans, by George W. and Walter S. Bromley*. G.W. Bromley and Co., Philadelphia.

City Environmental Quality Review (CEQR)
2010 *City Environmental Quality Review Technical Manual*. City of New York, Mayor's Office of Environmental Coordination. May, 2010.

Dripps, M.
1872 *Map of Staten Island, Richmond County, New York*. M. Dripps, New York.

Flick, Alexander C.
1933 *History of New York*, Vol. I. The New York State Historical Association.

Greenhouse Consultants, Inc.

1990a *Archaeological Sensitivity Evaluation For Eight Water Pollution Control Plant Expansions in New York City*. For: Stone and Webster Engineering Corporation.

1990b *Stage 1B Archaeological Survey Of The Oakwood Beach Water Pollution Control Plant Expansion Project, Borough of Staten Island, New York City, Richmond County, New York*. For: Stone and Webster Engineering Corporation.

Historical Perspectives, Inc. (HPI)
1996 *Final Report: Phase 3 Archaeological Data Recovery of the P.S. 56 R School Site, Staten Island, New York*. Westport, CT.
2009a Memorandum: Phase IA Cultural Resources Sensitivity Evaluation Addendum New York City Department of Environmental Protection, South Richmond Drainage Storm Water and Sanitary Drainage Plan, Lemon Creek Drainage Area, Staten Island, New York, Knox Street, BMP LC-16, BMP LC-17, BMP LC-18, and BMP LC-19.

2009b Phase IB Archaeological Investigations, New York City Department of Environmental Protection, South Richmond Drainage Storm Water and Sanitary Drainage Plan Lemon Creek Drainage Area, Staten Island, New York, BMP LC-16 and BMP LC-17.

2010a Phase II Archaeological Investigations, New York City Department of Environmental Protection, South Richmond Drainage Storm Water and Sanitary Drainage Plan Lemon Creek Drainage Area, Staten Island, New York, BMP LC-16.

2010b Lemon Creek Drainage Area, Staten Island, Richmond County, New York, BMP LC-16, Phase III Archaeological Data Recovery.

2011 Phase IA Archaeological Documentary Study, Cedar Grove Beach Rehabilitation, Block 4105, Part of Lot 50 and Block 4108, Part of Lot 45, Staten Island, Richmond County, New York.

Hunter Research, Inc.
2005 *Archaeological Investigations for Proposed Roadway Improvements at Miller Field, Gateway National Recreation Area, Richmond County, Staten Island, New York*.

John Milner Associates (JMA)
1978 *A Cultural Resources Inventory of the Gateway National Recreation Area, New York and New Jersey*.

Landmarks Preservation Commission (LPC)
2002 *Landmarks Preservation Commission Guidelines for Archaeological Work in New York City*.

Leng, Charles W. and William T. Davis
1930 *Staten Island and Its People, A History, 1609-1929.* Lewis Historical Publishing Company, Inc., New York.

Leng, Charles W. and Edward C. Delavan, Jr.
1924 *A Condensed History of Staten Island (Borough of Richmond, New York City).* The Staten Island Edison Corporation, Staten Island, New York.

Lenik, Edward J.
1989 "Cultural Contact and Trade in Prehistoric Staten Island." *Proceedings Staten Island Institute of Arts and Sciences*, Vol. 34, no. 1.

Lipson, Clara, and John Piet, Michael Alterman, and Kris Egelhof
1978 *Phase I Cultural Resources Reconnaissance: Beach Erosion Control and Hurricane Protection Project at Staten Island*.

Louis Berger & Associates, P.C.
2008 *Final Phase II Site Investigation for Oakwood Beach Section A, Staten Island, New York*. Prepared for the New York City Department of Design and Construction Bureau of Environmental and Geotechnical Services.

2009 *Final Phase II Site Investigation for Oakwood Beach Section B, Staten Island, New York*. Prepared for the NYC Department of Design and Construction Bureau of Environmental and Geotechnical Services.

McMillen, Loring
1933 *A Map of Staten Island During the Revolution 1775-1783*. Compiled from The Taylor & Skinner Map 1781, Plan No. 31 du Camp Anglo-Hessois dans Staten Island de 1780 a 1782 and The Hessian Map 1777.

Meadows, Robert E.
1983 *Proposed New Dorp Postal Station Site, Staten Island, New York: Report on the Preliminary Archaeological Investigation*.

Mueller, James W. and Dana C. Linck
1991 *Archaeological Testing For Two Miller Field Road Improvements, Gateway National Recreation Area, Staten Island, NY, Gate Package 185*. For: US Dept of Interior National Park Service, Denver Center.

National Park Service (NPS)
1982 *Archeological Investigations at Miller Field, Staten Island Unit, Gateway National Recreation Area*.

New York Archaeological Council (NYAC)
1994 *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections.* New York Archaeological Council.

New York City Bureau of Engineering
1924 *Sectional aerial maps of the City of New York*. On file at the New York Public Library.

New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP)
2005 *Phase I Archaeological Report Format Requirements.*

Panamerican Consultants, Inc.
2005 *Phase I Combined Erosion Control and Storm Damage Protection Feasibility Study, South Shore of Staten Island, Richmond County, New York*. Prepared for U.S. Army Corps of Engineers, New York District.

Pickman, Arnold & Rebecca Yamin
1984 *Oakwood Beach Water Pollution Control Project, Phase I Cultural Resources Survey*. Hylan Boulevard at Richmond Ave. to Arthur Kill Rd. at Krelscher St. Capital Project WP-136. NYC, Staten Island.

Ritchie, William A.
1980 *The Archaeology of New York State*. Revised edition. Harbor Hill Books, Harrison, New York.

Ritchie, William A. and Robert E. Funk
1971 Evidence For Early Archaic Occupation On Staten Island. *Pennsylvania Archaeologist* 31(3):45-60.

Robinson, E.
1907 *Atlas of the Borough of Richmond, City of New York*. E. Robinson, New York.

Ruttenber, E. M.
1872 *Indian Tribes of Hudson's River to 1700*. Reprinted in 1992 by Hope Farm Press & Bookshop.

Sanborn Map Company
1937 *Insurance Maps of Staten Island, New York.*

1951 *Insurance Maps of Staten Island, New York.*

Snow, Dean R.
1980 *The Archaeology of New England*. Academic Press, New York.

Taylor, George and A. Skinner
1781 *A Map of New York & Staten Island and Part of Long Island*.

United States Army Corps of Engineers (U.S.A.C.O.E.)
1994 *A Cultural Resource Reconnaissance Study Oakwood Beach, Staten Island, Richmond County, New York*.

United States Coast Survey (U.S.C.S.)
1844 *Map of New-York Bay And Harbor And The Environs*. Washington, D.C.

1856 *Staten Island From New Brighton to Great Kills*. Washington, D.C.

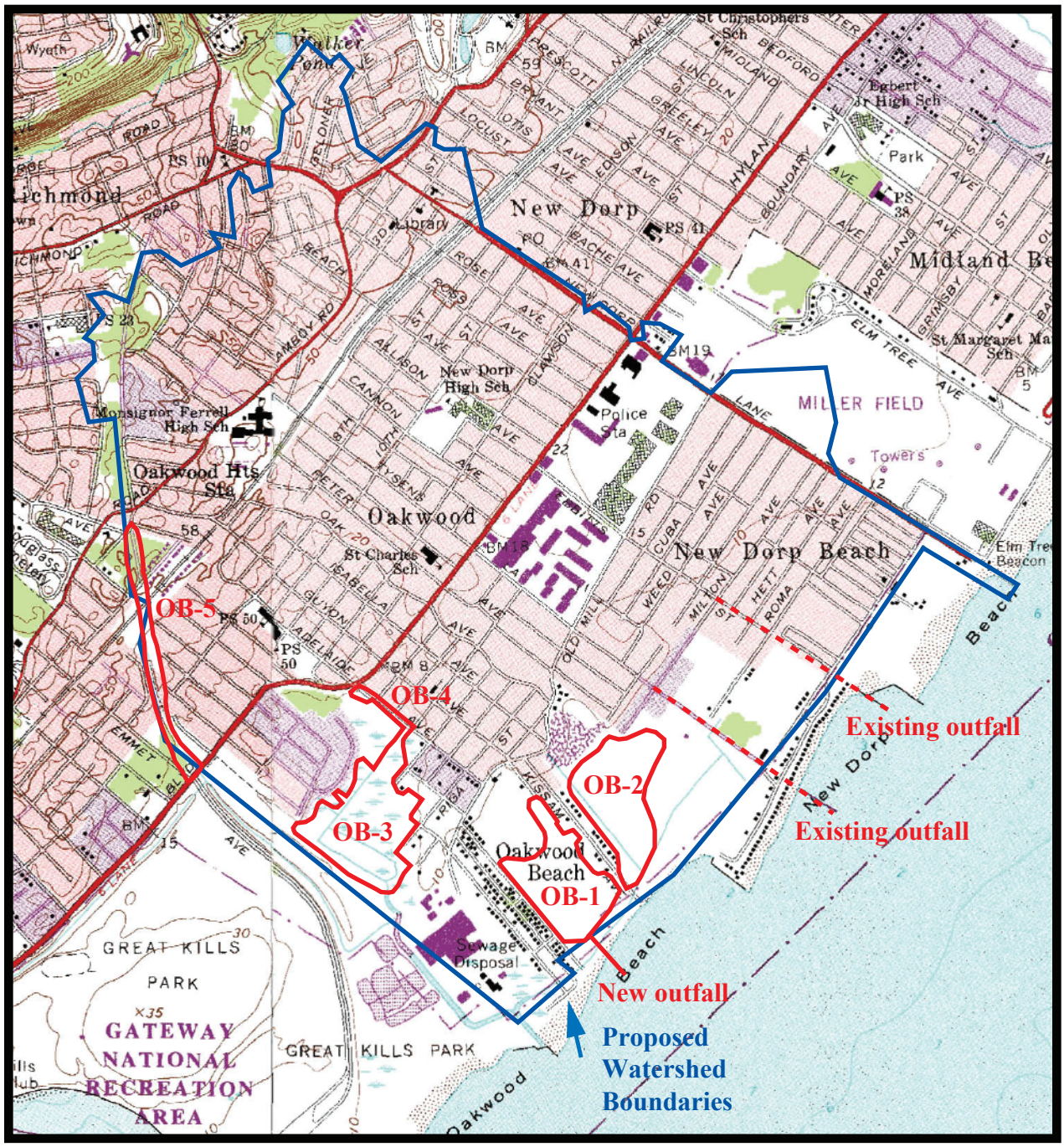
United States Department of Agriculture (U.S.D.A.)
2005 *New York City Reconnaissance Soil Survey*. United States Department of Agriculture, Natural Resources Conservation Service, Staten Island, NY. Map updated 2006.

United States Geological Survey (U.S.G.S.)
1981 *Arthur Kill, N.J.-N.Y.* 7.5 Minute Topographic Quadrangle.

Walling, H.F.
1860 *Map of the City Of New-York and Its Environs from Actual Surveys*. S.D. Tilden, New York.

Weslager, C. A.
1972 *The Delaware Indians A History*. Rutgers University Press, New Brunswick.

Figure 1: Oakwood Beach Watershed and BMP Locations.



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

Figure 2: Oakwood Beach Watershed and BMP Locations on *Arthur Kill, N.Y.-N.J.* and *The Narrows, N.Y.-N.J.* 7.5 Minute Topographic Quadrangles (U.S.G.S. 1981).

0 1000 2000 3000 4000 5000 FEET

Figure 3a: BMP OB-1 and BMP OB-2 on Block/Lot maps (DEP 2010).

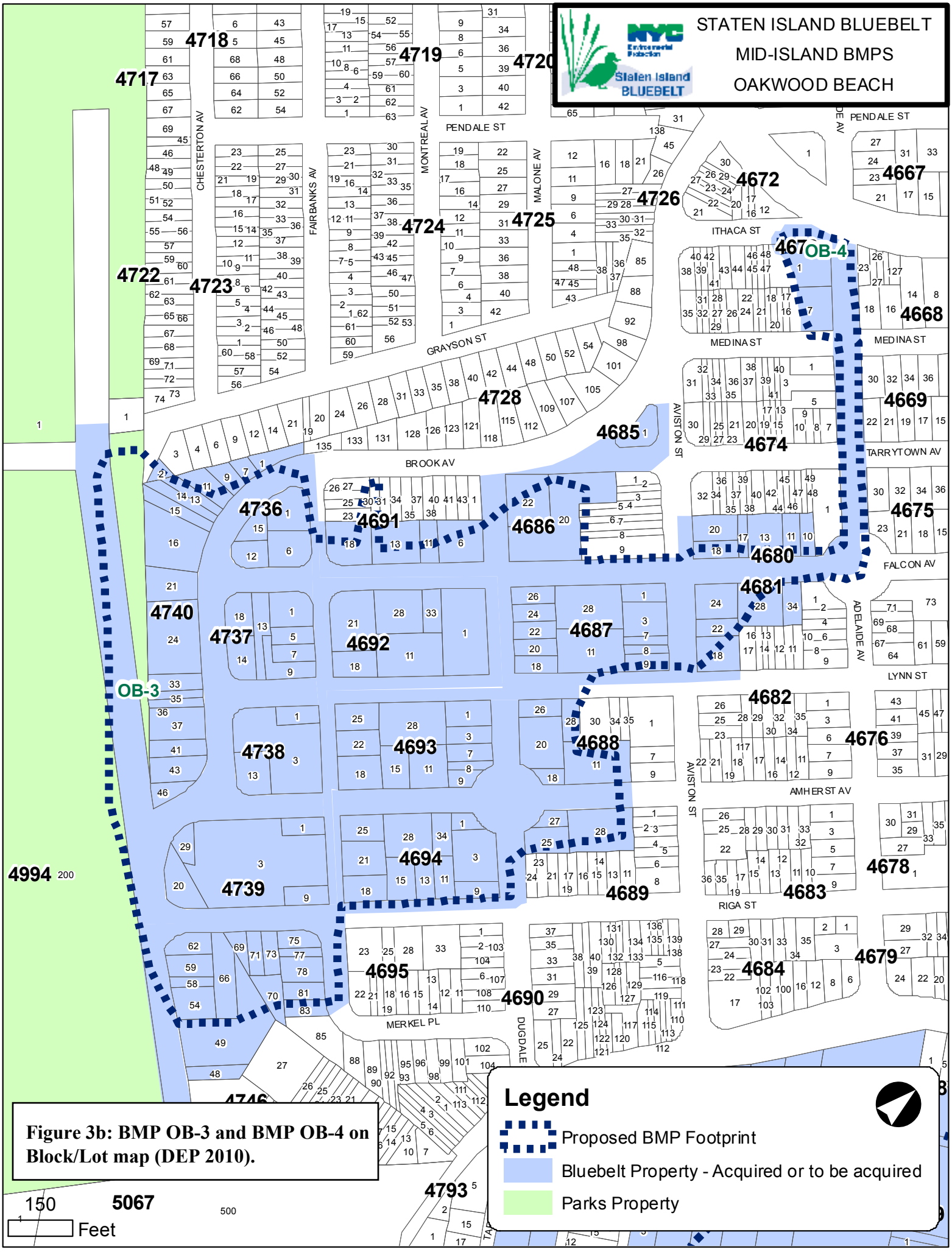


Figure 3b: BMP OB-3 and BMP OB-4 on Block/Lot map (DEP 2010).


STATEN ISLAND BLUEBELT
MID-ISLAND BMPS
OAKWOOD BEACH
Staten Island BLUEBELT
NYC Environmental Protection
MONTREAL AV
AMBOY RD
SHERIDAN CT
HOPKINS AV
BUFFALO ST
EMMET AV
CHESTERTON AV
FAIRBANKS AV
N RAILROAD AV
S RAILROAD AV
TWOMBLY AV
O'GORMAN AV
DURANT AV
HYLAN BL
PENDALE
CURRIE AV
TATRO ST
MALONE AV
PLATT ST
CHAMPLAIN AV
ADELAIDE AV
LEEDS ST
TARRING ST
FLINT ST
HAFSTROM ST
SAVOY ST
CEDARVIEW AV
WINDEMERE AV
RIEDEL AV
GUYON AV
OB-5
4475
4535
4394
4699
4265
4964
4960
4967
4697
4698
4700
4656
4655
4696
4965
4961
4962
4969
4966
4963
4710
4657
4973
4976
4970
4658
4659
4974
4977
4971
4708
4706
4705
4975
4978
4972
4709
4707
4660
4979
4982
4985
4661
4983
4711
4715
4986
4662
4987
4712
4713
4714
4716
4663
4718
4720
4717
4722
4667
5067
Figure 3c: BMP OB-5 on Block/Lot map (DEP 2010).
200
Feet
Legend
Proposed BMP Footprint
Bluebelt Property - Acquired or to be acquired
Parks Property

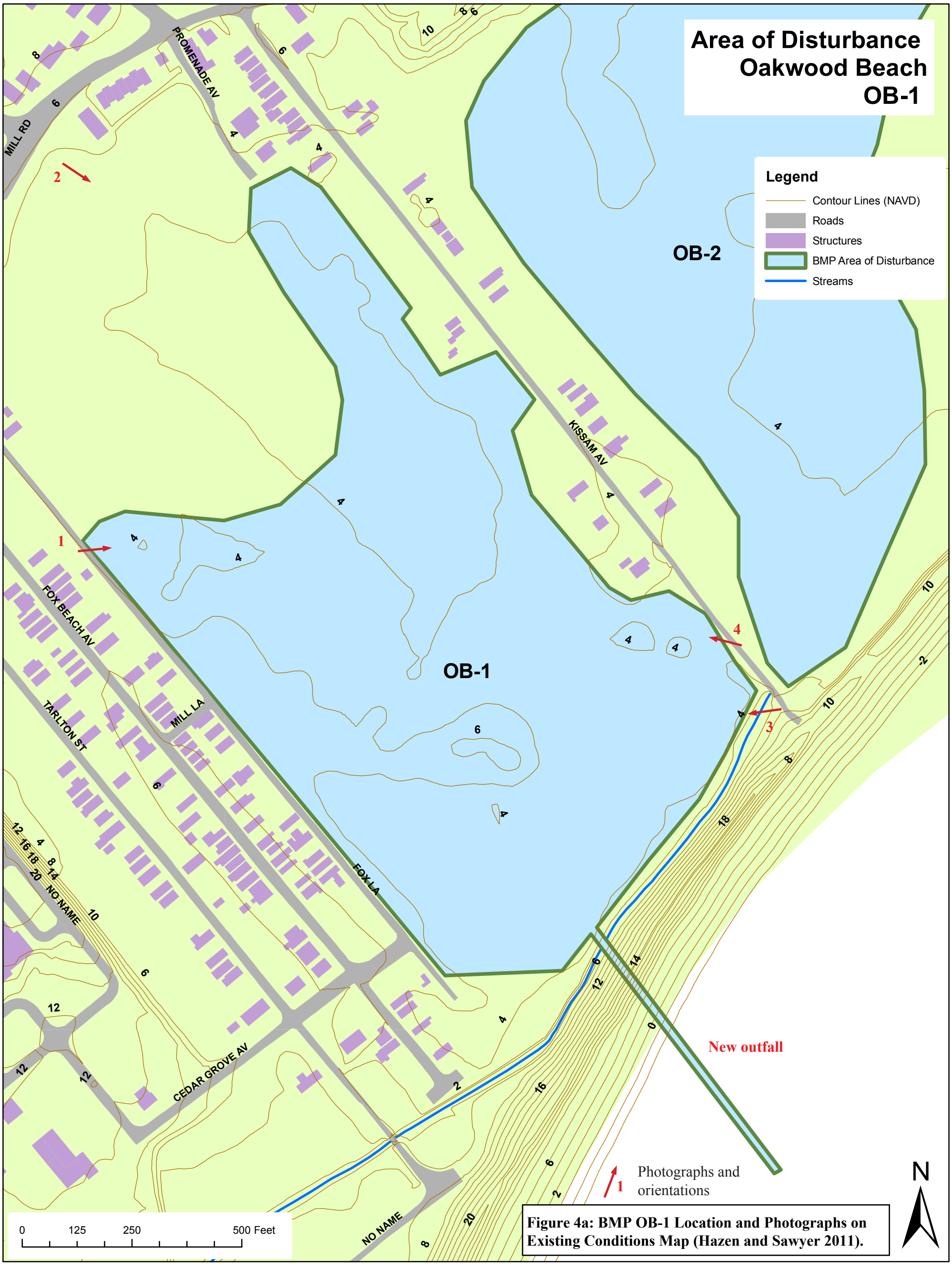


Figure 4a: BMP OB-1 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

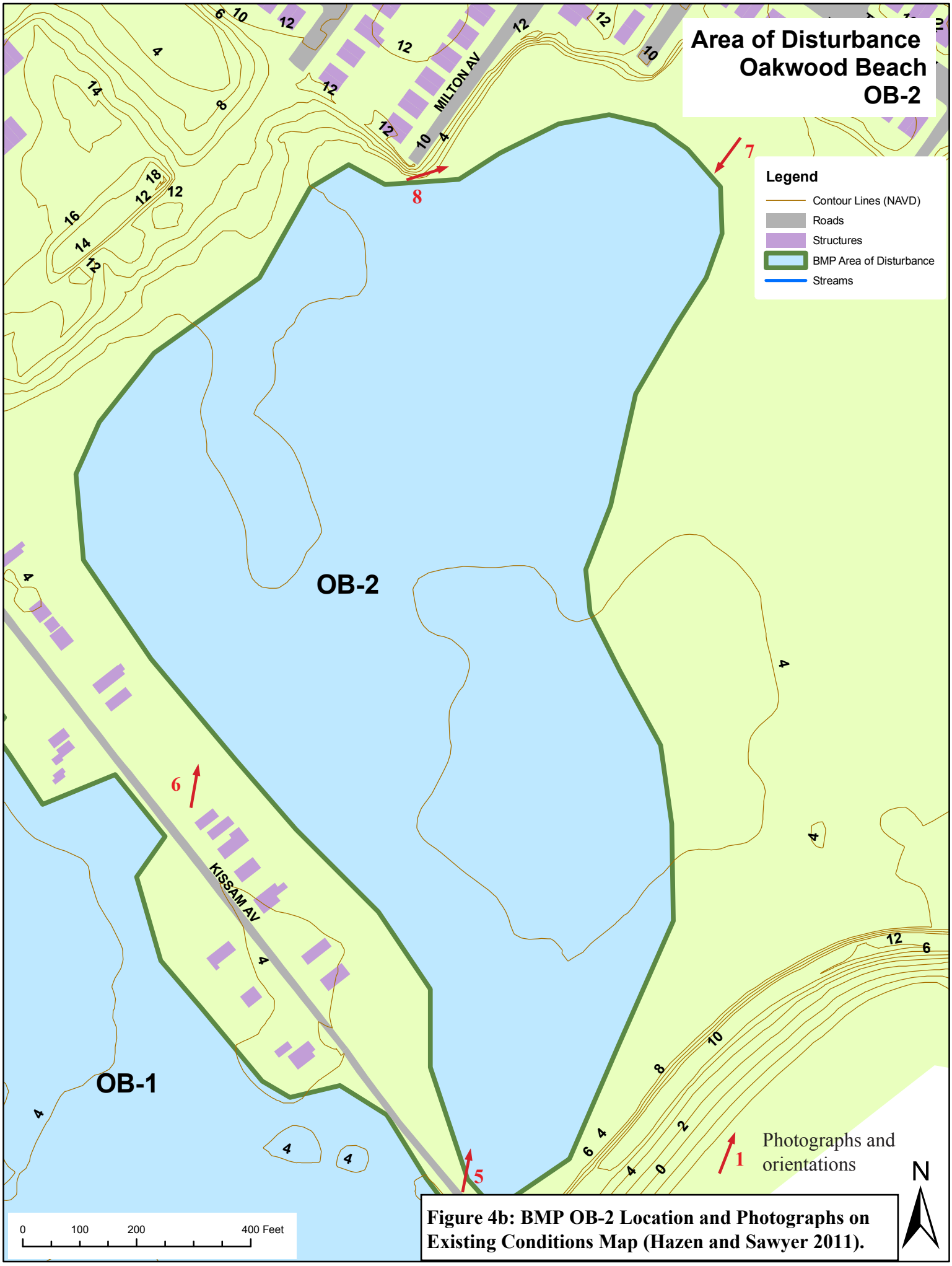


Figure 4b: BMP OB-2 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

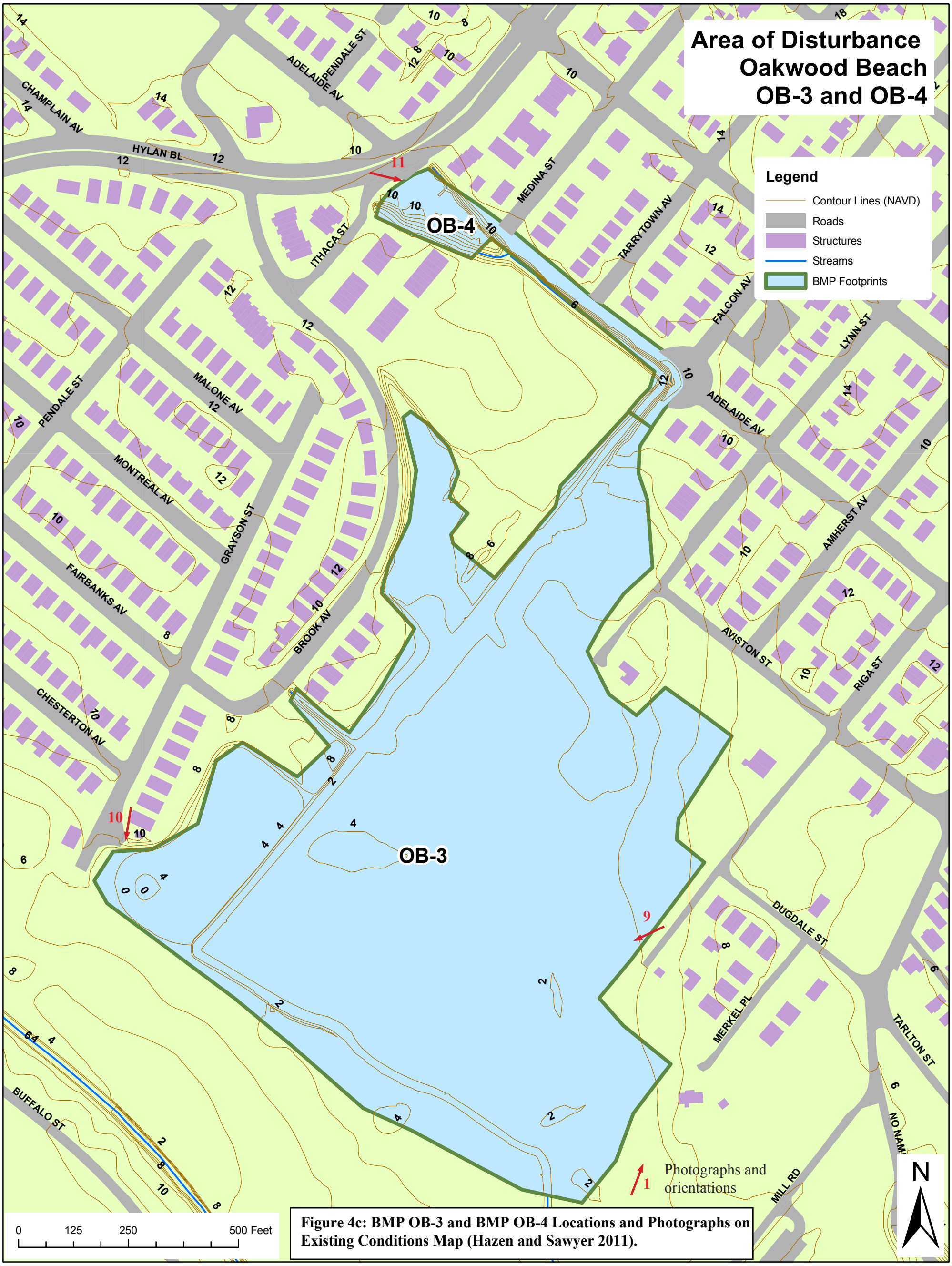


Figure 4c: BMP OB-3 and BMP OB-4 Locations and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

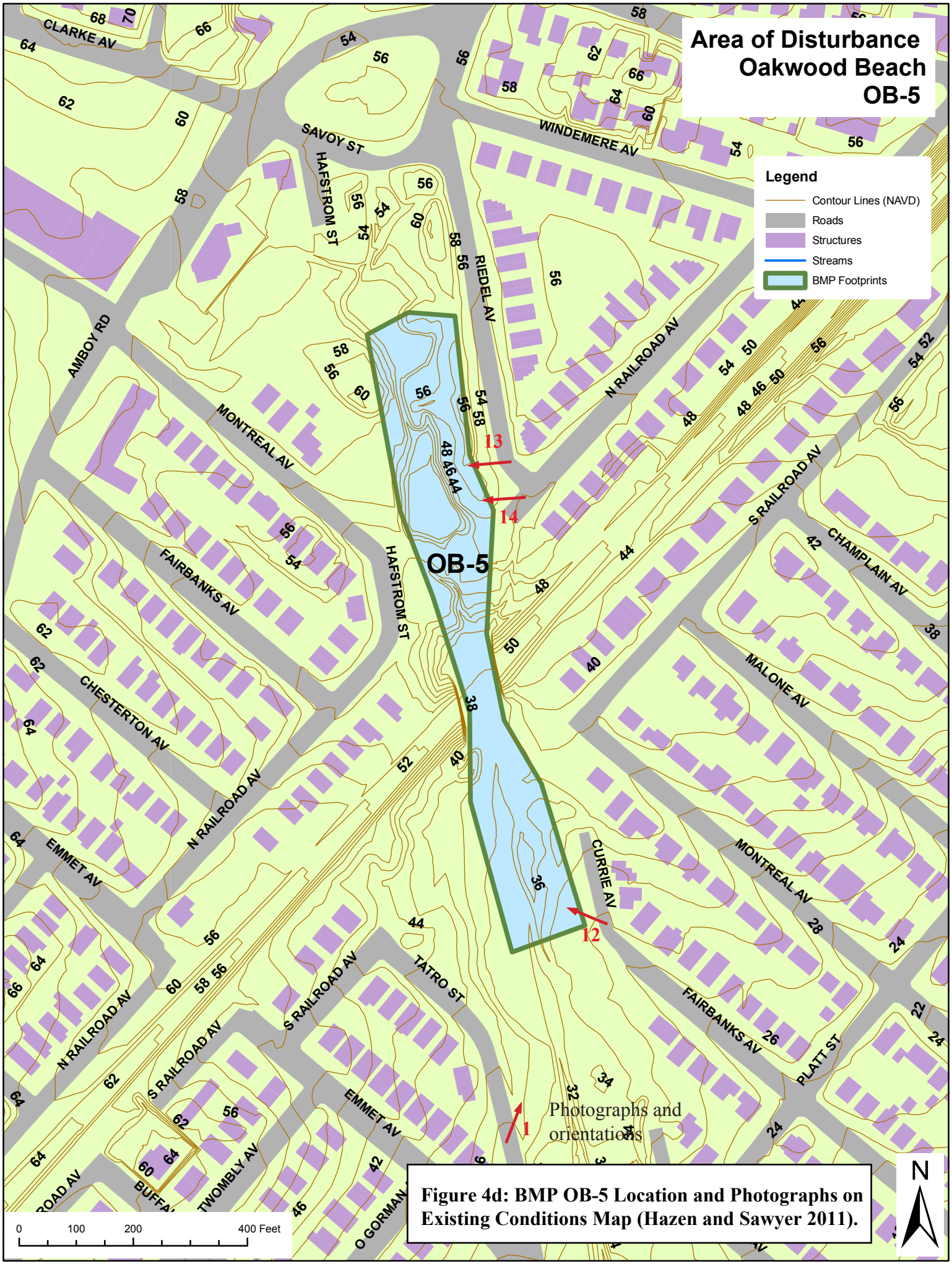
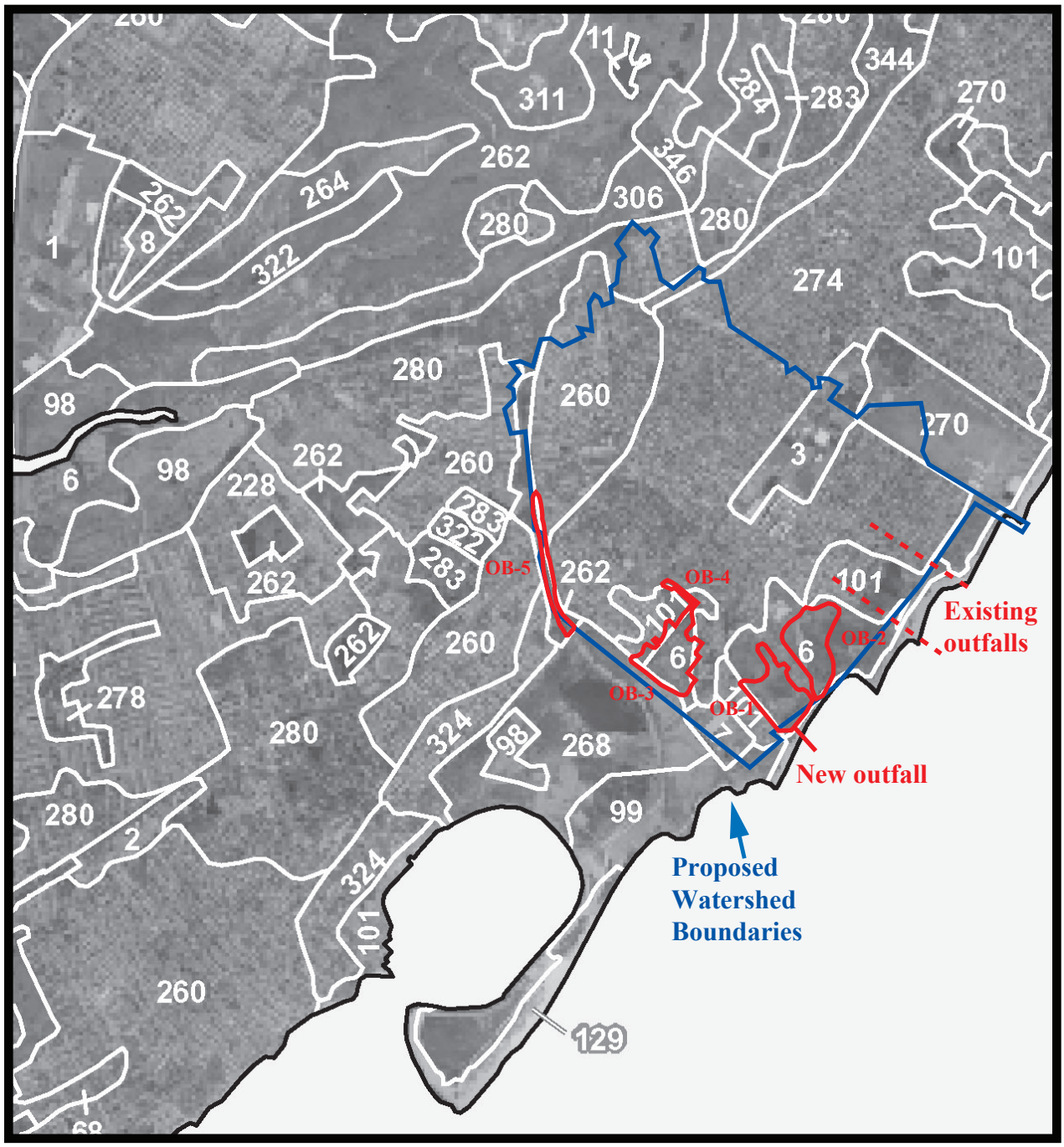


Figure 4d: BMP OB-5 Location and Photographs on Existing Conditions Map (Hazen and Sawyer 2011).

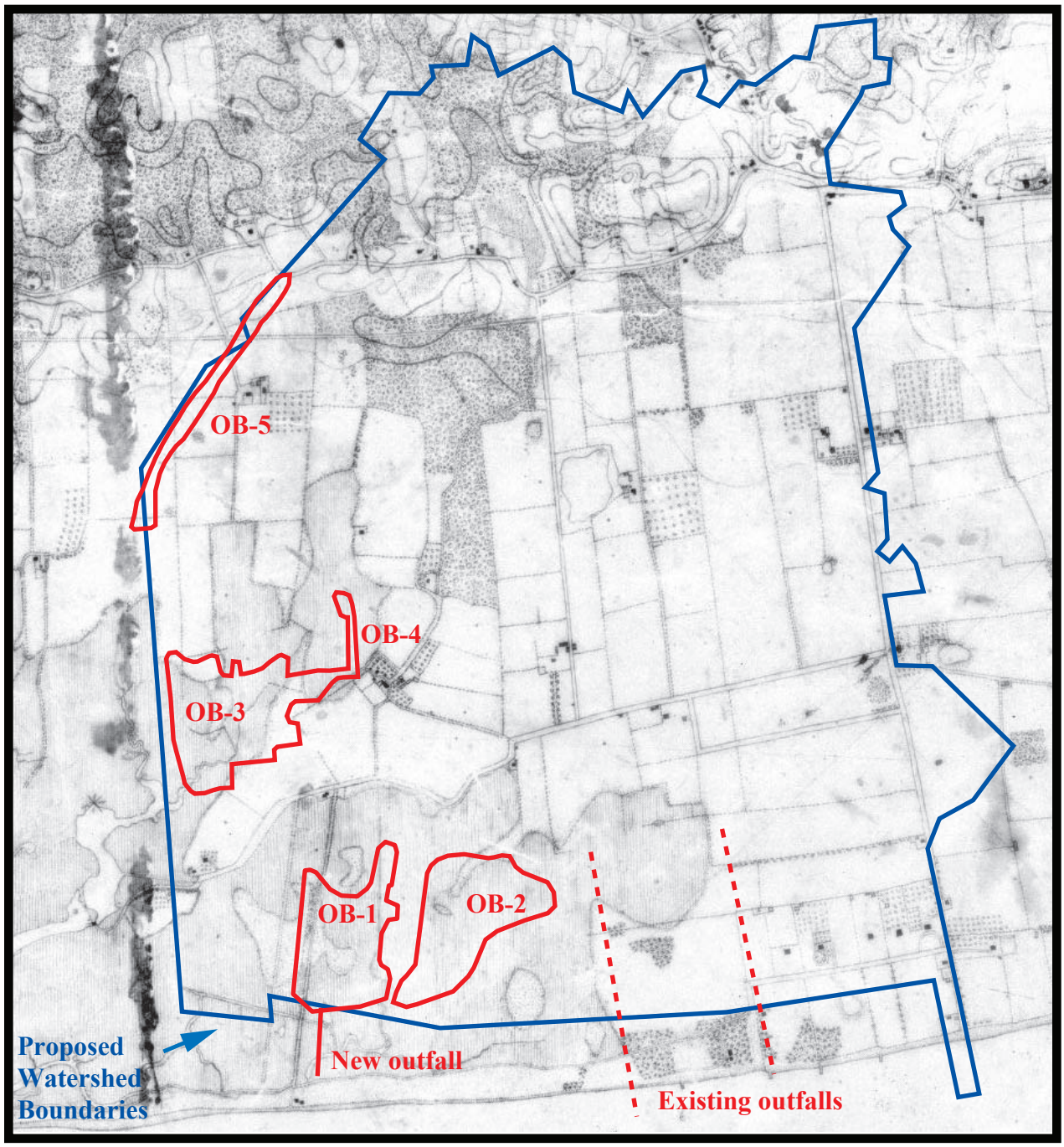


New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

N

Figure 5: Oakwood Beach Watershed and BMP Locations on *New York City Reconnaissance Soil Survey* (U.S.D.A. 2005).

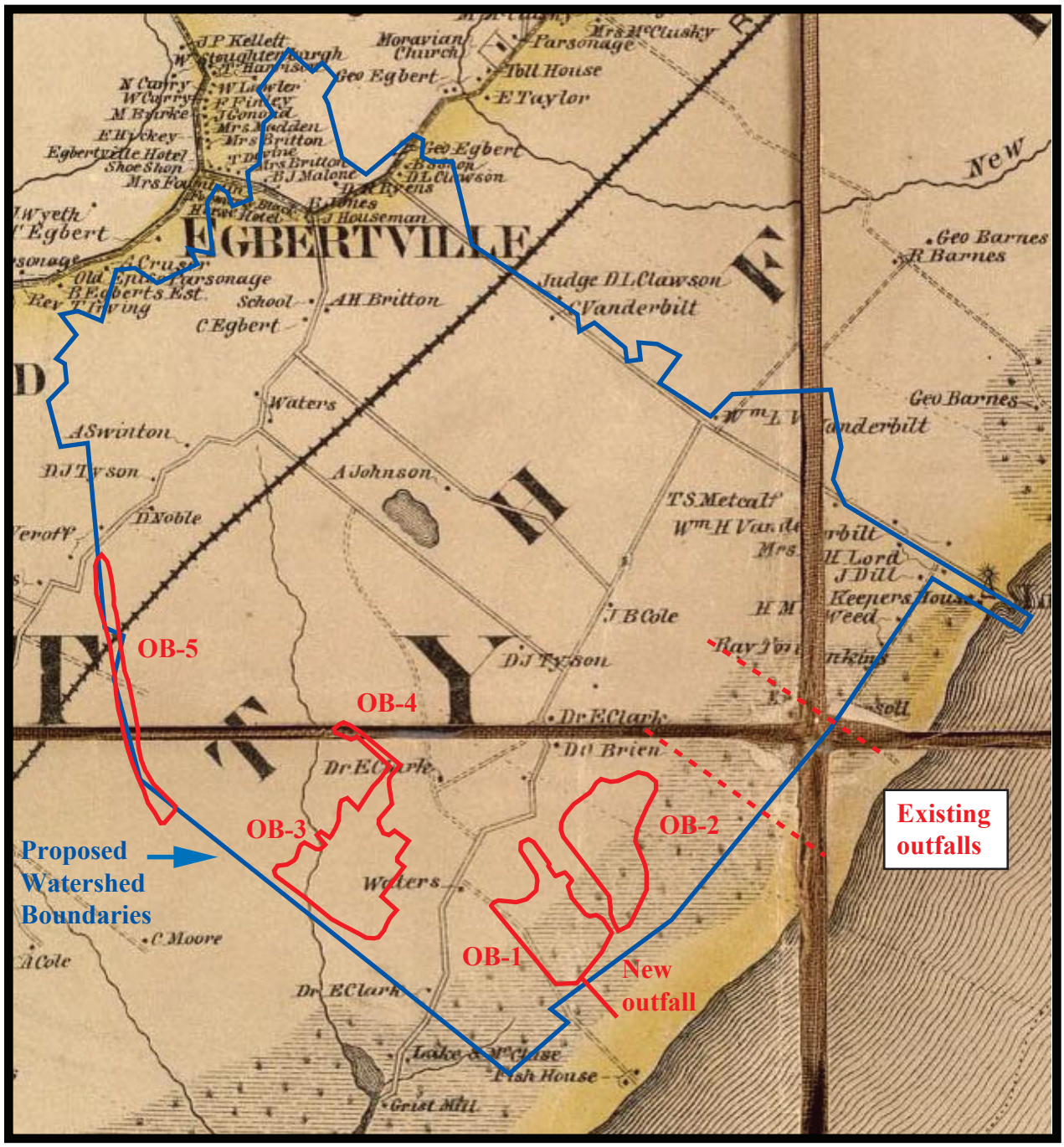
0 2000 4000 6000 8000 10,000 FEET



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

Figure 6: Oakwood Beach Watershed and BMP Locations on *Staten Island From New Brighton to Great Kills* (U.S.C.S. 1856).

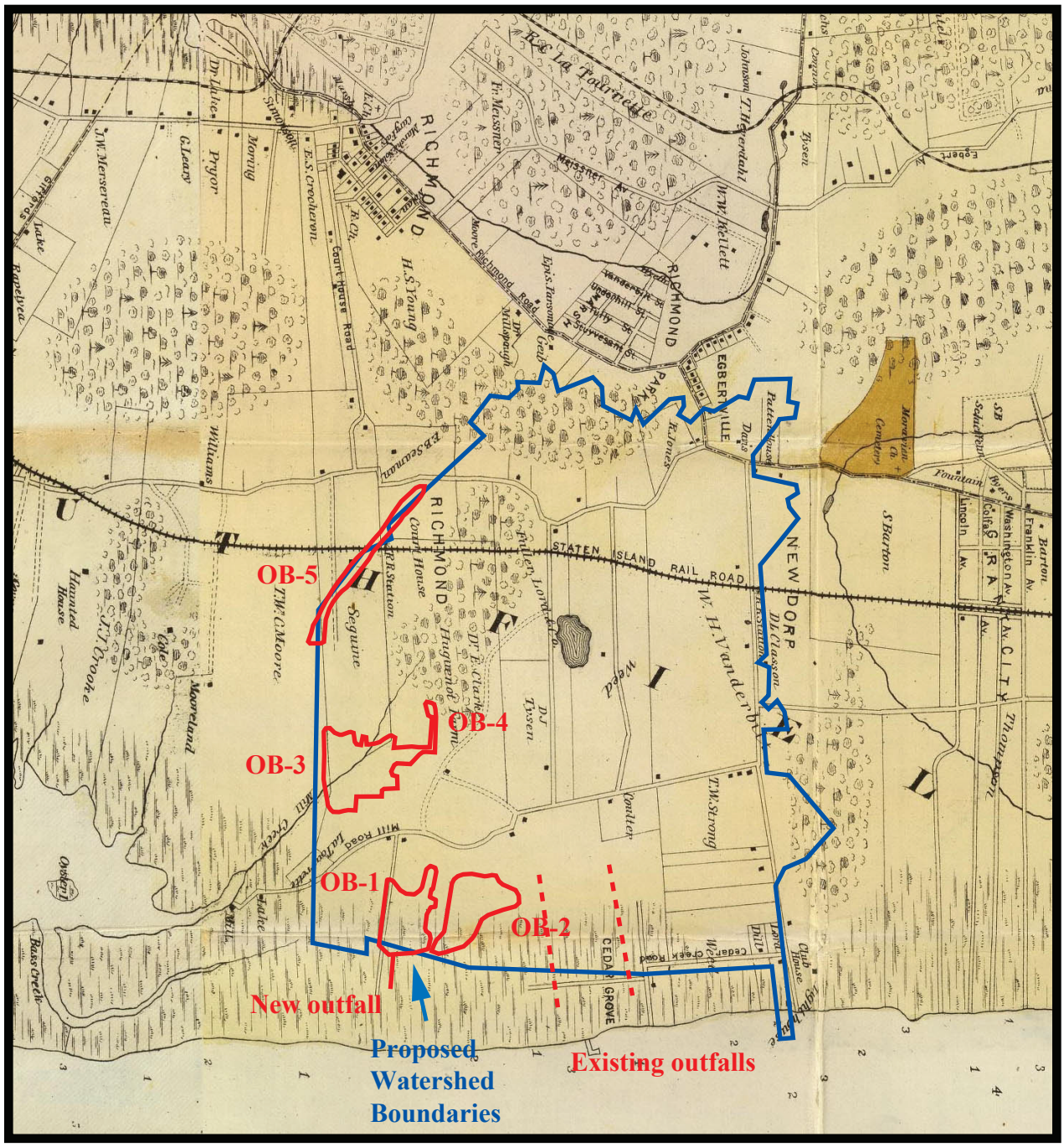
0 1000 2000 3000 4000 5000 FEET



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

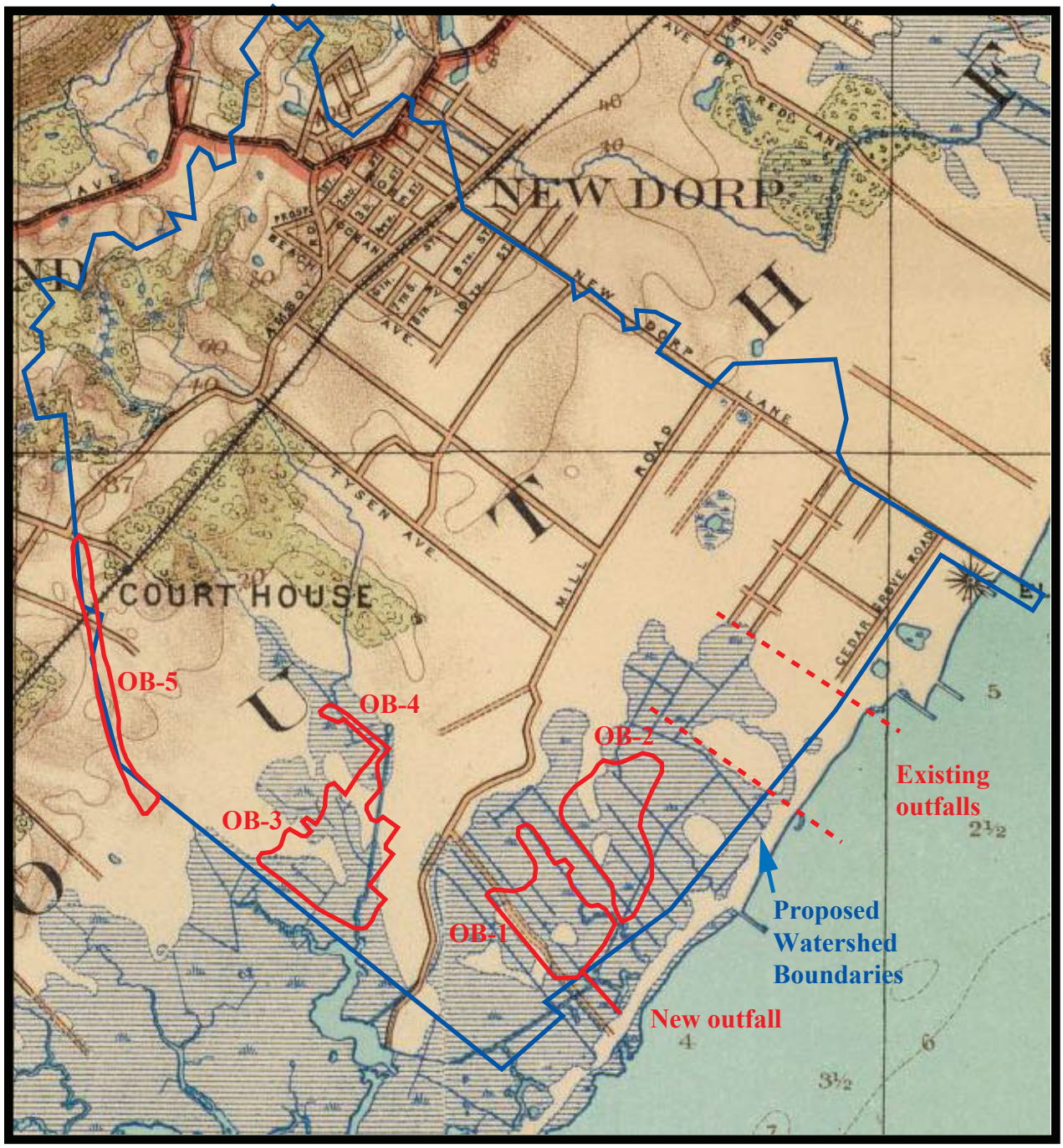
Figure 7: Oakwood Beach Watershed and BMP Locations on *Map of the City Of New-York and Its Environs from Actual Surveys* (Walling 1860).

0 1000 2000 3000 4000 5000 FEET



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

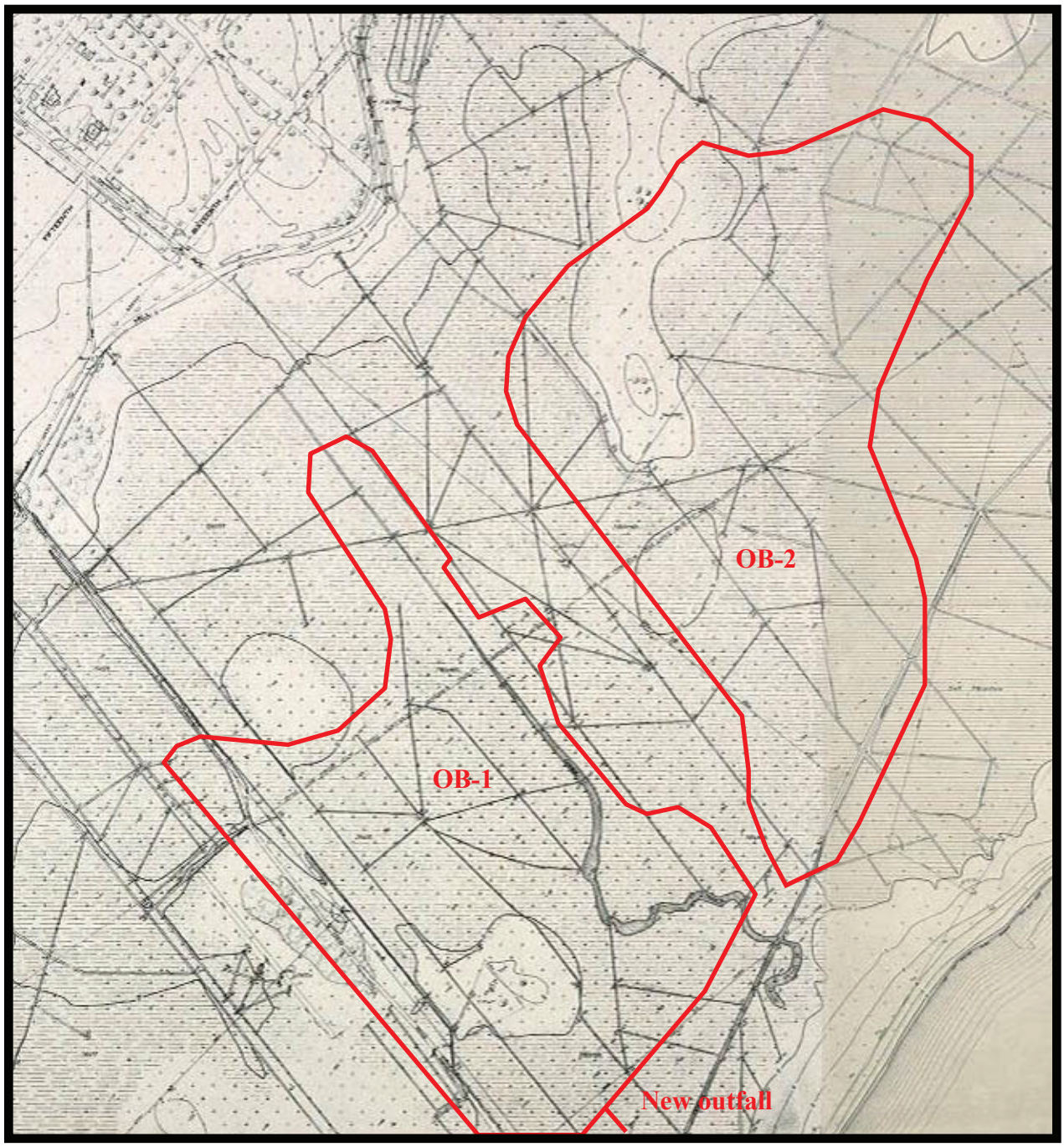
Figure 8: Oakwood Beach Watershed and BMP Locations on *Map of Staten Island, Richmond County, New York* (Dripps 1872).



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

Figure 9: Oakwood Beach Watershed and BMP Locations on *Atlas of the Metropolitan District and adjacent country...* (Bien and Vermuele 1891).

0 1000 2000 3000 4000 5000 FEET

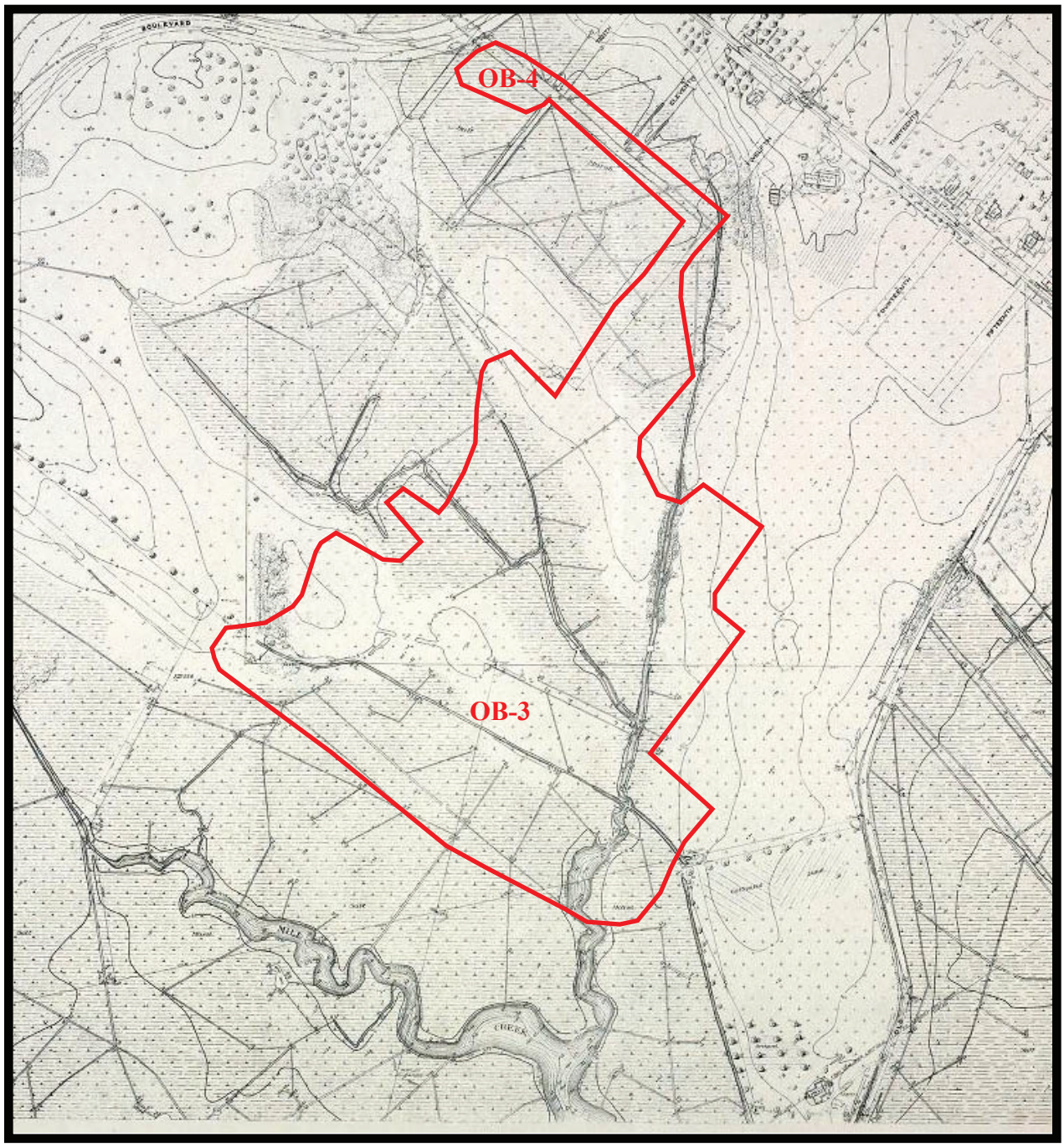


New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

N

Figure 10a: BMP OB-1 and OB-2 on *Borough of Richmond Topographical Survey*, Sheets 71 and 72 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

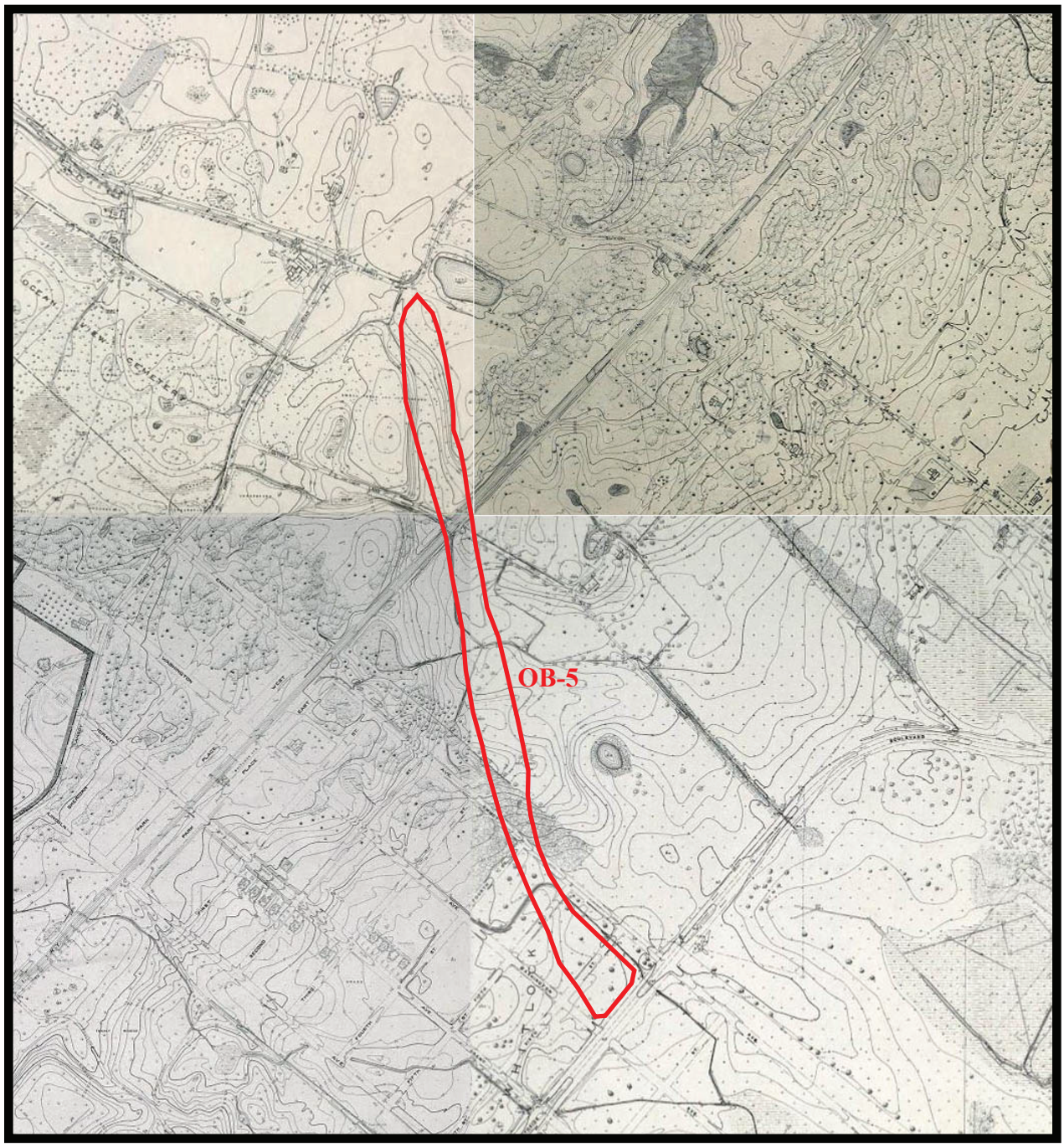


New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

N

Figure 10b: BMP OB-3 and OB-4 on *Borough of Richmond Topographical Survey*, Sheet 71 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

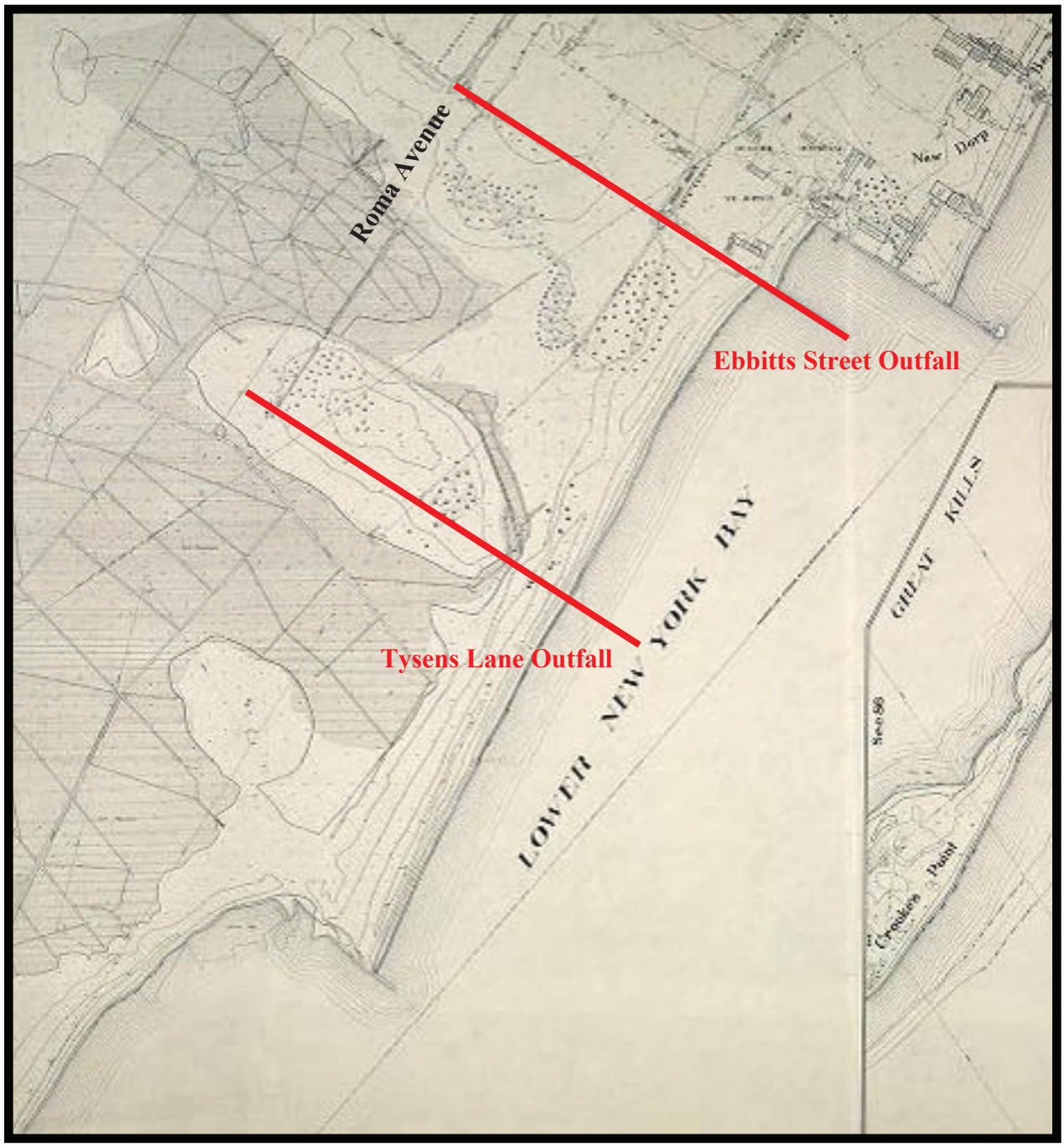


New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

N

Figure 10c: BMP OB-5 on *Borough of Richmond Topographical Survey*, Sheets 61, 62, 70 and 71 (Borough of Richmond 1911).

0 500 1000 1500 2000 2500 FEET



New York City Department of Environmental Protection
Staten Island Bluebelt, Mid-Island of Staten Island's South Shore
Oakwood Beach Watershed
Phase IA Archaeological Documentary Study

N

Figure 10d: Existing Outfalls on *Borough of Richmond Topographical Survey*, Sheet 72 (Borough of Richmond 1911).

0 200 400 600 800 1000 FEET

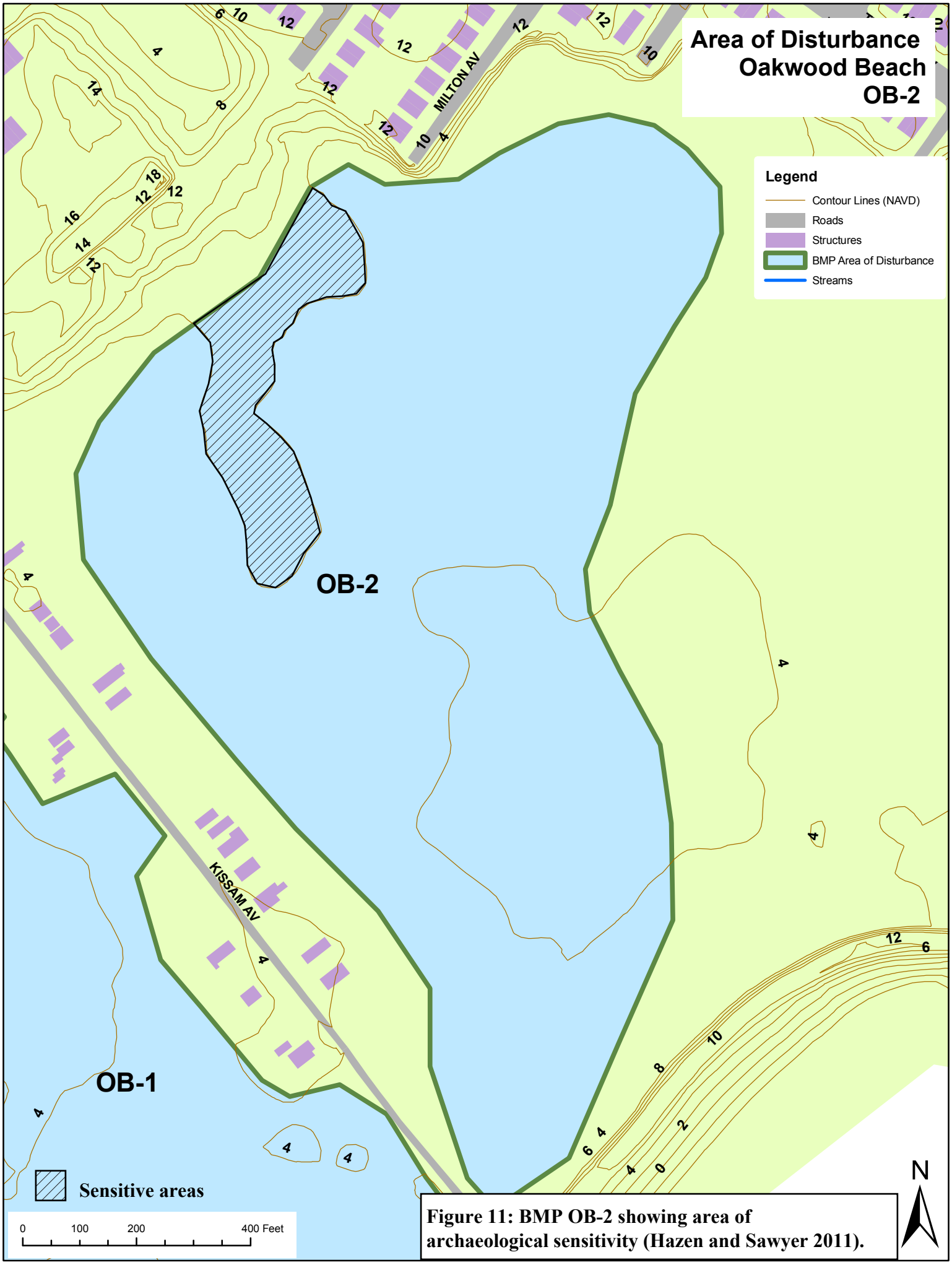


Figure 11: BMP OB-2 showing area of archaeological sensitivity (Hazen and Sawyer 2011).

Photograph 1: OB-1, Fox Lane, view to the east.

Photograph 2: OB-1, Old Mill Road, view to the southeast.

Photograph 3: OB-1, from Oakwood Beach, view to the northwest.

Photograph 4: OB-1, Kissam Avenue, view to the northwest.

Photograph 5: OB-2, from Oakwood Beach, view to the north.

Photograph 6: OB-2, Kissam Avenue, view to the north.

Photograph 7: OB-2, Hett Avenue, view to the south.


Photograph 8: OB-2, Milton Avenue, view to the northeast.

Photograph 9: OB-3, Riga Street, view to the southwest.

Photograph 10: OB-3, Grayson Street, view to the south.

Photograph 11: OB-4, Hylan Boulevard, view to the east.

Photograph 12: OB-5, Currie Avenue and Fairbanks Avenue, view to the northwest.

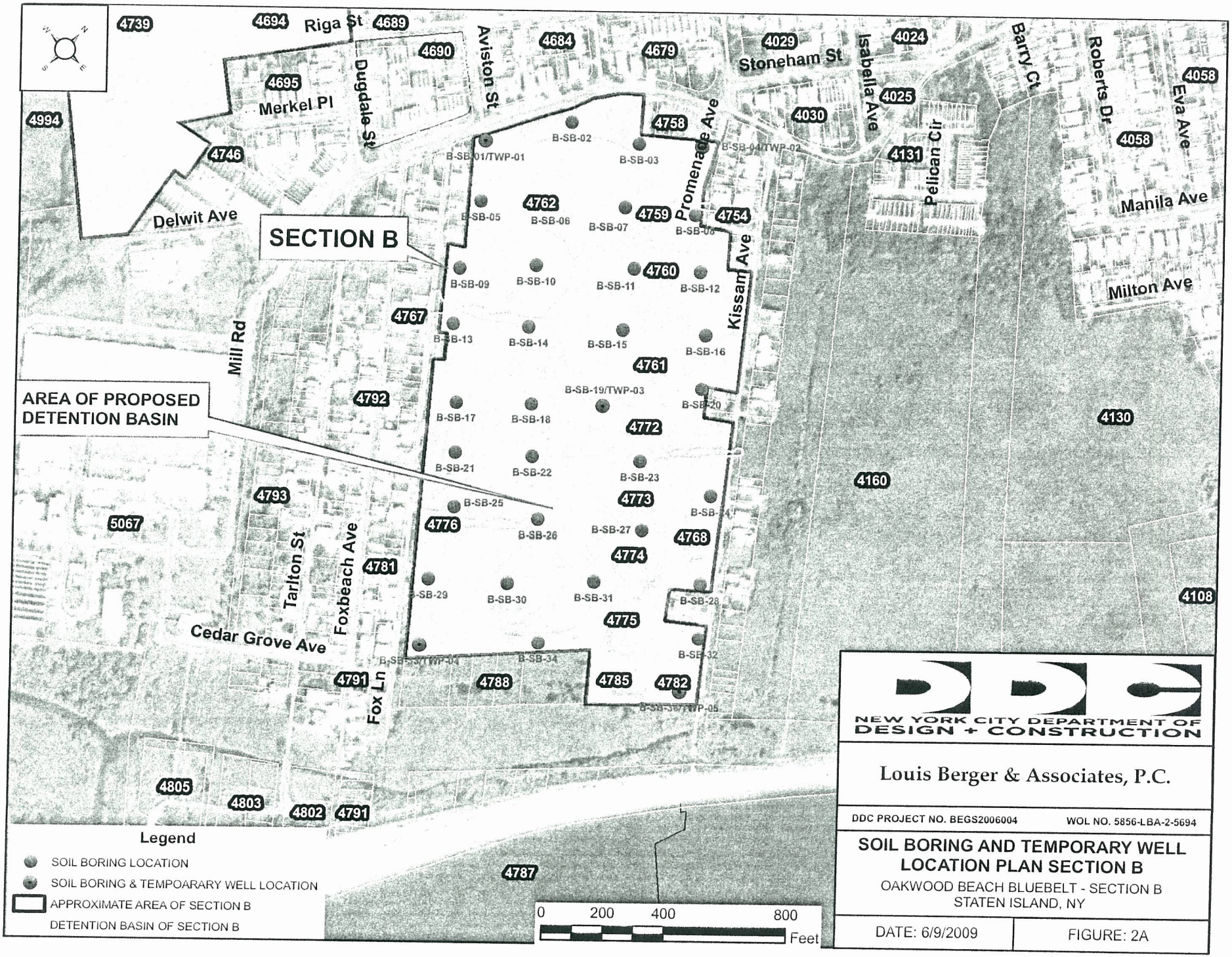
Photograph 13: OB-5, N. Railroad Avenue and Riedel Avenue, view to the west (note storm drainage pipe).

Photograph 14: OB-5, N. Railroad Avenue and Riedel Avenue, view to the west.

Appendix A: Block and Lot Data

BMP	Block	Lots
OB-1	4754	1, 23, 25, 63, 67, 68, 71, 76, 85
OB-1	4758	16, 19
OB-1	4759	1, 9, 11, 13, 17
OB-1	4760	1, 12
OB-1	4761	1, 8, 12, 16
OB-1	4762	1, 2, 3, 33, 105, 180, 255, 335
OB-1	4768	1, 51, 52, 62, 65, 68, 69, 70, 85, 86, 89
OB-1	4772	1
OB-1	4773	1
OB-1	4774	1
OB-1	4775	1
OB-1	4776	1, 90, 180, 270, 360
OB-1	4782	25, 38, 39, 40, 41
OB-1	4785	1
OB-1	4788	11, 105, 200, 290, 375
OB-2	4105	50
OB-2	4130	200
OB-2	4160	59, 70, 100, 318, 321, 325, 327, 328, 329
OB-3	4673	1, 7
OB-3	4680	1, 10, 11, 13, 17, 18, 20
OB-3	4681	17, 18, 22, 24, 28, 34
OB-3	4686	4, 5, 6, 7, 8, 9, 20, 22
OB-3	4687	1, 3, 7, 8, 9, 11, 18, 20, 22, 24, 26, 28
OB-3	4688	11, 18, 20, 26, 28, 30
OB-3	4689	25, 27, 28
OB-3	4691	6, 11, 13, 18, 23, 25, 26, 27, 30
OB-3	4692	1, 11, 18, 21, 28, 33
OB-3	4693	1, 3, 7, 8, 9, 11, 15, 18, 22, 25, 28
OB-3	4694	1, 3, 9, 11, 13, 15, 18, 21, 25, 28, 34
OB-3	4728	2
OB-3	4736	1, 6, 12, 15
OB-3	4737	1, 5, 7, 9, 13, 14, 18
OB-3	4738	1, 3, 13
OB-3	4739	1, 3, 9, 20, 29
OB-3	4740	1, 7, 9, 11, 13, 14, 15, 16, 21, 24, 33, 35, 36, 37, 41, 43, 46
OB-3	4746	49, 54, 58, 59, 62, 66, 69, 70, 71, 73, 75, 77, 78, 81, 83
OB-5	4696	150

APPENDIX B: SOIL BORINGS FOR BMP OB-1



NEW YORK CITY DEPARTMENT OF DESIGN + CONSTRUCTION

Louis Berger & Associates, P.C.

DDC PROJECT NO. BEGS2006004 WOL NO. 5856-LBA-2-5694

SOIL BORING AND TEMPORARY WELL LOCATION PLAN SECTION B

OAKWOOD BEACH BLUEBELT - SECTION B
STATEN ISLAND, NY

DATE: 6/9/2009 FIGURE: 2A

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB01 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/19/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/19/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		CL				<1	Dusky yellowish brown (10YR2/2) Silty CLAY, trace medium to fine Sand; moist.	**Silty Clay, collected composite sample SB01 from 0.0 - 1.5 ft bgs**
	2		ML				<1	Moderate brown (5YR4/4) Clayey SILT, little medium to fine Gravel; wet.	**Clayey Silt, collected sample SB01 for VOC analysis from 2.0 - 2.5 ft bgs**
	4		ML				<1	Moderate brown (5YR4/4) Clayey SILT, little medium to fine Gravel; saturated.	
	6								
	8								**End of Boring at 8 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB02 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/19/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/19/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	**Silty Sand, collected composite sample SB02 from 0.0 - 6.5 ft bgs**
	2		ML				<1	Moderate brown (5YR4/4) Clayey SILT, little medium to fine Gravel; moist.	**Clayey Silt, collected sample SB02 for VOC analysis from 2.0 - 2.5 ft bgs**
	4		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Silty Sand**
	6		SM				<1	Moderate brown (5YR4/4) to light brown (5YR5/6) coarse to fine SAND, some Silt, little medium to fine Gravel; saturated.	**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB03 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/21/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/21/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand, collected composite sample SB03 from 0.0 - 3.0 ft bgs**
	2								
			ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT, little medium to fine Gravel, little Peat; moist.	**Clayey Silt, collected sample SB03 for VOC analysis from 3.5 - 4.0 ft bgs**
	4		ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT, little coarse to fine Gravel, little Peat; wet.	
			ML				<1	Moderate brown (5YR3/4) Clayey SILT, little coarse to fine Gravel; saturated.	
	6								
	8								**End of Boring at 8 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB04 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/21/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/21/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	**Silty Sand, collected composite sample SB04 from 0.0 - 2.0 ft bgs**
	2		ML				<1	Moderate brown (5YR4/4) Clayey SILT, trace medium to fine Gravel; moist.	**Clayey Silt, collected sample SB04 for VOC analysis from 3.0 - 3.5 ft bgs**
	4		ML				<1	Moderate brown (5YR4/4) Clayey SILT, trace medium to fine Gravel; wet.	
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB05 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/27/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/27/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	**Peat, collected composite sample SB05 from 0.0 - 1.5 ft bgs and collected sample SB05 for VOC analysis from 1.0 - 1.5 ft bgs**
	2								**End of Boring at 4 ft. bgs.**
	4								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB06 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/3/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/3/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, some Silt; wet.	**Silty Peat, collected composite sample SB06 from 0.0 - 4.0 ft bgs and collected sample SB06 for VOC analysis from 1.0 - 1.5 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB07 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/27/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/27/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	**Peat, collected composite sample SB07 from 0.0 - 3.0 ft bgs and collected sample SB07 for VOC analysis from 2.5 - 3.0 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB08 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, trace medium to fine Gravel; moist.	**Silty Sand**
	2		ML				<1	Moderate brown (5YR4/4) Clayey SILT, trace medium to fine Gravel; wet.	**Clayey Silt, collected composite sample SB08 from 0.0 - 8.0 ft bgs and sample SB08 for VOC analysis from 1.5 - 2.0 ft bgs**
	4		CL				<1	Medium light gray (N6) Silty CLAY, trace medium to fine Gravel; satuarted.	**Silty Clay**
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB09 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/19/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/19/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

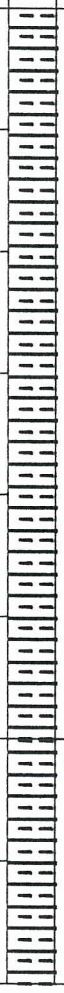
Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	**Peat, collected composite sample SB09 from 0.0 - 1.5 ft bgs and collected sample SB09 for VOC analysis from 1.0 - 1.5 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; saturated.	
	6		CL				<1	Medium light gray (N6) Clay; saturated.	**Clay** **End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB10 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 2/3/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/3/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, some Silt; wet.	**Peat, collected composite sample SB10 from 0.0 - 4.0 ft bgs**
			OL				<1	Dusky yellowish brown (10YR2/2) PEAT, some Silt; moist.	**Collected sample SB10 for VOC analysis from 1.0 - 1.5 ft bgs**
	2		ML				<1	Pale yellowish brown (10YR6/2) Clayey SILT; wet.	**Clayey Silt** **End of Boring at 4 ft. bgs.**
	4								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB11 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 2/6/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A
NOTES:		

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) Silty CLAY, little Peat; wet.	**Silty Clay, collected composite sample SB11 from 4.0 - 6.5 ft bgs and collected sample SB11 for VOC analysis from 4.0 - 4.5 ft bgs**
	2								
	4						<1		
	6		OL					Medium light grey (N6) CLAY; moist.	**Clay** **End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB12 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	**Peat**
	2		OL				<1	Medium light gray (N6) CLAY; saturated.	**Clay, collected composite sample SB12 from 0.0 - 4.0 ft bgs and collected sample SB12 for VOC analysis from 1.0 - 1.5 ft bgs End of Boring at 4 ft. bgs.**
	4								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB13 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/19/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/19/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little clay; moist.	**Peat, Collected composite sample SB13 from 0.0 - 1.5 ft bgs and collected sample SB13 for VOC analysis from 1.0 - 1.5 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little clay; wet.	
			CL				<1	Medium light gray (N6) CLAY; saturated.	**Clay**
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB14 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/3/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/3/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

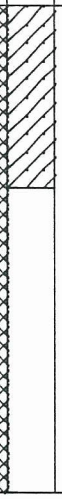
NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate brown (5YR3/4) to moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Silty Sand, collected composite sample SB14 from 0.0 - 2.5 ft bgs and collected sample SB14 for VOC analysis from 2.0 - 2.5 ft bgs**
	2								
	4		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, trace medium to fine Gravel; moist.	
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB15 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/6/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/6/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		CL				<1	Dusky yellowish brown (10YR2/2) Silty CLAY, little Peat; wet.	**Silt Clay, collected composite sample SB15 from 0.0 - 1.5 ft bgs and collected sample SB12 for VOC analysis from 1.0 - 1.5 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB16 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	**Peat, collected composite sample SB16 from 0.0 - 8.0 ft bgs and collected sample SB16 for VOC analysis from 1.0 - 1.5 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	
	6		CL				<1	Medium light gray (N6) Silty CLAY; moist.	**Silty Clay** **End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB17 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/19/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/19/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Moderate yellowish brown (10YR5/4) to light brown (5YR5/6) Clayey SILT, little medium fine Gravel; wet.	**Clayey Silt, collected composite sample SB17 from 0.0 - 2.0 ft bgs and collected sample SB17 for VOC analysis from 1.5 - 2.0 ft bgs**
	2		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; saturated.	**Peat** **End of Boring at 4 ft. bgs.**
	4								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB18 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/3/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/3/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		SM				<1	Moderate brown (5YR3/4) to moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel.	**Silty Sand, collected composite sample SB18 from 0.0 - 2.5 ft bgs and collected sample SB18 for VOC analysis from 2.0 - 2.5 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB19 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/6/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/6/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		CL				<1	Dusky yellowish brown (10YR2/2) Silty CLAY, little Peat; wet.	**Silty Clay, collected composite sample SB19 from 0.0 - 1.5 ft bgs and collected sample SB19 for VOC analysis from 1.0 - 1.5 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB20 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT, little Peat; wet.	**Clayey Silt, collected composite sample SB20 from 0.0 - 8.0 ft bgs and collected sample SB20 for VOC analysis from 1.0 - 1.5 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; saturated.	**Peat**
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB21 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction				**PROJECT NO:**	JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B				**FMS ID#:**	BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.				**WOL #:**	5856-LBA-2-5694
DRILLING METHOD: Direct Push				**DATE STARTED:**	11/26/2008
BOREHOLE DATA		**WELL DATA**		**DATE FINISHED:**	11/26/2008
Diameter (in):	2	**Well Diameter:**	N/A	**DRILLER:**	T. Palomeque
Total Depth (ft):	6.00	**Total Depth (ft):**	N/A	**LBA INSPECTOR:**	A. Trescott
Depth to Refusal (ft):	N/A	**Screen Length (ft):**	N/A	**NORTHING:**	N/A
Depth to Water (ft):	N/A	**Depth to Water (ft):**	N/A	**EASTING:**	N/A
Depth to Rock (ft):	N/A	**Slot Size:**	N/A	**SURFACE ELEVATION:**	N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky brown (5YR2/2) coarse to fine SAND, some Silt; moist.	**Silty Sand, collected composite sample SB21 from 0.0 - 4.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	
	2		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Collected sample SB21 for VOC analysis from 3.5 - 4.0 ft bgs**
	4		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; saturated.	
	6								**End of Boring at 6 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB22 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/4/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/4/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

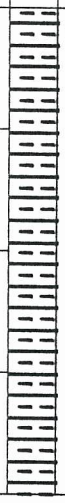
NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		NA				<1	No recovery.	**No recovery**
	2								
	4		CL				<1	Medium light gray (N6) CLAY; wet.	**Clay, collected composite sample SB22 from 4.0 - 8.0 ft bgs and collected sample SB22 for VOC analysis from 4.0 - 4.5 ft bgs**
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB23 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 2/5/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

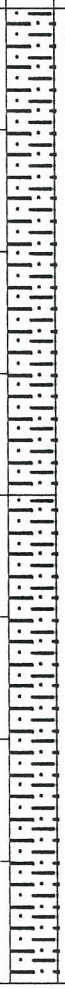
NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	**Peat, collected composite sample SB23 from 0.0 - 1.5 ft bgs and collected sample SB23 for VOC analysis from 0.5 - 1.0 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB24 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT, trace fine Gravel; moist.	**Clayey Silt, collected composite sample SB24 from 0.0 - 4.0 ft bgs and collected sample SB24 for VOC analysis from 3.5 - 4.0 ft bgs**
	2								
	4		ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT, trace fine Gravel; saturated.	
	6								
	8								**End of Boring at 8 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB25 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 11/26/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 11/26/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 10.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** A. Trescott
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A
NOTES:		

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky brown (5YR2/2) coarse to fine SAND, some Silt; moist.	**Silty Sand, collected composite sample SB25 from 0.0 - 10.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	
	2								
	4								**Collected sample SB25 for VOC analysis from 4.5 - 5.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; saturated.	
	6								
	8								**End of Boring at 10 ft. bgs.**
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB26 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/4/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/4/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		NA				<1	No recovery.	**No recovery**
	2								
	4		CL				<1	Medium light gray (N6) Silty CLAY; wet.	**Silty Clay, collected composite sample SB26 from 4.0 - 8.0 ft bgs and collected sample SB26 for VOC analysis from 4.0 - 4.5 ft bgs** **End of Boring at 8 ft. bgs.**
	6								
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB27 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 2/5/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay.	**Peat, collected composite sample SB27 from 0.0 - 2.5 ft bgs and collected sample SB27 for VOC analysis from 0.5 - 1.0 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	
	6								**End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB28 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	**Peat, collected composite sample SB28 from 0.0 - 5.5 ft bgs and collected sample SB28 for VOC analysis from 3.5 - 4.0 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; wet.	
	6		CL				<1	Medium light gray (N6) CLAY; saturated.	**Clay** **End of Boring at 8 ft. bgs.**
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB29 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 11/26/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 11/26/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 2.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** A. Trescott
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky brown (5YR2/2) coarse to fine SAND, some Silt; moist.	**Silty Sand, collected composite sample SB29 from 0.0 - 2.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Collected sample SB29 for VOC analysis from 0.5 - 1.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; saturated.	**End of Boring at 2 ft. bgs.**
	2								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB30 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:**	JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:**	BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:**	5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:**	2/4/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:**	2/4/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:**	T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:**	J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:**	N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:**	N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:**	N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0 2 4		CL				<1	Moderate brown (5YR4/4) Silty CLAY, trace medium to fine Gravel; wet.	**Silty Clay, collected composite sample SB30 from 0.0 - 2.0 ft bgs and collected sample SB30 for VOC analysis from 0.5 - 1.0 ft bgs** **End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB31 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 2/5/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	**Peat, collected composite sample SB31 from 0.0 - 5.0 ft bgs**
	2								
	4		OL				<1	Dusky yellowish brown (10YR2/2) PEAT, little Clay; moist.	**Collected sample SB31 for VOC analysis from 4.0 - 4.5 ft bgs**
			CL					Medium light gray (N6) CLAY.	**Clay**
	6								
	8								**End of Boring at 8 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB32 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:**	JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:**	BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:**	5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:**	1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:**	1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:**	T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:**	J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:**	N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:**	N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:**	N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand, collected composite sample SB32 from 0.0 - 4.0 ft bgs**
	2		ML				<1	Moderate brown (5YR4/4) Clayey SILT, little medium to fine Gravel; wet.	**Clayey Silt, collected sample SB32 for VOC analysis from 2.5 - 3.0 ft bgs**
	4		OL				<1	Dusky yellowish brown (10YR2/2) Peat, little Clay; saturated.	**Peat End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB33 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:** 11/26/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 11/26/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:** A. Trescott
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A
NOTES:		

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky brown (5YR2/2) coarse to fine SAND, some Silt; moist.	**Silty Sand, collected composite sample SB33 from 0.0 - 4.0 ft bgs**
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Collected sample SB33 for VOC analysis from 2.5 - 3.0 ft bgs**
	2								**End of Boring at 4 ft. bgs.**
	4								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB34 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction			**PROJECT NO:** JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B			**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.			**WOL #:** 5856-LBA-2-5694
DRILLING METHOD: Direct Push			**DATE STARTED:** 2/5/2009
BOREHOLE DATA	**WELL DATA**		**DATE FINISHED:** 2/5/2009
Diameter (in): 2	**Well Diameter:** N/A		**DRILLER:** T. Palomeque
Total Depth (ft): 4.00	**Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky brown (5YR2/2) coarse to fine SAND, some Silt; moist.	**Silty Sand**
			SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, trace medium fine Gravel; moist.	**Collected composite sample SB32 from 0.5 - 2.5 ft bgs and collected sample SB32 for VOC analysis from 2.0 - 2.5**
	2		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, trace medium fine Gravel; wet.	
	4								**End of Boring at 4 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** SB36 **WELL ID:** N/A **LOCATION:** Staten Island, NY

CLIENT: New York City Department of Design and Construction		**PROJECT NO:**	JG880F4
PROJECT: Oakwood Beach Bluebelt - Section B		**FMS ID#:**	BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:**	5856-LBA-2-5694
DRILLING METHOD: Direct Push		**DATE STARTED:**	1/20/2009
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:**	1/20/2009
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:**	T. Palomeque
Total Depth (ft): 8.00	**Total Depth (ft):** N/A	**LBA INSPECTOR:**	J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:**	N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:**	N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:**	N/A

NOTES:

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand**
			ML				<1	Moderate brown (5YR4/4) Clayey SILT, little medium to fine Gravel; wet.	**Clayey Silt, collected composite sample SB36 from 0.0 - 4.0 ft bgs and collected sample SB36 for VOC analysis from 2.5 - 3.0 ft bgs**
	2								
	4		OL				<1	Moderate brown (5YR4/4) PEAT, little Clay; saturated.	**Peat**
	6								**End of Boring at 8 ft. bgs.**
	8								

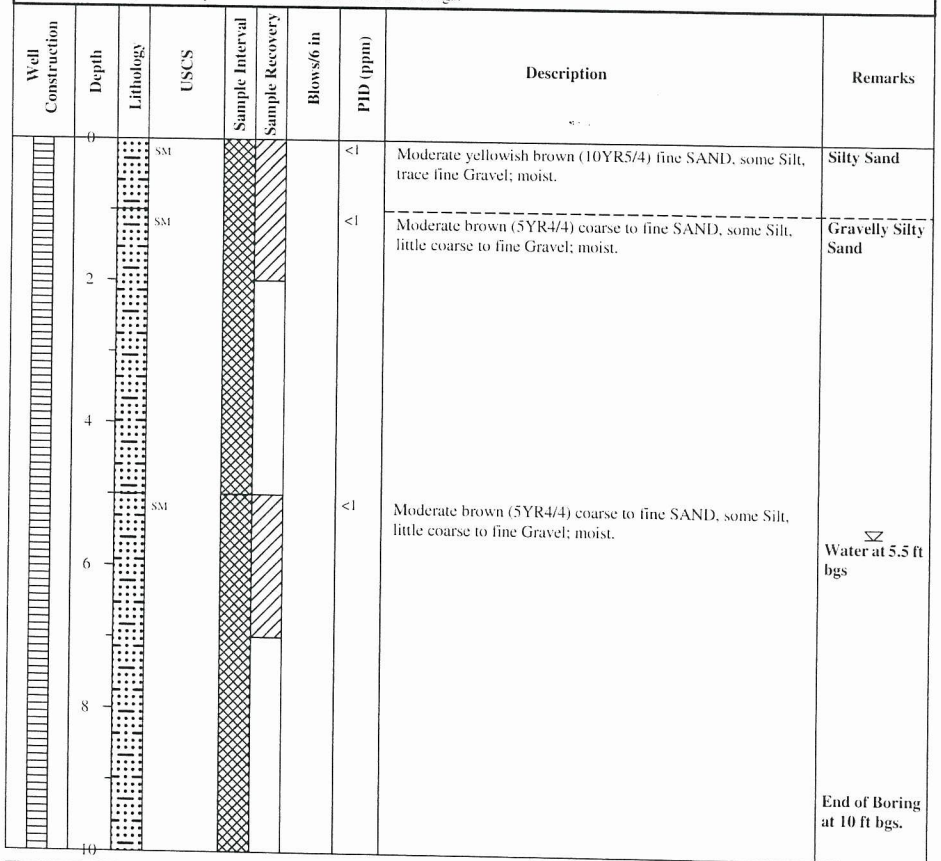
APPENDIX C: SOIL BORINGS FOR BMP OB-3 AND 4


Pendale St
Hylan Blvd
Ithaca St
Brook Ave
Malone Ave
Montreal Ave
Fairbanks Ave
Chesterton Ave
Grayson St
Medina St
Aviston St
Guyon Ave
Buffalo St
Amherst Ave
Adelaide Ave
Riga St
Dugdale St
Merkel Pl
Mill Rd
Promenade Ave
Delwit Ave
Tarlton St
Foxbeach Ave
Fox Ln
A-SB-01/A-TWP-01
A-SB-02
A-SB-03/A-TWP-03
A-SB-05/A-TWP-05
A-SB-06/A-TWP-06
A-SB-07
A-SB-08
A-SB-09
A-SB-10
A-SB-11
A-SB-15
A-SB-16
A-SB-17/A-TWP-17
A-SB-18
A-SB-19
A-SB-20
A-SB-21
A-SB-22
A-SB-23
A-SB-24
A-SB-25
A-SB-27
A-SB-28
A-SB-29
A-SB-30
A-SB-31/A-TWP-31
A-SB-32
A-SB-33
A-SB-34
A-SB-36
A-SB-37
A-SB-38
A-SB-39
A-SB-40
A-SB-41
A-SB-42/A-TWP-42
A-SB-43/A-TWP-43
A-SB-44
A-SB-45
A-SB-46/A-TWP-46
A-SB-47
A-SB-48
A-SB-49
A-SB-50
A-SB-51/A-TWP-51
A-SB-52
A-SB-53
A-SB-54
A-SB-55/A-TWP-55
A-SB-56
Legend
Soil Boring Location
Soil Boring and Temporary Well Location
Approximate Site Boundary
Proposed Detection Basin
Historical Wetlands 1891
0
150
300
600
Feet


Pendale St
Hylan Blvd
Ithaca St
Medina St
Tarrytown Ave
Grayson St
Chesterton Ave
Fairbanks Ave
Montreal Ave
Malone Ave
Brook Ave
Aviston St
Buffalo St
Guyon Ave
TP-12
TP-8
TP-5
TP-7
TP-9
TP-11
TP-10
TP-6
TP-2
TP-3
TP-4
TP-1
Amherst Ave
Adelaide Ave
Riga St
Dugdale St
Merkel Pl
Mill Rd
Promenade Ave
Delwit Ave
Tarlton St
Foxbeach Ave
Fox Ln
Legend
Test Pit Locations
Approximate Site Boundary
Proposed Detection Basin
Historical Development
0
150
300
600
Feet

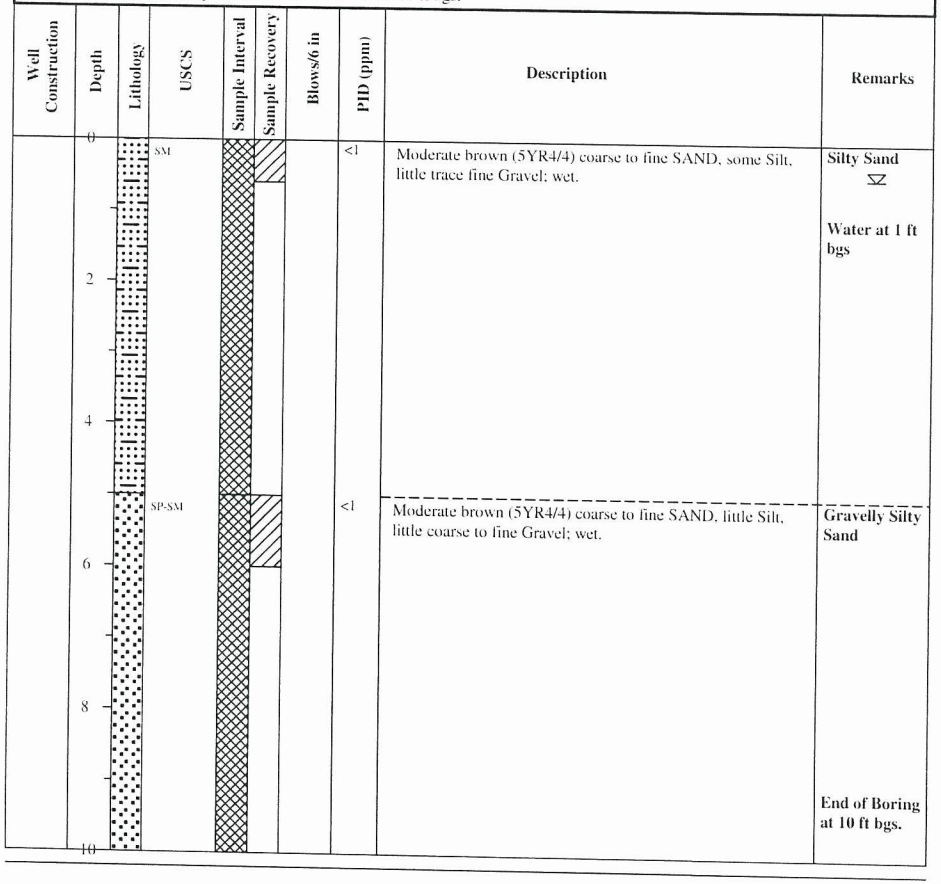
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-01
		WELL ID: TWP-01
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/8/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/8/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 5.5	**Depth to Water (ft):** 5.5	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-01 collected from 5-5.5 ft bgs for VOCs.
Composite sample ASB-01 collected from 0-10 ft bgs.



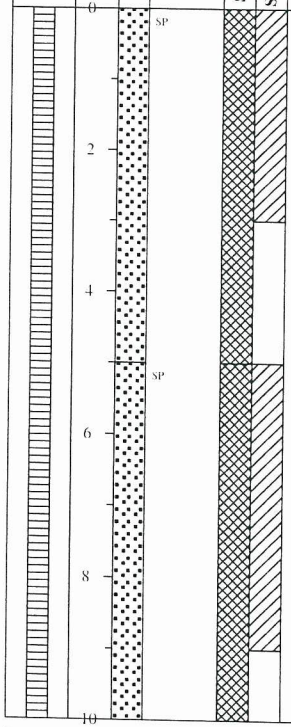
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-02
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/8/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/8/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 0.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-02 collected from 0-0.5 ft bgs for VOCs.
Composite sample ASB-02 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-03 **WELL ID:** TWP-03 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** 1	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

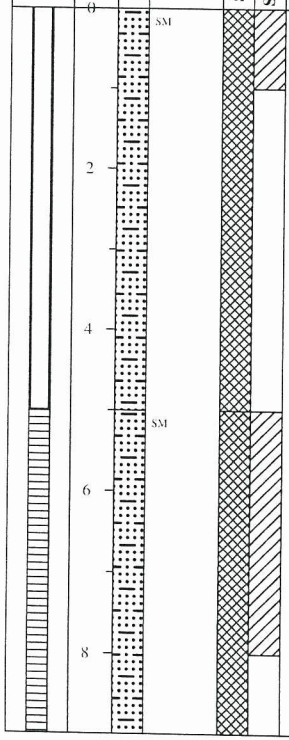
NOTES: Sample ASB-03 collected from 0.5-1 ft bgs for VOCs.
Composite sample ASB-03 collected from 0-10 ft bgs.



Depth	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
0	SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand ▽ Water at 1 ft bgs
4	SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	
10							End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-05 **WELL ID:** TWP-05 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 15	**Total Depth (ft):** 15	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 7	**Depth to Water (ft):** 7	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-05 collected from 6.5-7 ft bgs for VOCs.
Composite sample ASB-05 collected from 0-15 ft bgs.



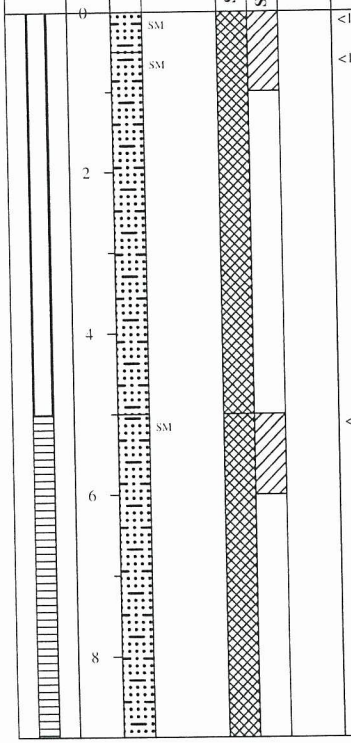
Description	PID (ppm)	Remarks
Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, trace fine Gravel; moist.	<1	Gravelly Silty Sand
	<1	
Dark yellowish brown (10YR4/2) to light brown (5YR5/6) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	<1	▽ Water at 7 ft bgs

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-05
	Page 2 of 2	WELL NO.: TWP-05

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	Gravelly Sand
	12								
	14								End of Boring at 15 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-06 **WELL ID:** TWP-06 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/8/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/8/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 15	**Total Depth (ft):** 15	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 10	**Depth to Water (ft):** 10	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-06 collected from 9-9.5 ft bgs for VOCs.
Composite sample ASB-06 collected from 0-10 ft bgs.



Depth	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
0	SM				<1	Dusky yellowish brown (10YR2/2) fine SAND, some Silt, little fine Gravel; moist.	Gravelly Silty Sand
	SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, little fine Gravel; moist.	
4	SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, little Silt, little fine Gravel; wet.	

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-06
	Page 2 of 2	WELL NO.: TWP-06

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		ML				<1	Grayish black (N2) SILT and fine Sand; wet.	Sandy Silt, Water at 10 ft bgs
			CL				<1	Medium light gray (N6) CLAY & SILT; wet.	Clay & Silt
	12								
	14								End of Boring at 15 ft bgs.

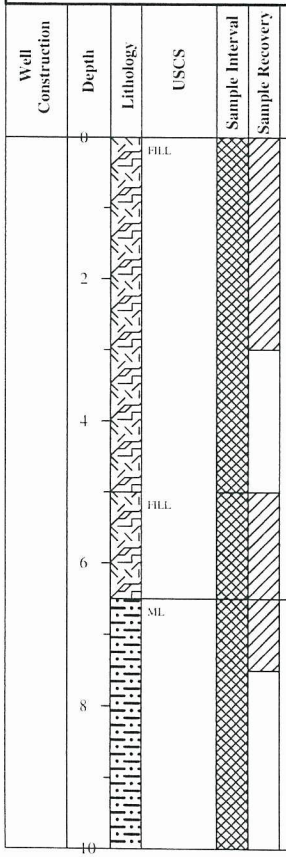
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-07
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-07 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-07 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		FILL				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	**Gravelly Silty Sand (Fill)**
	2		FILL				<1	Light brown (5YR5/6) coarse to fine SAND, some Silt, some coartse to fine Gravel; moist.	
	4		FILL				<1	Light brown (5YR5/6) coarse to fine SAND, some Silt, some coarse to fine Gravel (fill material - brick and concrete debris); wet.	⊠ **Water at 5 ft bgs**
	6								
	8		OL				<1	Dark gray (N3) PEAT, some Silty Clay; wet.	**Peat, End of Boring at 10 ft bgs.**
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-08 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/5/2008
Diameter (in): 2 / **Well Diameter:** N/A		**DRILLER:** J. Meyer
Total Depth (ft): 10 / **Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A / **Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): 9 / **Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-08 collected from 8.5-9 ft bgs for VOCs.
Composite sample ASB-08 collected from 0-10 ft bgs.



Description	PID (ppm)	Remarks
Moderate brown (5YR4/4) to moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	<1	**Gravelly Silty Sand (Fill)**
Dark yellowish brown (10YR4/2) to light brown (5YR5/6) coarse to fine SAND, some coarse to fine Gravel (fill material - brick and concrete debris); moist.	<1	**Gravelly Sand (Fill)**
Dusky yellowish brown (10YR2/2) SILT, some Peat; wet.	<1	**Silt** **Water at 9 ft bgs** ▽ **End of Boring at 10 ft bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-09 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/7/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/7/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 8.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-09 collected from 8-8.5 ft bgs for VOCs.
Composite sample ASB-09 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A				<1	No Recovery	
	2								
	4								
			SP-SM				<1	Moderate brown (5YR3/4) coarse SAND, little Silt, and Gravel; wet.	Gravelly Silty Sand
	6								
	8								Water at 8.5 ft bgs ▽
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-10
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/8/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/8/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-10 collected from 0.5-1 ft bgs for VOCs.
Composite sample ASB-10 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SP-SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, little coarse to fine Gravel; wet.	Gravelly Silty Sand ▽ Water at 1 ft bgs
	2								
	4		SP-SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, little coarse to fine Gravel; wet.	
	6								
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-11 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-11 collected from 1.5-2 ft bgs for VOCs.
Composite sample ASB-11 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		FILL				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, some coarse to fine Gravel; moist.	**Gravelly Silty Sand (Fill)**
			FILL				<1	Light brown (5YR5/6) coarse to fine SAND, little Silt, some coarse to fine Gravel; wet.	▽ **Water at 2 ft bgs**
	2								
	4		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, little medium to fine Gravel; wet.	**Sand**
	6								
	8								**End of Boring at 10 ft bgs.**
	10								

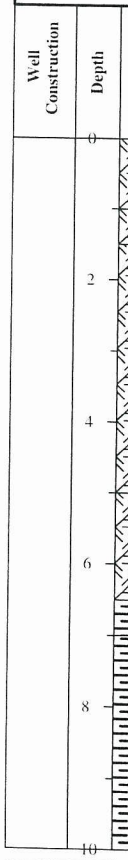
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-15
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 8	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-15 collected from 7.5-8 ft bgs for VOCs.
Composite sample ASB-15 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	**Gravelly Silty Sand**
	2								
	4								
			OL				<1	Dark gray (N3) to medium gray (N5) PEAT, some Silty Clay; moist.	**Peat**
	6								
	8		CL				<1	Light gray (N7) SILTY CLAY; wet.	**Silty Clay, Water at 8 ft bgs** **End of Boring at 10 ft bgs.**
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-16 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/6/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/6/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-16 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-16 collected from 0-10 ft bgs.



Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	FILL				<1	Moderate brown (5YR3/4) to dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little fine Gravel; moist.	**Gravelly Silty Sand (Fill)**
	FILL					Very light gray (N8) CONCRETE debris; dry.	**Concrete(Fill)**
	FILL					Moderate brown (5YR3/4) to dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little fine Gravel; moist.	**Gravelly Silty Sand (Fill)**
	FILL				<1	Moderate brown (5YR3/4) to dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little fine Gravel; moist.	
	OL					Dark gray (N3) PEAT, some Silty Clay; wet.	**Peat**
	CL				<1	Light gray (N7) SILTY CLAY; wet.	**Silty Clay** ▽ **Water at 8 ft bgs** **End of Boring at 10 ft bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-17 **WELL ID:** TWP-17 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/5/2008
Diameter (in): 2 / **Well Diameter (in):** 1		**DRILLER:** J. Meyer
Total Depth (ft): 15 / **Total Depth (ft):** 15		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A / **Screen Length (ft):** 10		**NORTHING:** N/A
Depth to Water (ft): 10 / **Depth to Water (ft):** 10		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size (in):** 0.1		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-17 collected from 9.5-10 ft bgs for VOCs.
Composite sample ASB-17 collected from 0-15 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, some coarse to fine Gravel; moist.	**Gravelly Silty Sand**
	2								
	4								
			ML				<1	Dusky yellowish brown (10YR2/2) SILT, little medium to fine SAND, little coarse to fine Gravel; moist.	**Gravelly Sandy Silt**
	6								
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-17
	Page 2 of 2	WELL NO.: TWP-17

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
									Water at 10 ft bgs ▽
	10		ML				<1	Dark yellowish orange (10YR6/2) SILT, little coarse to fine Gravel; wet.	Gravelly Silt
	12		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand
	14								End of Boring at 14 ft bgs.

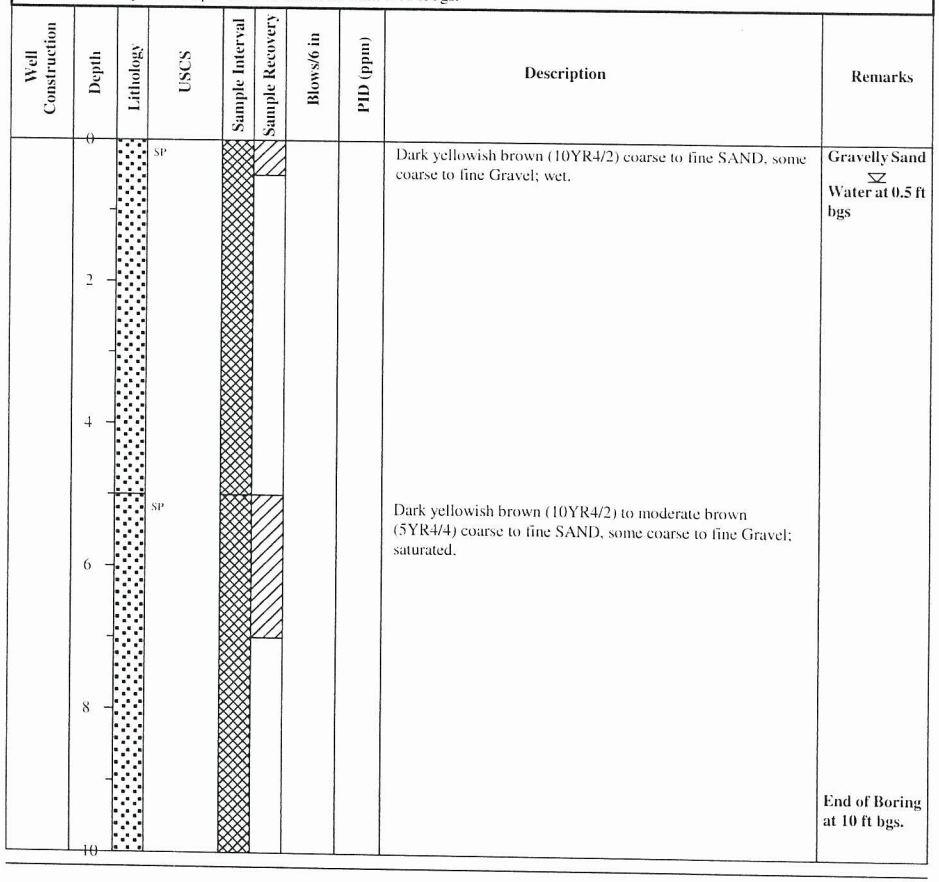
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-18 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/7/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/7/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-18 collected from 5-5.5 ft bgs for VOCs.
Composite sample ASB-18 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SP-SM				<1	Moderate yellowish brown (10YR5/4) to darky gray (N3) coarse to fine SAND, little Silt, little coarse Gravel (fill material - glass and rubber debris); moist.	**Gravelly Silty Sand**
	2		SP-SM					Darky gray (N3) medium to fine SAND, little Silt; moist.	**Silty Sand**
	4								
			SP-SM				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, little Silt, little medium to fine Gravel; wet.	**Gravelly Silty Sand ▽ Water at 5.5 ft bgs**
	6								
			OL				<1	Dark gray (N3) PEAT; wet.	**Peat**
	8								
	10								**End of Boring at 10 ft bgs.**

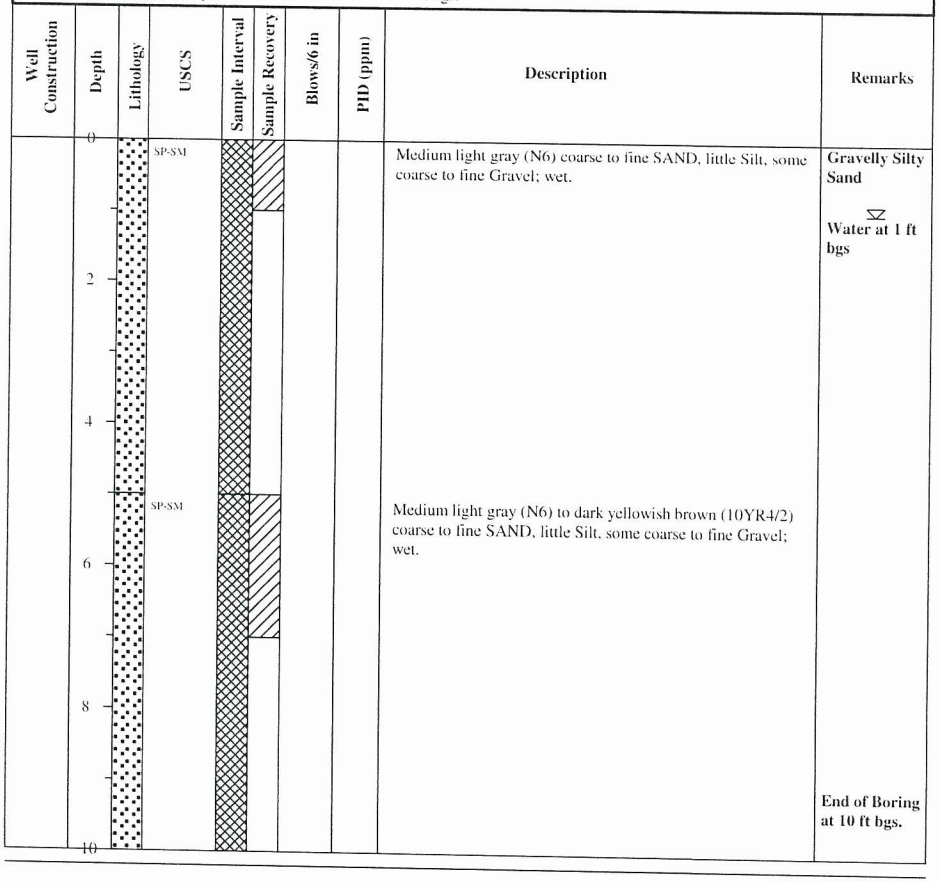
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-19 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-19 collected from 0-0.5 ft bgs for VOCs.
Composite sample ASB-19 collected from 0-10 ft bgs.



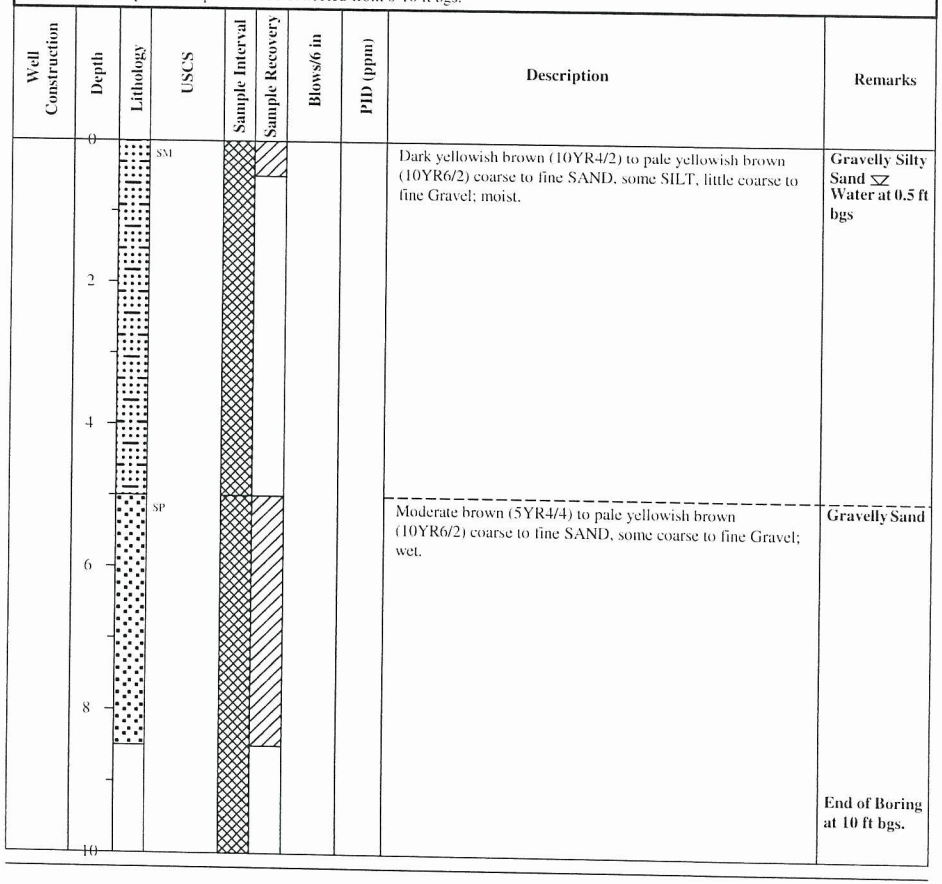
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-20
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-20 collected from 0.5-1 ft bgs for VOCs.
Composite sample ASB-20 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-21 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/4/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/4/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 0.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-21 collected from 0-0.5 ft bgs for VOCs.
Composite sample ASB-21 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-22 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/4/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/4/2008
Diameter (in): 2 / **Well Diameter:** N/A		**DRILLER:** J. Meyer
Total Depth (ft): 10 / **Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A / **Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): 5.5 / **Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-22 collected from 5-5.5 ft bgs for VOCs.
Composite sample ASB-22 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A				<1	No Recovery	
	2								
	4								
			SP-SM				<1	Pale brown (5YR5/2) coarse to fine SAND, little Silt, some coarse to fine Gravel; wet.	**Gravelly Silty Sand** ▽ **Water at 5.5 ft bgs**
	6								
			SP-SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, some coarse to fine Gravel; wet.	
	8								
	10								**End of Boring at 10 ft bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-23 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/4/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/4/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-23 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-23 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Dusky yellowish brown (10YR2/2) CLAYEY SILT, little medium to fine Grave; moist.	**Gravelly Clayey Silt**
			ML				<1	Pale yellowish brown (10YR6/2) CLAYEY SILT, little medium to fine Gravel; moist.	
	2		ML				<1	Dark greenish gray (5GY4/1) CLAYEY SILT, little medium to fine Gravel; moist.	
			SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; moist.	**Gravelly Sand**
	4								
			SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; moist.	▽ **Water at 5 ft bgs**
	6								
	8								
									End of Boring at 10 ft bgs.
	10								

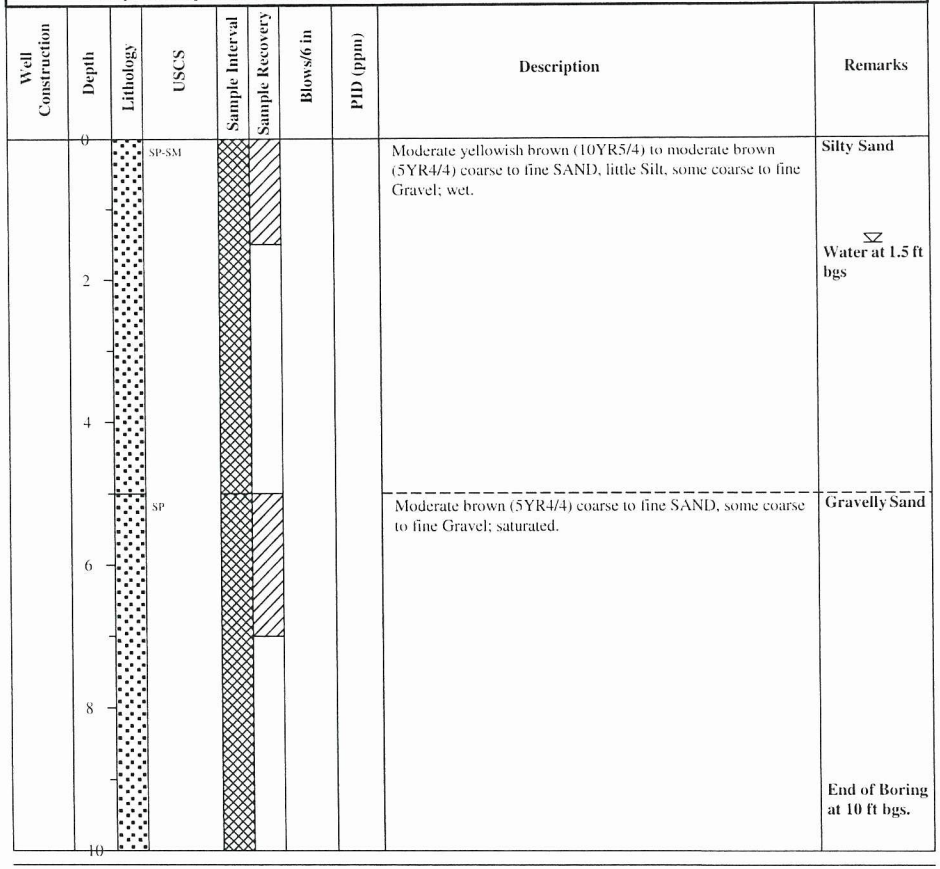
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-25 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/5/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-25 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-25 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	**Gravelly Silty Sand**
	2		ML				<1	Dusky yellowish brown (10YR2/2) SILT, trace fine Gravel (organic debris); moist.	**Silt**
	4		ML				<1	Pale yellowish brown (10YR6/2) SILT, little fine Sand; moist.	**Sandy Silt** ▽ **Water at 5 ft bgs**
	6		ML				<1	Pale yellowish brown (10YR6/2) SILT, little coarse to fine SAND, trace medium to fine Gravel; wet.	
	8		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	**Gravelly Sand**
	10								**End of Boring at 10 ft bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-27
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-34 collected from 1-1.5 ft bgs for VOCs.
Composite sample ASB-27 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-28
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 15	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 4.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-28 collected from 4-4.5 ft bgs for VOCs.
Composite sample ASB-28 collected from 0-15 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky yellowish brown (10YR2/2) medium to fine SAND, some Silt, little medium to fine Gravel; moist.	**Gravelly Silty Sand**
	2								
			ML				<1	Greenish gray (5GY6/1) SILT, little fine Gravel; wet.	**Silt** **Water at 4.5 ft bgs** ▽
	4								
			SP				<1	Dark yellowish brown (10YR4/2) to pale yellowish brown (10YR6/2) coarse to fine SAND, some coarse to fine Gravel; wet.	**Gravelly Sand**
	6								
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-28
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP				<1	Dark yellowish brown (10YR4/2) to pale yellowish brown (10YR6/2) coarse to fine SAND, some coarse to fine Gravel; wet.	
			SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, little medium to fine Gravel; wet.	
	12								
	14								End of Boring at 15 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-29 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/5/2008
Diameter (in): 2 / **Well Diameter:** N/A		**DRILLER:** J. Meyer
Total Depth (ft): 10 / **Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A / **Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): 4.5 / **Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-29 collected from 4-4.5 ft bgs for VOCs.
Composite sample ASB-29 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Dusky yellowish brown (10YR2/2) medium to fine SAND, some Silt, trace fine Gravel; moist.	Silty Sand
			SM				<1	Light brown (5YR5/6) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	Gravelly Silty Sand
	2								
	4								Water at 4.5 ft bgs ▽
			SP-SM				<1	Light brown (5YR5/6) coarse to fine SAND, little Silt, some coarse to fine Gravel; wet.	
	6								
			SP				<1	Moderate brown (5YR4/4) to pale yellowish brown (10YR6/2) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand
	8								
									End of Boring at 10 ft bgs.
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-30 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/1/2008
Diameter (in): 2 / **Well Diameter:** N/A		**DRILLER:** J. Meyer
Total Depth (ft): 10 / **Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A / **Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): 5.5 / **Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-30 collected from 0-0.5 ft bgs for VOCs.
Composite sample ASB-30 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A					No Recovery	
	2								
	4		ML					Medium dark gray (N4) CLAYEY SILT; saturated.	Clayey Silt ▽ Water at 5.5 ft bgs
	6		SP-SM					Medium gray (N5) coarse to fine SAND, little Silt, some coarse to fine Gravel; saturated.	Gravelly Silty Sand
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-31 **WELL ID:** TWP-31 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 1.5	**Depth to Water (ft):** 1.5	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-31 collected from 1-1.5 ft bgs for VOCs.
Composite sample ASB-31 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SP					Moderate yellowish brown (10YR5/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand ⧖ Water at 1.5 ft bgs
	2								
	4		SP					Moderate yellowish brown (10YR5/4) to moderate brown (5YR4/4) coarse to fine SAND, trace Silt, some coarse to fine Gravel; saturated.	
	6								
	8								
	10								End of Boring at 10 ft bgs.

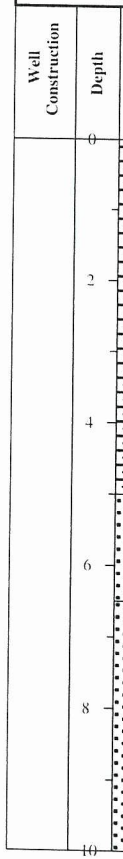
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-32 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 0.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-32 collected from 0-0.5 ft bgs for VOCs.
Composite sample ASB-32 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		CL					Medium light gray (N6) SILTY CLAY; wet.	**Silty Clay** ▽ **Water at 0.5 ft bgs**
	2								
	4								
	6		SP					Medium gray (N5) coarse to fine SAND, some coarse to fine Gravel; saturated.	**Gravelly Sand**
	8		SP-SM					Moderate yellowish brown (10YR5/4) coarse to fine SAND, little Silt, some coarse to fine Gravel; saturated.	**Gravelly Silty Sand** **End of Boring at 10 ft bgs.**
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-33
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-33 collected from 0.5-1 ft bgs for VOCs.
Composite sample ASB-33 collected from 0-10 ft bgs.



Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		CL					Medium gray (N5) SILTY CLAY; wet.	Silty Clay ▽ Water at 1 ft bgs
	6		SP-SM					Dark yellowish brown (10YR4/2) coarse to fine SAND, some coarse to fine Gravel; saturated.	Gravelly Sand
	8		SP-SM					Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; saturated.	End of Boring at 10 ft bgs.
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-34 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/1/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/1/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Nelson
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 2.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-34 collected from 2-2.5 ft bgs for VOCs.
Composite sample ASB-34 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML					Moderate yellowish brown (10YR5/4) CLAYEY SILT; wet.	Clayey Silt
	2								▽ Water at 2.5 ft bgs
	4								
			SP					Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand
	6								
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-36
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/7/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/7/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-36 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-36 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SP-SM				<1	Dark gray (N3) coarse to fine SAND, little Silt, trace fine Gravel; moist.	**Silty Sand**
	2								
	4								▽
			SP-SM				<1	Dark yellowish brown (10YR4/2) coarse to medium SAND, little Silt, little Gravel; wet.	**Gravelly Silty Sand, Water at 5 ft bgs**
	6								
	8								
			SP				<1	Moderate brown (5YR3/4) coarse to medium SAND, little Silt, and medium to fine Gravel; wet.	**End of Boring at 10 ft bgs.**
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-37 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-37 collected from 5-5.5 ft bgs for VOCs.
Composite sample ASB-37 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Medium dark gray (N4) CLAYEY SILT; moist.	Clayey Silt
	2								
	4								
			SM				<1	Medium light gray (N6) coarse to fine SAND, some Silt; saturated.	Silty Sand ▽ Water at 5.5 ft bgs
	6		SP				<1	Medium light gray (N6) coarse to fine SAND, some coarse to fine Gravel; saturated.	Gravelly Sand
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-38 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 3	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-38 collected from 2.5-3 ft bgs for VOCs.
Composite sample ASB-38 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Dusky yellowish brown (10YR2/2) CLAYEY SILT (organic debris); moist.	Clayey Silt
			ML				<1	Dusky yellowish brown (10YR2/2) CLAYEY SILT, trace fine Gravel; moist.	
	2		SP-SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, some coarse to fine Gravel; moist.	Silty Sand ▽ Water at 3 ft bgs
	4		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; saturated.	Gravelly Sand
	6								
	8								
	10								End of Boring at 10 ft bgs.

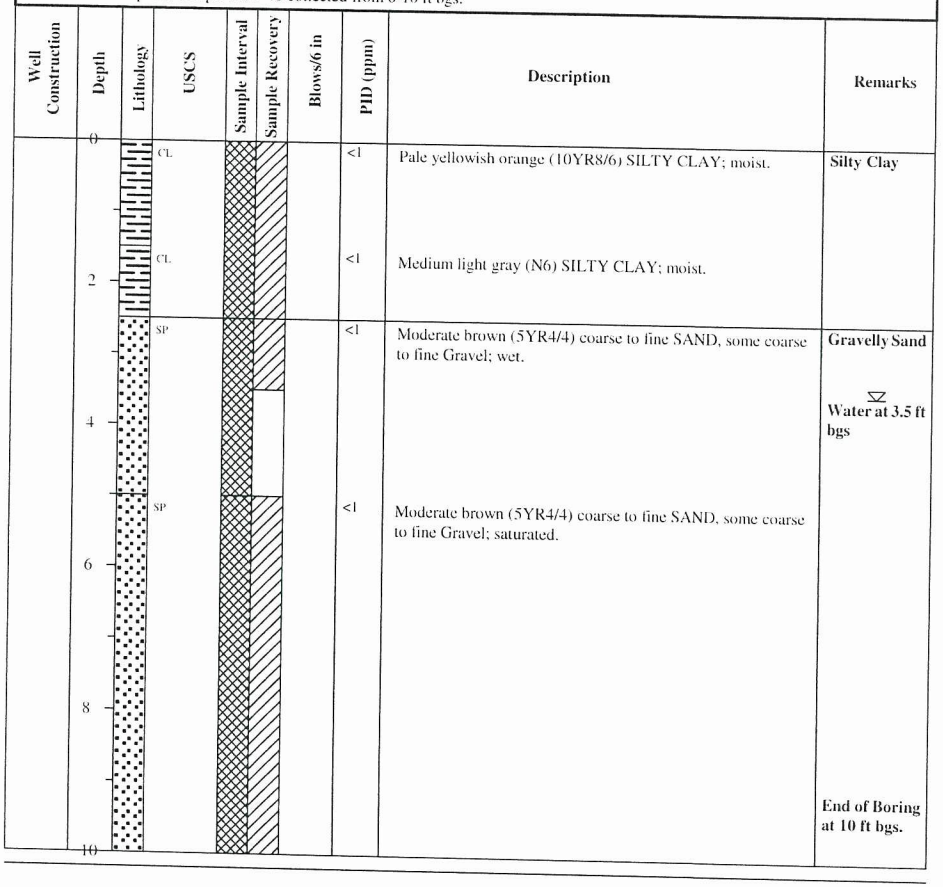
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-39 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-39 collected from 1-1.5 ft bgs for VOCs.
Composite sample ASB-39 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Medium gray (N5) to dark greenish gray (5GY4/1) CLAYEY SILT, trace fine Gravel; moist.	Clayey Silt
	2								▽ Water at 1.5 ft bgs
	4		ML				<1	Medium gray (N5) CLAYEY SILT, trace fine Gravel; saturated.	
	6		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; saturated.	Gravelly Sand
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-40
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

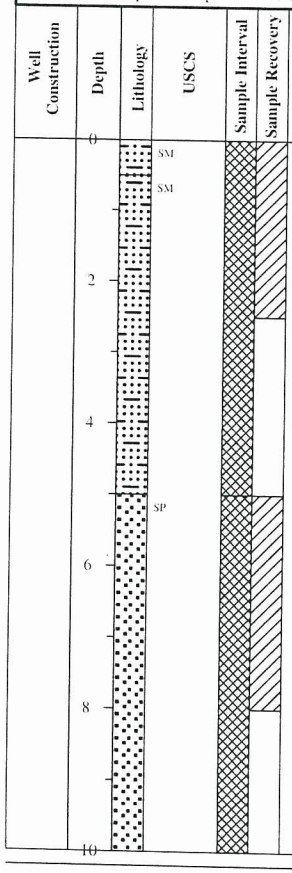
NOTES: Sample ASB-40 collected from 3-3.5 ft bgs for VOCs.
Composite sample ASB-40 collected from 0-10 ft bgs.



Depth (ft)	USCS	PID (ppm)	Description	Remarks
0	CL	<1	Pale yellowish orange (10YR8/6) SILTY CLAY; moist.	Silty Clay
2	CL	<1	Medium light gray (N6) SILTY CLAY; moist.	
	SP	<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand ▽ Water at 3.5 ft bgs
4				
	SP	<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; saturated.	
6				
8				
10				End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-41
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-41 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-41 collected from 0-10 ft bgs.



Description	PID (ppm)	Remarks
Dusky yellowish brown (10YR2/2) medium to fine SAND, some Silt (organic debris); moist.	<1	**Silty Sand**
Moderate brown (5YR4/4) to light brown (10YR5/6) coarse to fine SAND, some Silt, some coarse to fine Gravel; moist.	<1	
Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	<1	**GravellySand, Water at 5 ft bgs**
		End of Boring at 10 ft bgs.

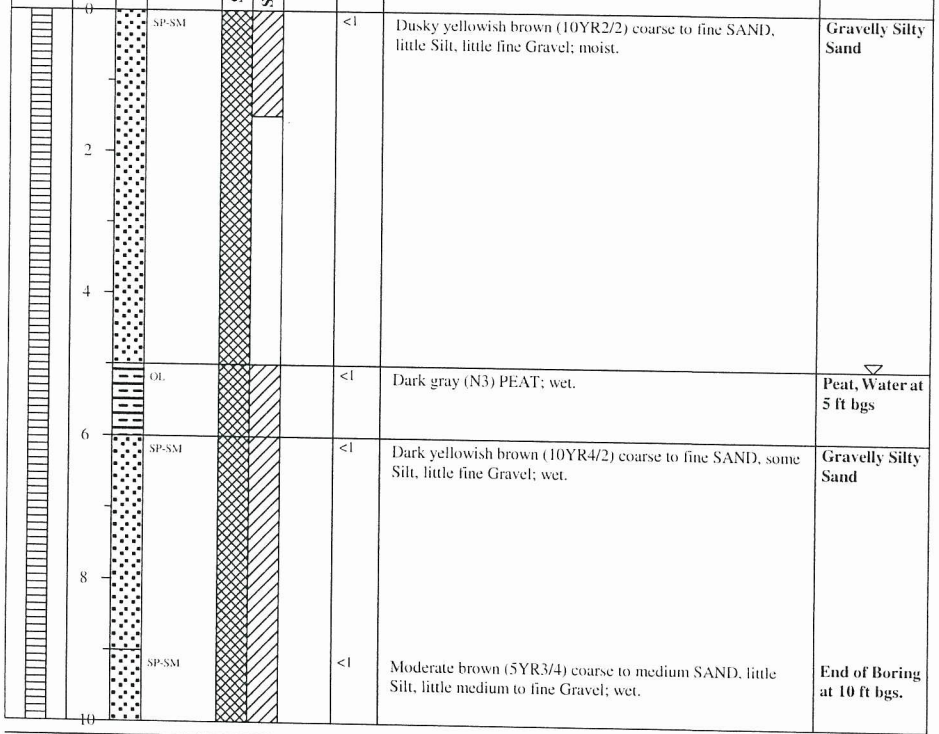
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-42
		WELL ID: TWP-42
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/5/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/5/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 7	**Depth to Water (ft):** 7	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-42 collected from 6.5-7 ft bgs for VOCs.
Composite sample ASB-42 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel; moist.	Silty Sand
	2		ML				<1	Dark yellowish orange (10YR6/6) CLAYEY SILT, trace fine Gravel; moist.	Clayey Silt
	4		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand ▽ Gravelly Sand, Water at 7 ft bgs
	6								
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-43 **WELL ID:** TWP-43 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/7/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 2/7/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** 5	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-43 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-43 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-44
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/24/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/24/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 12	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 2	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-44 collected from 1.5-2 ft bgs for VOCs.
Composite sample ASB-44 collected from 0-12 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		SM			1 1 1	<1	Dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt (roots); moist.	**Silty Sand**
	2		ML-CL			1 1 1 1	<1	Medium light gray (N6) to medium dark gray (N4) Silty Clay; wet.	**Silty Clay, Water at 2 ft bgs**
	4		ML-CL			1 2 4 8	<1	Medium light gray (N6) to medium dark gray (N4) Silty Clay, little medium to fine Gravel; wet.	**Gravelly Silty Clay**
	6		SP-SM			12 10 24 22	<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, some coarse to fine Gravel; wet.	**Gravelly Silty Sand**
	8		SP			28 10	<1	Moderate brown (10YR4/4) coarse to fine SAND, little medium to fine Gravel; wet.	**Gravelly Sand**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-44
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
						19 20			
	10		SP-SM			18	<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt; wet.	**Silty Sand**
						12			
						12			**End of Boring at 12 ft bgs.**
	12					16			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-45
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/24/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/24/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 12	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 4	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-45 collected from 3.5-4 ft bgs for VOCs.
Composite sample ASB-45 collected from 0-12 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A			1 1 1	<1	No Recovery	
	2		ML			2 1 1 1	<1	Dusky yellowish brown (10YR4/2) SILT (roots); moist.	**Silt**
	4		SP			1 2 3 4	<1	Moderate brown (5YR3/4) to dark greenish gray (5GY4/1) coarse to fine SAND, trace Silt, some coarse to fine Gravel; wet.	**GravellySand, Water at 4 ft bgs**
	6		SP			3 3 6 7	<1	Moderate brown (5YR4/4) coarse to fine SAND, little medium to fine Gravel; wet.	
	8					7 4	<1		

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-45
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
						7 7			
	10		SP			10 7 7 7	<1	Moderate brown (5YR4/4) coarse to fine SAND, trace fine Gravel; wet.	**Sand** **End of Boring at 12 ft bgs.**
	12								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-46
		WELL ID: ATWP-46
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Sampling		**DATE STARTED:** 1/22/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/22/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 14	**Total Depth (ft):** 14	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 3	**Depth to Water (ft):** 3	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-46 collected from 1.5-2 ft bgs for VOCs.
Composite sample ASB-46 collected from 0-14 ft bgs.

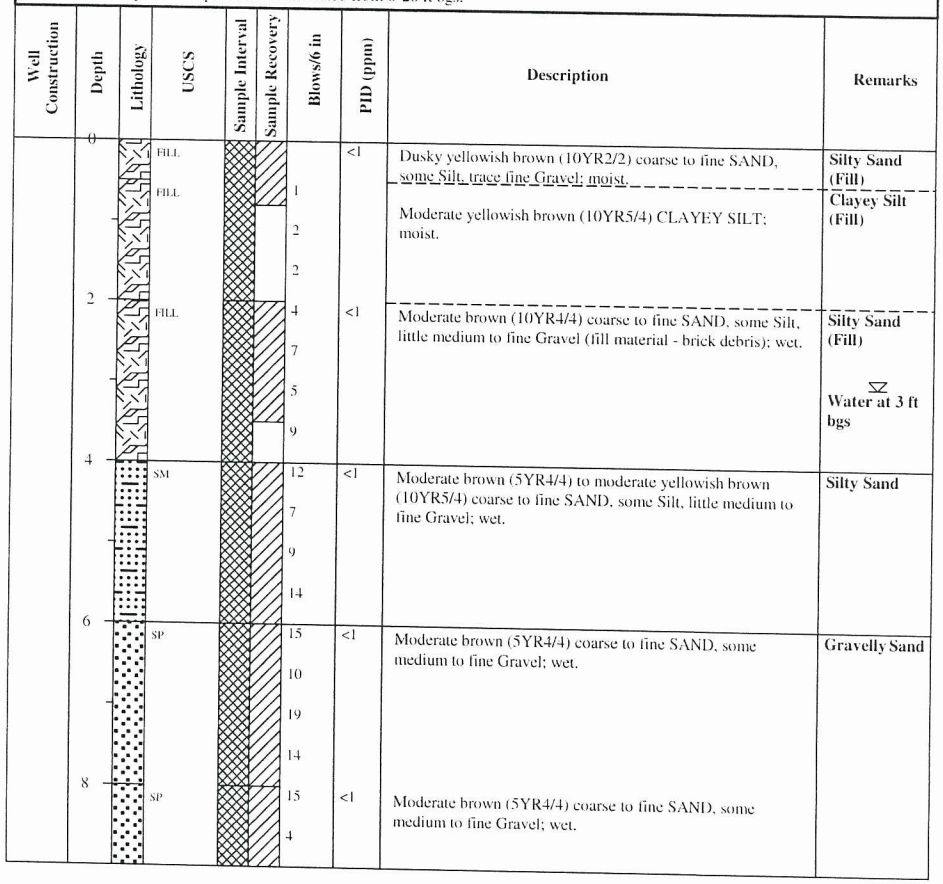
Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML-CL			3 2 3	<1	Medium light gray (N6) to dark gray (N3) SILTY CLAY (roots); moist.	**Silty Clay**
	2		SM			5 7 4 7	<1	Medium light gray (N6) medium to fine SAND, some Silty Clay (roots); wet	**Silty Clayey Sand** ▽ **Water at 3 ft bgs**
	4		SP			6 3 3 4	<1	Dark yellowish brown (10YR4/2) medium to fine SAND, trace Silt; wet.	**Sand**
	6		SP			6 10 11 14	<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some coarse to fine Gravel; wet.	**Gravelly Sand**
	8		SP-SM			17 10	<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, little Silt, little coarse to fine Gravel; wet.	**Sand**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-46
	Page 2 of 2	WELL NO.: ATWP-46

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP			14 16 17 12 17 19	<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	**Gravelly Sand**
	12		SP-SM				<1	Moderate brown (5YR4/4) medium to fine SAND, little Silt; wet.	**Silty Sand** **End of Boring at 14 ft bgs.**
	14								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-47
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/23/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/23/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 20	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 3	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-47 collected from 3-3.5 ft bgs for VOCs.
Composite sample ASB-47 collected from 0-20 ft bgs.



Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		FILL			1	<1	Dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, trace fine Gravel; moist.	Silty Sand (Fill)
			FILL			2		Moderate yellowish brown (10YR5/4) CLAYEY SILT; moist.	Clayey Silt (Fill)
						2			
	2		FILL			4	<1	Moderate brown (10YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel (fill material - brick debris); wet.	Silty Sand (Fill) ▽ Water at 3 ft bgs
						7			
						5			
						9			
	4		SM			12	<1	Moderate brown (5YR4/4) to moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	Silty Sand
						7			
						9			
						14			
	6		SP			15	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	Gravelly Sand
						10			
						19			
						14			
	8		SP			15	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	
						4			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-47
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP			5 5 8 5 6 7	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	
	12		SP			8 12 10 10	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	
	14		SP			9 6 9 9	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	
	16		SP			12 6 11 12	<1	Moderate brown (5YR4/4) coarse to fine SAND, some medium to fine Gravel; wet.	
	18		SP			15 4 7 11	<1	Moderate brown (5YR4/4) to dusky brown (5YR2/2) coarse to fine SAND, little fine Gravel; wet.	**Sand** **End of Boring at 20 ft bgs**
	20								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-48
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/22/2008
		DATE FINISHED: 1/22/2008

BOREHOLE DATA		**WELL DATA**		
Diameter (in):	2	**Well Diameter:**	N/A	**DRILLER:** J. Meyer
Total Depth (ft):	20	**Total Depth (ft):**	N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft):	N/A	**Screen Length (ft):**	N/A	**NORTHING:** N/A
Depth to Water (ft):	3	**Depth to Water (ft):**	N/A	**EASTING:** N/A
Depth to Rock (ft):	N/A	**Slot Size:**	N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-48 collected from 3-3.5 ft bgs for VOCs.
Composite sample ASB-48 collected from 0-20 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML-CL			5 4 5	<1	Moderate brown (5YR4/4) to light brown (5YR5/6) CLAYEY SILT; dry.	Clayey Silt
	2		SM			4 6 6 7	<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little trace fine Gravel; moist.	Silty Sand ▽ Water at 3 ft bgs
	4		SM			4 8 5 4	<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt; wet.	
	6		SP-SM			5 8 9 9	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	Sand
	8		SP-SM			12 17	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-48
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP-SM			12 13 11 8 7 7	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	
	12		SP-SM			7 9 8 9	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	
	14		SP-SM			10 6 7 9	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	
	16		SP-SM			10 8 9 12	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	
	18		SP-SM			19 9 8 10	<1	Moderate brown (5YR4/4) coarse to fine SAND, little coarse to fine Gravel; wet.	**End of Boring at 20 ft bgs.**
	20								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-49 **WELL ID:** N/A **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 2/7/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 2/7/2008
Diameter (in): 2 / **Well Diameter:** N/A		**DRILLER:** J. Meyer
Total Depth (ft): 10 / **Total Depth (ft):** N/A		**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A / **Screen Length (ft):** N/A		**NORTHING:** N/A
Depth to Water (ft): 5 / **Depth to Water (ft):** N/A		**EASTING:** N/A
Depth to Rock (ft): N/A / **Slot Size:** N/A		**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-49 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-49 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Dusky yellowish brown (10YR2/2) SILT, little fine Sand, trace fine Gravel; moist.	Silty Sand
	2								
	4								▽
			SP				<1	Moderate brown (5YR3/4) coarse to medium SAND, medium to fine Gravel; wet.	Sand, Water at 5 ft bgs
	6								
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-50
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/25/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/25/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 12	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): N/A	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Composite sample ASB-50 collected from 0-12 ft bgs.

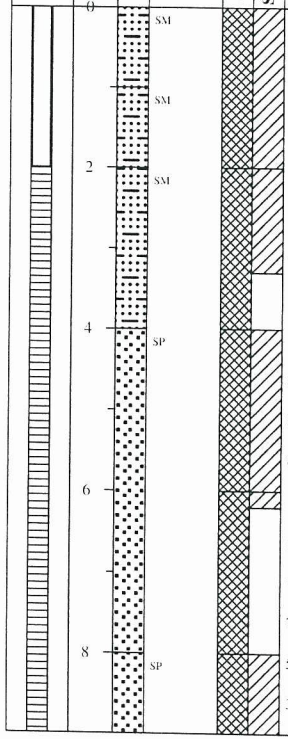
Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A			1 1 1	<1	No Recovery	
	2		ML			1 1 1 2	<1	Dusky yellowish brown (10YR2/2) SILT; wet.	**Silt**
	4		SM			2 3 2 4	<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	**Gravelly Silty Sand**
	6		SM			7 6 11 11	<1	Dark yellowish brown (10YR4/2) to moderate brown (5YR4/4) coarse to fine SAND, some Silt, little medium to fine Gravel; wet.	
	8		SP			0 6	<1	Moderate brown (5YR4/4) coarse to fine SAND, little fine Gravel; wet.	**Gravelly Sand**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-50
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Litl.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10					8 8 8 8 10 9	<1		End of Boring at 12 ft bgs.
	12								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-51 **WELL ID:** ATWP-51 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/25/2008
BOREHOLE DATA / **WELL DATA**		**DATE FINISHED:** 1/25/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 12	**Total Depth (ft):** 12	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 3	**Depth to Water (ft):** 3	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-51 collected from 2.5-3 ft bgs for VOCs.
Composite sample ASB-51 collected from 0-14 ft bgs.



Depth	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
0	SM			2	<1	Dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silty (roots); moist.	Silty Sand
	SM			4		Moderate yellowish brown (10YR5/4) medium to fine SAND, some SILT; moist.	
2	SM			4			
				3	<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet	Gravelly Silty Sand
				5			▽ Water at 3 ft bgs
4	SP			9			
				14			
				10	<1	Moderate brown (5YR4/4) to moderate yellowish brown (10YR5/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand
				6			
				8			
6				8			
				11	<1		
				12			
				12			
				7			
8	SP			5	<1	Moderate brown (5YR4/4) coarse to fine SAND, little medium to fine Gravel; wet.	
				3			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-51
	Page 2 of 2	WELL NO.: ATWP-51

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
						2			
						2			
	10		SP			3	<1	Moderate brown (5YR4/4) coarse to fine SAND, little fine Gravel; wet.	Sand
						3			
						4			End of Boring at 12 ft bgs.
	12					3			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-52
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-52 collected from 4.5-5 ft bgs for VOCs.
Composite sample ASB-52 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Medium gray (N5) CLAYEY SILT; moist	Clayey Silt
	2								▽ Water at 1.5 ft bgs
	4								
	6		SP				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some coarse to fine Gravel; saturated.	Gravelly Sand
			SP				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some coarse to fine Gravel; saturated.	
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; saturated.	Gravelly Silty Sand
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 2	**BORING ID:** ASB-53
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 15	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-53 collected from 0.5-1 ft bgs for VOCs.
Composite sample ASB-53 collected from 0-15 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		CL-ML				<1	Dusky yellowish brown (10YR2/2) Clayey SILT (organic debris); wet.	**Clayey Silt** ▽ **Water at 1 ft bgs**
	2								
	4								
			SP-SM				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, little Silt, some medium to fine Gravel; saturated.	**Gravelly Silty Sand**
	6								
			SP-SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, little Silt, some medium to fine Gravel; saturated.	
	8								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	PROJECT NO.: JG8554	BORING NO.: ASB-53
	Page 2 of 2	WELL NO.: N/A

Well	Depth	Lith.	USCS	Interval	Rec.	Blows	PID	Description	Remarks
	10		SP				<1	Moderate brown (5YR4/4) coarse to fine SAND, little fine Gravel; saturated.	Gravelly Sand
	12								
	14								End of Boring at 15 ft bgs.

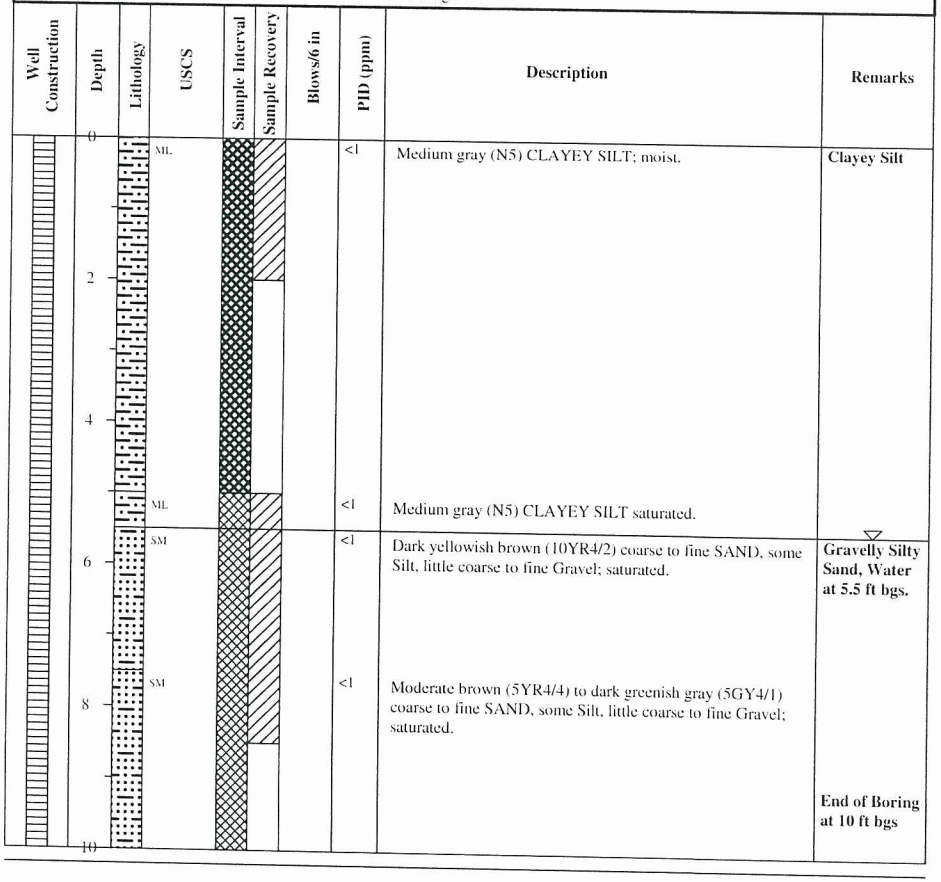
Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-54
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: B-57 Auger Rig with Split Spoon Soil Sampling		**DATE STARTED:** 1/25/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/25/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 2.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-54 collected from 2-2.5 ft bgs for VOCs.
Composite sample ASB-54 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		N/A			1 1 1	<1	No Recovery	
	2		ML-CL			1 3	<1	Medium light gray (N6) SILTY CLAY; wet.	Silty Clay, Water at 2.5 ft bgs ▽
			SM			4 5		Moderate brown (10YR4/4) to dark greenish gray (5GY4/1) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet.	Gravelly Silty Sand
	4		SM			4 2 4 6	<1	Moderate brown (10YR4/4) to dark yellowish brown (10YR4/2) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet.	
	6		SP			5 5 8 10	<1	Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	Gravelly Sand
	8					7 11 9 8	<1		End of Boring at 10 ft bgs.
	10								

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-55 **WELL ID:** TWP-55 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter (in):** 1	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** 10	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** 10	**NORTHING:** N/A
Depth to Water (ft): 5.5	**Depth to Water (ft):** 5.5	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size (in):** 0.1	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-55 collected from 5-5.5 ft bgs for VOCs.
Composite sample ASB-55 collected from 0-10 ft bgs.



Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Drilling Log** Page 1 of 1	**BORING ID:** ASB-56
		WELL ID: N/A
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
DRILLING CONTRACTOR: Aquifer Drilling and Testing, Inc.		**WOL #:** 3870-LBA-1-5133
DRILLING METHOD: Geoprobe Direct Push with Macrocore Soil Sampling		**DATE STARTED:** 1/31/2008
BOREHOLE DATA	**WELL DATA**	**DATE FINISHED:** 1/31/2008
Diameter (in): 2	**Well Diameter:** N/A	**DRILLER:** J. Meyer
Total Depth (ft): 10	**Total Depth (ft):** N/A	**LBA INSPECTOR:** J. Lacanlale
Depth to Refusal (ft): N/A	**Screen Length (ft):** N/A	**NORTHING:** N/A
Depth to Water (ft): 1.5	**Depth to Water (ft):** N/A	**EASTING:** N/A
Depth to Rock (ft): N/A	**Slot Size:** N/A	**SURFACE ELEVATION:** N/A

NOTES: Sample ASB-56 collected from 1-1.5 ft bgs for VOCs.
Composite sample ASB-56 collected from 0-10 ft bgs.

Well Construction	Depth	Lithology	USCS	Sample Interval	Sample Recovery	Blows/6 in	PID (ppm)	Description	Remarks
	0		ML				<1	Medium gray (N5) CLAYEY SILT; moist	Clayey Silt
	2								▽ Water at 1.5 ft bgs
	4								
			SP				<1	Dark yellowish brown (10YR4/2) coarse to fine SAND, some coarse to fine Gravel; saturated.	Gravelly Sand
	6		SP				<1	Moderate yellowish brown (10YR5/4) coarse to fine SAND, some coarse to fine Gravel; saturated.	
			SM				<1	Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; saturated.	Gravelly Silty Sand
	8								
	10								End of Boring at 10 ft bgs.

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-1
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 6	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 3	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 2	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0 1 2		Dark gray (N3) to very dusky red (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel, little organic material; wet.	**Silty Sand** **Water Level at 2 ft. bgs.**
	CL	2 3 4 5		Medium light gray (N6) CLAY; wet.	**Clay** **Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-2 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 3	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): N/A	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel, little Organic Material; moist.	**Silty Sand**
	SM	1		Moderate yellowish brown (10YR5/4) to dark yellowish orange (10YR6/6) coarse to fine SAND, some Silt, little Clay, trace Brick Debris; moist.	**Silty Sand (Fill)**
	SM	2			
		3		Medium light gray (N6) to moderate brown (5YR4/4) coarse to fine SAND some Silt, little Clay, little coarse to fine Gravel; moist.	**Silty Sand**
		4			
		5			**Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-3 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 7	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 3	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 1	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0 1		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel, little Organic Material; wet.	**Silty Sand** ▽ **Water Level at 1 ft. bgs.**
	CL	2 3 4 5		Medium light gray (N6) CLAY; wet.	**Clay** **Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-4
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 4	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 3	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): N/A	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel, little Organic Material; moist.	**Silty Sand**
	SM	1		Moderate yellowish brown (10YR5/4) to pale yellowish brown (10YR6/2) coarse to fine SAND, some Silt, little Clay, little coarse to fine Gravel; moist.	**Silty Sand (Fill)**
		2			
	CL	3		Medium light gray (N6) CLAY; moist.	**Clay**
	SM	4		Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand** **Bottom of Pit at 5 ft. bgs.**
		5			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-5
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 4	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 1	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0 1 2		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little Organic Material; wet.	**Silty Sand** ▽ **Water Level at 1 ft. bgs.**
	CL	2 3 4 5		Medium light gray (N6) CLAY; wet.	**Clay** **Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-6
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 6	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 4	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 4	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A

NOTES:

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand**
	SM	1		Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little Clay, little medium to fine Gravel; moist.	**Silty Sand (Fill)**
	SM	2		Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet.	**Silty Sand** ▽ **Water Level at 4 ft. bgs.**
		3			
		4			**Bottom of Pit at 5 ft. bgs.**
		5			

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-7
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 6	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 4	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 3	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand**
	SM	1		Moderate yellowish brown (10YR5/4) coarse to fine SAND, some Silt, little Clay; moist.	**Silty Sand (Fill)**
	SP	2		Moderate brown (5YR4/4) coarse to fine SAND, some coarse to fine Gravel; wet.	**Gravelly Sand** ▽ **Water Level at 3 ft. bgs.**
		3			
		4			
		5			**Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-8 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/25/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/25/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 5	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 5	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): Surface	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some Silt, little Organic Material; wet.	**Silty Sand** **Water Level at Surface**
	CL	1 2 3 4 5		Medium light gray (N6) CLAY; wet.	**Clay** **Bottom of Pit at 5 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-9
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/26/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/26/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 4	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 6	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 5.5	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SP	0 1 2 3		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, little Silt, some coarse to fine Gravel; moist.	**Gravelly Sand (Fill)**
	CL	3 4 5		Medium light gray (N6) to greenish gray (5GY6/1) CLAY; moist.	**Clay** **Water Level at 5.5 ft. bgs.** ▽
	SM	6		Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet.	**Silty Sand** **Bottom of Pit at 6 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-10 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/26/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/26/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 4	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 6	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): N/A	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SP	0 1 2 3		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, little Silt, some coarse to fine Gravel; moist.	**Gravelly Sand (Fill)**
	CL	4 5 6		Medium light gray (N6) to greenish gray (5GY6/1) CLAY; moist.	**Clay** **Bottom of Pit at 6 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-11 **LOCATION:** Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/26/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/26/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 5	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 6	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 3	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SP	0 1 2 3 4 5		Dark gray (N3) to dusky yellowish brown (10YR2/2) coarse to fine SAND, some coarse to fine Gravel, little concrete and metal debris; wet.	**Gravelly Sand (Fill)** ▽ **Water Level at 3 ft. bgs.**
	CL	6		Medium light gray (N6) to greenish gray (5GY6/1) CLAY; wet.	**Clay** **Bottom of Pit at 6 ft. bgs.**

Louis Berger & Assoc., P.C. 199 Water Street, 23rd Floor New York, New York 10038	**Test Pit Log** Page 1 of 1	**TEST PIT NO.:** TP-12
		LOCATION: Staten Island, NY
CLIENT: New York City Department of Design and Construction		**PROJECT NO:** JG8554
PROJECT: Oakwood Beach Phase II - Section A		**FMS ID#:** BEGS2006004
EXCAVATION CONTRACTOR: Environmental Closures, Inc.		**WOL #:** 3870-LBA-1-5133
EXCAVATOR: Backhoe		**DATE STARTED:** 2/26/2008
EXCAVATION DATA	**BACKFILL DATA**	**DATE FINISHED:** 2/26/2008
Length (ft): 5	**Material:** Excavated Fill	**OPERATOR:** B. Karshick
Width (ft): 5	**Compaction:** Tamping	**LBA INSPECTOR:** J. Lacanlale
Depth (ft): 6	**Lifts (ft):** N/A	**NORTHING (ft):** N/A
Depth to Water (ft): 3	**Restoration:** N/A	**EASTING (ft):** N/A
Depth to Rock (ft): N/A		**GROUND ELEVATION (ft):** N/A
NOTES:		

Lithology	USCS	Depth (ft)	PID (ppm)	Description	Remarks
	SM	0		Dark yellowish orange (10YR6/6) coarse to fine SAND, some Silt, little coarse to fine Gravel; moist.	**Silty Sand (Fill)**
		1			
		2			
		3			**Water Level at 3 ft. bgs.**
	SM			Moderate brown (5YR4/4) coarse to fine SAND, some Silt, little coarse to fine Gravel; wet.	**Silty Sand**
		4			
		5			
		6			**Bottom of Pit at 6 ft. bgs.**